Critical analysis of the Integrated Water Resources Management legal framework in India

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Abstract

Water security is critical not only for achieving economic growth, social development, and maintaining the ecosystem but also for ensuring political stability in any country. Since declining water security will ultimately constrain economic growth, slow poverty alleviation, and leave many exposed to the threats of floods, droughts, and water-borne disease. Today, water security has become one of the biggest challenges facing the world. The situation is more severe in developing countries such as India. There are vast differences in water availability in Indian rivers due to the variability of supply through time as a result of both seasonal variation and inter-annual variation. This not only equates to the unreliability of the resource, but it also causes floods and drought due to its uneven distribution, which poses significant challenges to water managers in particular and societies as a whole. Moreover, achieving spectacular economic growth over the decades has further accelerated the problem while options for supply augmentation are few. In addition to these challenges, water pollution has emerged as one of the most critical issues in India, as almost 70% of the surface water and groundwater resources are contaminated by biological, toxic, organic, and inorganic pollutants. In the face of these challenges, better management of water quality, and achieving water security have become one of the biggest challenges. The problem of water security is further aggravated by shortcomings in the current water management system. The sectoral approach to water resources management dominated in the past and still prevails to some extent has proved inadequate for managing water resources effectively. This approach to water resources has been geared towards resource development through capital investments rather than water management in India. This inadequacy of the existing water governance has led to the realisation of a paradigm shift from water resource development to water resource conservation and management by highlighting the need for institutional reform. This institutional reform in the country has been introduced as Integrated Water Resource Management (IWRM). The concept of IWRM was officially introduced at the international level in 1992 at the Dublin conference and has since been adopted worldwide. A central goal of IWRM is to achieve water security at the river basin level for all purposes. The route to achieving water security requires creating adaptable governance mechanisms to achieve Economic efficiency, Environmental sustainability, and social equity, including Poverty reduction. The broad framework for IWRM involves implementing a few elements/ principles into practice as part of water governance. Firstly, IWRM intends to move away from top-down, centralised approaches for water security towards a more flexible, decentralised approach that involves a variety of diversified governance structures at a local, basin, national and transnational level. Secondly, it focuses on the development of participatory planning and the implementation process. It, therefore, calls for the involvement of decision-makers across the various sectors and stakeholders, who represent a designated group or sector of society, to set policy and make sound, balanced decisions in response to specific water challenges. Thirdly, IWRM tends to move away from command-and-control instruments that focus on supply-side water management, such as large– 3 scale water infrastructure, towards incorporating demand-side management with economic instruments such as water pricing. When it comes to India, as mentioned above country has introduced institutional reform in the form of IWRM and is keen to adopt this approach as a way forward to solve its water-related

problems. So far, some initiatives have been taken in the form of introducing the pilot project at the state level and policy legislation. However, despite these efforts, a success story is yet to be recorded. With regard to India, the main question is, what are the realities on the ground in the Indian context to promote the successful initiation and implementation of IWRM? Is the situation on the ground conducive to successfully implementing IWRM into practice? Here ground realities refer to the existing legal framework in the water sector in India. To find the answer to all these questions, this research project was set up to investigate the application of IWRM in India, specifically from a legal perspective. Each principle of IWRM has been studied to see whether the existing legal framework supports the application of IWRM at national and state levels in practice or not. After a deep legal analysis, findings reveal that a number of changes need to be introduced in the existing legislation at the national and state level to ensure the effective implementation of IWRM in the water sector in India.

Firstly, regarding the principle of public participation, both national and state-level legislative frameworks have failed to recognise the role of water users in water management in line with IWRM. the principle of public participation in IWRM requires the involvement of all stakeholders from planning to management. However, the National Water Policy 2012, which is a significant document for the introduction of the participatory approach in the water sector, has merely refereed to public consultation. Further, the term beneficiaries and stakeholders used in the policy is very unclear about what stakeholder means. In addition, the water sector is also lacking national comprehensive legislation, particularly in the case of irrigation water management, which has a direct impact on the role of farmers. The ambiguities in the national framework have directly impacted the state legislation.

Moreover, when it comes to decentralised decision making which means involving all governance bodies from the local, basin, and national to the transnational level. The findings revealed that there are challenges arising from both the Indian constitution and national water policy that has made the lowest level of governance bodies subject to the control of the state government. As a result, the role of local government bodies is highly impacted, and cannot be said that decentralised decision-making has been implemented in line with IWRM. Besides legislative provisions, gaps in the informative mechanisms were also found which has a direct impact on the participation of stakeholders. Further, the findings reveal that the principle of water pricing has been introduced in the water sector in India. However, when it comes to its implementation, it is far from reaching its goal. Several challenges have been identified in the form of poor legislation, bureaucratic control, lack of recognition of water as a resource, etc.

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List of Abbreviations:

AMC	Ahmadabad Municipal Corporation
ARWSP	Accelerated Rural Water Supply. Programme
ASHA	Accredited Social Health Activist
BAU	Business-as-Usual Scenario
BIS	Bureau of Indian Standards BRC
BPL	Below Poverty Line
BRC	Block Resource Coordinators
CB&T	Capacity Building and Training
CCDU	Communication and Capacity Development Unit
CPCB	Central Pollution Control Board
CRRID	Centre For Research in Rural and Industrial Development
DPMC	District Programme Management Cell
DWSM	District Water and Sanitation Mission
DWSC	District Water Sanitation Committee
DWSS	Department of Water Supply & Sanitation
FFS	Farmer Field Schools
FTK	Field-Testing Kit
GOP	Government of Punjab
GP	Gram Panchayat
HRD	Human Resource Development
IEC	Information, Education and Communication
IWRM	Integrated Water Resources Management
NGOs	Non- Governmental Organisations
NHRD	National Human Resources Development
NRDWP	National Rural Drinking Water Programme
OBCs	Other Backward Class
ODF	Open-Defecation Free
O&M	Operation and Maintenance
PRI	Panchayat Raj Institution
PIM	Participatory Irrigation Management
PRWSSP	Punjab Rural Water Supply Services Program

RAWTL	Regional Advance Water Testing Lab
RO	Reverse Osmosis
RWSS	Rural Water Supply Services
SCs	Scheduled Castes
SFC	State Finance Commission
SPMC	State Program Management Cell
SRP	Sector Reform Projects
STs	Scheduled Tribes
SWAP	Sector- Wide Approach
SWSM	State Water & Sanitation Mission
TRYSEM	Training of Rural Youth for Self-Employment
UNFCCC	United Nations Framework Convention on Climate Change
VWSC	Village Water and Sanitation Committee
WALMIs	Water and Land Management Institutes
WHO	World Health Organisation
WRA	Water Regulatory Authority
WSSO	Water and Sanitation Support Organisation
WQM&S	Water Quality Monitoring & Surveillance

Chapter 1

Introduction

1.1 Water Resources and Challenges to Its Availability in India:

Water security is critical not only for achieving economic growth, social development, the integrity of ecosystems, and ecological balance but also for ensuring political stability in any country.[1] Declining water security will constrain economic growth, slow poverty alleviation, and leave many exposed to the threats of floods, droughts, and water-borne diseases. Today, water security has become one of the biggest challenges for countries.[2] According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the total volume of water on planet earth is about 1.4 billion km^3.[3] Out of which around 97.5% is in the oceans, leaving about 2.5% as freshwater. Of this freshwater, nearly 68.9 % is in the form of ice and permanent snow cover in mountainous regions, the Antarctic, and Arctic regions and 29.9% is present as groundwater. The rest, 0.3% of all freshwaters, is available in lakes, and rivers, and 0.9 % in soil moisture, swamp water, and permafrost atmosphere.[4] Further, the existing freshwater resources are not available in equal proportion. In the world, there is a significant difference in the availability of water from region to region - from the extremes of deserts to tropical forests, and with now the onset of climate change this availability of freshwater is now further widening. In many regions, water availability is based on the variability of supply based on seasonal and inter-annual variation. All these changing factors now are putting a strain on freshwater access for the world[5] and in rapidly developing countries like India situation is getting more critical which poses great challenges for water managers. The reasons are discussed below:

1.2 Water Resources in India:

Water resources in India are a study in contrast. The average annual precipitation in volumetric terms is 4,000 billion cubic meters (BCM), including snowfall.[6] The natural runoff out of this is 1869 BCM, which constitutes a little over 4% of the total river flows of the world. However, due to various constraints of topography and uneven distribution over space and time, only 1,121 BCM of the total annual water potential is utilizable (690 BCM from surface water resources and 431 BCM from groundwater resources as per the Central Water Commission of India.[7] Indian rivers are a major source of surface

[1] Comptroller and Auditor General of India Report No. 21 of 2011-12 p. 1
[2] Dadson, S., Hall, J. W., Garrick, D., Sadoff, C., Grey, D., and Whittington, D. (2017), Water security, risk, and economic growth: Insights from a dynamical systems model, Water Resour. Res., 53, 6425– 6438
[3] Central Water Commission (CWC) Water and Related Statistics 2013 p.1
[4] Ibid
[5] United Nations Department of Economic and Social Affairs, Integrated Water Resources Management International Decade for Action: Water for Life 2005-2015 available at http://www.un.org/waterforlifedecade/iwrm.shtml (assessed on 1- 1- 2018)
[6] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) p.110
[7] Central Water Comission (CWC) Annual Report 2013 - 14 p.15

water and have 12 major, and 46 medium rivers respectively. These Rivers contribute 92% of the total runoff in the country and the remaining 8% comes from minor rivers. [8] These rivers are also known as the Himalayan Rivers, Peninsular Rivers, Coastal Rivers, and Inland Drainage Basins.[9] India also has 6 Desert rivers which do not contribute as they flow for some distance before becoming lost in the desert.[10] Water availability from these main rivers is very dependent on temporal and seasonal variations within the country. The country receives nearly 75% (3000 BCM) of its rainfall during the monsoon season, which lasts from June to September.[11] While only 48% of rainfall ends up in Indian rivers, out of which only 18 % can be utilised due to a lack of storage and crumbling infrastructure.[12] Due to India's large earth mass, country rainfall is skewed geographically with the average ranging from 100mm in the west to 1,170 mm in the East. This disparity in rainfall has meant that approximately 71% of India's water resources are available to only 36 % of the land area, namely in the Ganga, Brahmaputra - Meghna basins, and the rivers flowing in the western Ghats.[13] While the remaining 64% of the land has only 29 % of water resources available.[14] This inter-basin and region disparity is leading to water resource unreliability which is one of the main causes of extreme conditions of floods and droughts in the country. according to India's Second National Communication to UNFCCC, on average annually 91 districts in India are affected by floods, 40 million hectares of land (MHA) (12% of the total geographical area) is flood-prone, and 51 MHA of area (16% of the total geographical area of the country) is drought-prone.[15]

1.3 Current Status and Utilizations of Surface Water Resources in India:

Utilisable surface water availability differs between different rivers based on the area it supports. Utilisable proportion is remarkably high in smaller basins except in river Mahi and West Flowing River basins between Tapi and Tadri compared to the larger rivers such as the Ganga-Brahmaputra-Meghna. This is mainly because the utilisation % (total withdrawal of water) can sometimes far exceed the average annual availability and replenishment of natural water flows.[16] Total water resources potential and utilisation in the rivers are shown in table1:

[8] Government of India Ministry of Water Resources Central Water Commission, Status of Trace and Toxic Metals in Indian Rivers 2014, p.4
[9] Development, River Rejuvenation, Ganga Mission, National Water (2015) Template for Vulnerability Assessment, Mitigation and Adaptation p.1
[10] Water sector at glance, water resources Water resources p.13
available at http://cwc.gov.in/main/downloads/Water_Data_Complete_Book_2005.pdf (assessed on 1- 1- 2-18)
[11] Development, River Rejuvenation, Ganga Mission, National Water (2015) Template for Vulnerability Assessment, Mitigation and Adaptation P.14
[12] Tariq Ahmad Bhat, An Analysis of Demand and Supply of Water in India, Journal of Environment and Earth Science (2014), Vol 4(11)
[13] Yoginder K. Alagh, Ganesh Pangare and Biksham Gujja, Interlinking of Rivers in India 28 (New Delhi: Academic Foundation, 2006)
[14] United Nations, Water in India: situation and prospects (India UNICEF 2013) P. 1
[15] Development, River Rejuvenation, Ganga Mission, National Water (2015) Template for Vulnerability Assessment, Mitigation and Adaptation
[16] Central Water Commission (CWC) Water and Related Statistics – 2015 p.5

Table 1 Total Water Resources Potential and Utilisation in Major Rivers in India

River Basin	Water resources potential (percentage to total 1869 BCM)	Utilizable surface water (percentage to total 690 BCM)
Ganga - Brahmaputra- Meghna	59.4	39.7
Indus (up to border)	3.9	6.7
Godavari	5.9	11.1
Krishna	4.2	8.4
Mahanadi	3.6	7.2
Narmada	2.4	5.0
Others	20.6	21.9

Moreover, the existing water availability of these rivers is further threatened by economic development with the expansion of agriculture, industries, and population growth coupled with urbanisation.[17] According to the Business-as-Usual Scenario (BAU), total water demand in India is projected to increase by 22% by 2025 and 32 % by 2050. [18] While the per capita availability in India is projected to decrease to 1140 cu m (cubic meter) in the year 2050 against 1545 cu m in 2011(census report 2011), and 1816 cu m in 2001 (census report 2001). This data is based on national average figures, but the position is quite different in the individual river basins. For example, the estimated per capita average availability during the year 2010 in the Ganga-Brahmaputra Meghna basins was recorded to be 20136 cu m while it was as low as 263 cu m in the Sabarmati basin.[19] It is indispensable to note that any situation of a per capita water availability of less than 1700 cu m is termed as a water-stressed condition, while classified as water scares if per capita availability is below 1000 cu m.[20] There are several Indian rivers namely Krishna, Cauvery, Subarnarekha, Pennar, Mahi, Sabarmati, Tapi, and East and West Flowing Rivers of Kutch and Saurashtra including Luni which are classed as having acute water scarcity with per capita availability of water less than or around 500 cu m.[21]

To get a better understanding of the water availability, supply, and demand relationship of water, it is important to measure the individual sectoral water demand, based on the ratio between water withdrawal by agriculture, domestic, and industries over total renewable water resources in India. It is important to note that water has a multiplicity of use which also includes environmental needs. However, this research will focus on water consumption by human activities since they are the major threat not only to the quantity but also to the water quality. Since on one side demand is increasing by these

[17] United Nations, Water in India: situation and prospects (India UNICEF 2013) P. 5
[18] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p. 10
[19] Development, River Rejuvenation, Ganga Mission, National Water (2015) Template for Vulnerability Assessment, Mitigation and Adaptation p.9
[20] United Nations, Water in India: situation and prospects (India UNICEF 2013) P. 4
[21] Development, River Rejuvenation, Ganga Mission, National Water (2015) Template for Vulnerability Assessment, Mitigation and Adaptation p.9

sectors, on the other side quality of available water is affected by the pollutants released by them which makes the situation worse.

i. Agriculture Sector:

The agriculture sector is one of the predominant sectors in the Indian economy. India holds the second-largest area of agricultural land (179.9 million hectares) in the world[22] and has occupied a central stage in global food supply and demand projections, due to the rise in population, and huge economic growth in the last decade.[23] According to the Food and Agriculture Organization (FAO), world agriculture statistics 2010, India is the world's largest producer of millets and the second-largest producer of wheat, rice, and pulses.[24] Even though, in recent times, the growth in agricultural GDP has fluctuated from 4.8% per annum in the Eighth Five Year Plan (1992-96) to a low of 2.4 % during the Tenth Five Year Plan (2002-06) before rising to 4.1% in the Eleventh Five Year Plan (2007-12).[25] However, this sector still forms the backbone of development and remains the predominant sector in terms of employment and livelihood in India, recording a share of 48.9% in employment as per the National Sample Survey Office 2011-2012.[26] This growth has also made the agriculture sector one of the major water consumers in the country which accounts for nearly 90% of the total withdrawals of 690 (BCM) (surface water) whereas the domestic and industrial sectors contribute 5% each.[27] Another report stated slightly different figures, under which agriculture accounted for 86.5 %, domestic 8.1 %, and the industrial sector 5.4 % of the total withdrawal in 2000.[28] These figures have been confirmed by the planning commission report (India) 2010, but the commission has also indicated that the shares of the industrial and domestic sectors are likely to increase in the future.[29]

ii. Industrial Sector:

The industrial sector in India has expanded dramatically with the expansion of major, medium, and small-scale industries. [30] In the year 2014-15, the Industrial sector registered a growth of 5.9 % as against a growth of 5% during 2013-14. [31] According to the different agencies' reports (including World

[22] B.S. Khatkar, N. Chaudhary, P. Dangi, Production and Consumption of Grains: India, (eds) Colin Wrigley, Harold Corke, Koushik Seetharaman, Jon Faubion, Encyclopaedia of Food Grains (2nd edn, Academic Press, 2016, p.367
[23] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p.1
[24] B.S. Khatkar, N. Chaudhary, P. Dangi, Production and Consumption of Grains: India, (eds) Colin Wrigley, Harold Corke, Koushik Seetharaman, Jon Faubion, Encyclopaedia of Food Grains (2nd edn, Academic Press, 2016, p.367

[25] Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare, State of Indian Agriculture 2015-16 p.2
[26] India's Economic Survey 2015-2016 Key Highlights, available at https://home.kpmg.com/content/dam/kpmg/pdf/2016/04/KPMG-Flash-News-India-Economic-Survey-2015-16%E2%80%93Key-Highlights-3.pdf (assessed on 2-3-2018)
[27] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p. 9
[28] FAO, AQUASTAT database, available at http://www.fao.org/nr/water/aquastat/main/index.stm (assessed on 2-3-2018)
[29] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p. 9
[30] Debesh Chakraborty, kakali. Mukhopadhyay, Water Pollution and Abatement Policy in India: A Study from an Economic Perspective (Global Issues in Water Policy 2014) pp. 229- 30
[31] Indian Economic Survey 2015-16-Key Highlights,

Bank, and CPCB). The contribution of the industrial sector to economic growth is forecast to increase greatly, and the industrial water demand to increase accordingly.[32] According to the figures presented by the Central Pollution Control Board 2015 (CPCPB) (India), total industrial water use in India is about 8% and the water demand for industrial and energy production is estimated to rise to about 18% (191 BCM) of the total requirements in 2025.[33] Even though there is a difference in figures, the increase in water demand in the industrial sector is evident to rise year by year due to industrialisation and globalisation.

iii. Domestic Sector:

The final major water consumer in India is the domestic sector. India is the second most populated country in the world with over 1.2 billion people.[34] In recent times, population growth has strained the demand for freshwater resources both in urban and rural areas and is expected to increase in the future. According to the BAU scenario, the average domestic water demand is expected to increase to 125 liters per capita per day (lpcd) by 2025 and further increase to 170 lpcd by 2050.[35] The BAU scenario approach differs from the approach adopted by the National Commission on Integrated Water Resources Development India (NCIWRD), which provides water consumption figures both for the rural and urban sectors separately. According to NCIWRD, the rural domestic water demand in 2025 and 2050 is estimated to increase at the rate of 70 and 150 lpcd respectively, and the urban water demand at 200 and 220 lpcd, respectively.[36]

1.4 Poor Water Quality Is a Challenge:

The increase in demand for water has also increased the level of pollution due to the wastewater and pollutants released by these sectors. Almost 70% of surface water and various groundwater resources are contaminated by biological, toxic, organic, and inorganic pollutants in India.[37] According to the CPCB report 2021, about 62% of the total sewage is discharged into water bodies.[38] While with industrial pollution it is reported that nearly 6614 million liters per day (MLD) wastewater containing an organic pollution load of 426 tonnes per day (TPD) is reported to be released into the river Ganga alone, with an additional 25% wastewater discharge into the marine water bodies of the country.[39] This untreated waste not only contributes to water scarcity as it limits its availability for both human use and

available at https://home.kpmg.com/content/dam/kpmg/pdf/2016/04/KPMG-Flash-News-India-Economic-Survey-2015-16%E2%80%93Key-Highlights-3.pdf (assessed on 2-3-2018)

[32] S. C. Aggarwal, S. Kumar, Industrial Water Demand in India: Challenges and Implications for Water Pricing (eds) Infrastructure Development Finance Company, India Infrastructure Report (1st edn, Oxford University Press, 2011)

[33] Central Pollution Control Board Ministry of Environment, Forests & Climate Change, Monitoring of Indian National Aquatic Resources Series: MINARS/37 /2014-15, p. 39

[34] Census of India 2011

[35] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p. 9

[36] Ibid

[37] Maharashtra Pollution Control Board, 2014, Compilation of Water Quality Data Recorded by MPCB 2011-12, p.3

[38] CPCB 2021. Available online: http://cpcb.nic.in/effluent-emission/, (accessed 13-11-2022)

[39] Niti B. Jadeja, Tuhin Banerji, Atya Kapley, Rakesh Kumar (2022) Water pollution in India – Current scenario, Water Security, Vol 16

the ecosystem[40] but also leads to an economic impact (economic water scarcity) as the water would require purification and infrastructure investment, which burdens the country's finance.[41]

To assess the quality status of rivers particularly, their pollution levels are gauged by analysing the water quality reports produced by the Central Pollution Board (CPCB). Under these reports, water quality is measured with respect to the four indicators namely Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Total Coliforms, and pH.[42] These Chemical and biological indicators are traditional methods of water quality monitoring that indicate organic pollution.[43] To manage water quality, CPCB follows a 'Designated Best Uses' approach in water quality monitoring and surveillance by using these parameters. According to this approach, five designated best uses have been identified. These are class A (Drinking Water Source without conventional treatment but after disinfection), class B (outdoor bathing), class C (Drinking water source after conventional treatment and disinfection), class D (Propagation of Wildlife and Fisheries), and class E (Irrigation, Industrial Cooling, Controlled Waste disposal). The CPCB guidelines specify standard limits for these different uses and if the permissible limit exceeds any of those parameters, then it will classify this water as not fit for use for that category (table 2). This classification helps water quality managers and planners to set water quality targets and design suitable restoration programs for various water bodies.[44]

Using water quality status reports from the Central Pollution Control Board between the years 2002-2012 water quality analysis was focused on specific rivers namely rivers Ganga, Yamuna, Mahi, Brahmaputra, Tapi, Narmada, Godavari, Krishna, Cauvery, Mahanadi, Baitarani, Brahmani, and river Beas, and Sutlej (tributaries of Indus River). These rivers are the major rivers in India, which cover more than one state along with their tributaries. Pollution in these rivers also flows into connected tributaries and therefore gives an accurate reflection of the water quality status in the country. A map has been attached to understand the flow of these rivers and the states they are covering (Figure 1).

Table 1 Water Quality Criteria Used by The Central Pollution Control Board

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	**A**	Total Coliforms Organism MPN/100 ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6 mg/l or more Biochemical Oxygen Demand 5 days 20C 2 mg/l or less

[40]Avanira, Draft Report Comprehensive Study of Polluted River Stretches and Preparation of Action Plan of River Godavari from Nasik D/S To Paithan, Maharashtra Pollution Control Board March 2015, p. 14
[41] Cap Net UNDP (2016) Water Pollution Management: An IWR Approach to Improving Water Quality, p. viii
[42] CPCB BULLETIN VOL.-I, JULY 2016 p.5
[43] Comptroller and Auditor General of India Report No. 21 of 2011-12, p.21

[44] Comptroller and Auditor General of India Report No. 21 of 2011-12, pp. 2-3

Outdoor bathing (Organised)	**B**	Total Coliforms Organism MPN/100 ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5 mg/l or more Biochemical Oxygen Demand 5 days 20C 3 mg/l or less
Drinking water source after conventional treatment and disinfection	**C**	Total Coliforms Organism MPN/100 ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4 mg/l or more Biochemical Oxygen Demand 5 days 20C 3 mg/l or less
Propagation of Wildlife and Fisheries	**D**	pH between 6.5 to 8.5 Dissolved Oxygen 4 mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	**E**	pH between 6.0 to 8.5 Electrical Conductivity at 25C micro mhos Max. 2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l

Figure 1 Flow of Major Indian Rivers and Their Tributaries (Google.Com)

1.4.1 Data Analysis of Water Quality Reports Prepared by The CPCB Between the Years 2002-2012:

i. Dissolved Oxygen:

Dissolved oxygen is the amount of oxygen present in the water. It plays a significant role in the quality of water, the livelihood of plants and animals, fish farming, and corrosion control.[45] The data analysis reports from the year 2002- 2012 reveals that the level of Dissolved oxygen was recorded to be fluctuating throughout ten years but most rivers not meeting the criteria limits set by the CPCB. Only four rivers including the river Baitarani, Beas, Brahmani, and Narmada were reported to be meeting the criteria limits. For instance, river Baitarani was recorded as meeting the criteria limit of 6mg/l or more in the year 2002, 2006, 2007, and 2009 and therefore falling under the category of A. while in the years 2003, 04, 05, 07, 10, 11, and 2012 it met the limit of 5mg/l or more and thus fall under the category of B. Similarly, rivers Brahmani and Beas were also recorded with a fluctuating rate with some years meeting the limit of 6mg/l or more and some years it met the limit of 5mg/l or more. But there was a time when both rivers failed to meet the criteria limit. In addition, the river Narmada was also recorded to be falling under the category of A in the years 2006, 07, and 2011, while in the years 2002, 2004, and 2012 it met the category of B, and the rest of the year falls under the category C and D. On the other hand, other rivers were recorded with exceeding the limit of DO in most of the years (Annexure 1).

ii. Biological Oxygen Demand (BOD):

The level of BOD, which is widely used to measure the impact of pollutants released by domestic and industrial sectors, [46] was recorded above 2 mg/l in all the rivers throughout the ten years except for river Beas which was recorded with the lowest value of 1.5 mg/l in 2011, and river Baitarani with 1.8 mg/l in 2006 and 2 mg/l in 2008. Except for these years, both these rivers along with others exceeded the permissible limit of 2 mg/l or less and failed to fall under category A, which means water is not fit to be used for drinking purposes. When it comes to categories B and C, only three rivers namely river Beas, river Baitarani and river Mahi were recorded to be meeting the permissible limit of 3mg/l or less. River Beas at 2.9 mg/l in 2007 and 2.8 mg/l in 2008, while with river Baitarani, its level was recorded as extremely low (2.6 mg/l in the year 2004), (2.2 mg/l in 2007), (2.6 mg/l in 2010), and (2.8 mg/l in 2012). River Mahi was also recorded with a value of 3.0 mg/l in 2002 and 3 mg/l in 2003. This indicates trivial improvement concerning these rivers, particularly the river Baitarani.

On the other hand, the majority of rivers were recorded with a very high level of BOD throughout ten years, with Yamuna recording the highest level ranging from 36 mg/l minimum in 2002 to the highest at 113 mg/l in 2012, followed by the river Godavari from the lowest of 78 mg/l in 2002 to 40mg/l in 2012, river Ganga 16.8 mg/l in 2002 to 27 mg/l in 2012, river Sutlej from 40 mg/l in 2002 to 27 mg/l in 2012,

[45] The Importance of Dissolved Oxygen in Water and Water Systems, available at The Importance of Dissolved Oxygen in Water and Water Systems - Sensorex (assessed on 24-3-2018

[46] CPCB BULLETIN VOL.-I, JULY 2016 p.8

river Krishna from 10 mg/l in 2002 to 24mg/l in 2012, river Cauvery from 26.6 mg/l in 2002 to 21.9 mg/l in 2012, and river Tapi from 10 mg/l in 2002 to 18 mg/l in the year 2012. Besides these rivers, rivers Brahmani, Brahmaputra, Narmada, and Mahanadi, also failed to meet the criteria (Annexure 1).

iii. pH:

pH is a measure of how acidic or basic water is. The quality level defined by pH is determined by using a number determined by the negative log of the hydrogen ion concentration. The lower the number, the more acidic the water is. The higher the number, the more basic it is. A pH of 7 is considered neutral. The logarithmic scale means that each number below 7 is 10 times more acidic than the previous number when counting down. Likewise, when counting above 7, each number is 10 times more basic than the previous number. Point source pollution is a common cause that can increase or decrease pH depending on the chemicals involved. These chemicals are discharged from agricultural and industrial runoff, or wastewater discharge from the domestic sector (such as wastewater containing soap, and detergent), or mining operations (particularly coal) produce acid runoff and acidic groundwater seepage.[47] Data analysis from the last ten years points out that the value of pH fluctuated throughout the ten years, with some rivers meeting the criteria limits sometimes, while others did not. The river Baitarani for instance was recorded to be meeting the pH criteria limit (between 6.5-8-5) throughout ten years (except in 2005), followed by the river Brahmani which met the limit in the year 2002, 03, 06,07,09,10, and 2011. Other rivers also showed some improvement including the river Beas, which was recorded to be meeting the criteria limit in the years 2004, 06, 08, 09, and 2012. River Brahmaputra also met the limit in the years 2006, 2010, and 2012, river Mahanadi in 2011,2012, river Narmada in 2003,2010, river Sutlej in 2004, and 05,08, and river Tapi in 2007. Except for these rivers, other rivers such as rivers Ganga, Godavari, Krishna, and Mahi were recorded as exceeding the maximum limit of 8.5 for ten years with no improvement. While River Cauvery and Yamuna had below the limit in 2004 and 2007 respectively but exceeded the limit in other years. It is essential to note that the improvements in other rivers were not consistent. (Annexure 1).

iv. Total Coliforms

This is bacteria associated with the colon, but other sources occur naturally in the soil, insects, and plants. They are found in water that has been influenced by surface water, and human or animal waste[48]. Faecal coliform is the group of total coliforms and is present specifically in the gut and faeces of warm-blooded animals. Because the origins of faecal coliforms are more specific than the origins of the more general total coliform group of bacteria, faecal coliforms are considered a more accurate indication of animal or human waste than total coliforms.[49] The total coliform level was recorded as more than its quantity (MPN/100 ml shall be 50 or less 50 or less) throughout the ten years in all the rivers, except river Mahi. This is the only river that met the criteria limit of 50 or less in the year 2011

[47] Fondriest, Environmental Learning Center available at https://www.fondriest.com/environmental-measurements/parameters/water-quality/ph/# (assessed on 24-3-2018)
[48] Coliform Bacteria in Drinking Water Supplies, available at https://www.health.ny.gov/environmental/water/drinking/coliform_bacteria.htm (Assessed on 23-4-2018)
[49] Ibid

and therefore was under the category of A for that year. River Mahi was also recorded to be meeting the criteria limit of 500 or less in the year 2006-2010 and 2012 and thus falling under the category of B. Apart from that, all the rivers were recorded with very high amounts of total coliform making the water unfit for drinking and bathing (Annexure 1).

It is indispensable to note that though some of these rivers showed improvement concerning the indicators, improvement however was not consistent. Moreover, such improvement was noticed with rivers Baitarani and Brahmani, followed by rivers Beas and Narmada sometimes whereas many of the rivers exceeded the permissible limits for all set parameters. It is also essential to note that sometimes rivers showed improvement for one indicator but in the same year they exceed the limit for another. For instance, river Baitarani showed improvement concerning DO in the years 2002, 2007, and 2009 but it exceeds its limit regarding BOD in the same year. This therefore cannot be considered superior quality water.

1.4.2 Water Quality Monitory Report from The Year 2018-19:

Based on these water quality monitoring results, pollution assessment of rivers has been conducted by CPCB from time to time to ensure that state governments are taking necessary actions to clean and rejuvenate the rivers. However, according to the recent water quality monitoring report of the CPCB 2018-19, 351 polluted river stretches on 323 rivers have been identified in 28 States and 3 UTs. The identified rivers include major rivers such as rivers Ganga, Yamuna, Sutlej, Bear, Tapi, Narmada, Brahmani, Godavari, and Krishna along with several small rivers. The Water Quality Parameter Biochemical Oxygen Demand (BOD) which is the indicator of organic pollution was considered for the identification of Polluted River Stretches.[50] The identified polluted river stretches were prioritised under five classes i.e., Priority- I to V for implementation of pollution control measures and restoration of river water bodies, to at least meet the quality fit for category B (bathing) in identified polluted stretches. According to the report, 45 rivers were identified in class 1, 16 in class 2, 43 in class 3, 72 in class 4, and 175 in class 5, requiring the state pollution control boards to take immediate action. The State-wise & Priority-wise number of Polluted River Stretches are given in Table – 5.1[51]

Table 2 State-Wise & Priority Wise Number of Polluted River Stretches in The Year 2018-19

State/ Union Territory	Priority class I -V					Total	Major Rivers
	I	II	III	IV	V		
Andhra Pradesh				2	3	5	Godavari, Krishna
Assam	3	1	4	3	33	44	
Bihar			1		5	6	Ganga
Chhattisgarh				4	1	5	Mahanadi
Daman, Diu, and Dadar Nagar Haveli	1					1	Mahanadi
Delhi	1					1	Yamuna
Goa			1	2	8	11	

[50] Central Pollution Control Board Ministry of Environment, Forest & Climate Change, Annual Report 2018-19 pp.9-10
[51] Ibid

Gujarat	5	1	2	6	6	20	Tapi, Narmada
Haryana	2					2	
Himachal Pradesh	1	1	1		4	7	Beas
Jammu and Kashmir		1	2	2	4	9	
Jharkhand				3	4	7	
Karnataka			4	7	6	17	Cauvery, Krishan
Kerala	1			5	15	21	
Madhya Pradesh	3	1	1	3	14	22	Tapi
Maharashtra	9	6	14	10	14	53	Godavari, Krishna, Tapi
Manipur		1			8	9	
Meghalaya	2			3	2	7	
Mizoram			1	3	5	9	
Nagaland	1		1	2	2	6	
Odisha	1		3	2	13	19	Brahmani and Mahanadi
Puducherry				1	1	2	
Punjab	2			1	1	4	Gaggar, Sutlej, and Beas
Rajasthan			1		1	2	
Sikkim					4	4	
Tamil Nadu	4			1	1	6	
Telangana	1	2	2	2	1	8	
Tripura					6	6	
Utter Pradesh	4		1	2	5	12	Yamuna, Gomti, Ganga
Uttrakhand	3	1	1	4		9	Ganga
West Bengal	1	1	3	4	8	17	Ganga
Total	45	16	43	72	175	351	

All these above-mentioned issues including deterioration in water quality which is driving a decline in per capita water availability and increasing and competitive demand for water for various purposes are now posing a major threat to water security in India. These problems have been aggravated by the sectoral approach/ institutional framework to water resources management implemented by the government of India [52] in the past and are still followed to some extent which has proved weak in managing water resources effectively. This approach to water resources has been geared towards resource development through capital investments rather than water management in India.[53] Therefore, analysis to address the water crisis, which is seen as essentially a crisis of governance, led to the

[52] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) P.109

[53] Vishal Narain, Annasamy Narayana Moorthy (eds) Indian Water Policy at the Crossroads: Resources, Technology and Reforms, Global Issue in Water Policy 16 (1st edn springer 2016) P.16

realisation that the water sector needs reform.[54] The concept of water sector reform normally refers to a detailed review of the country's policies, planning, implementation, and supporting activities to develop and manage its water resources and deliver water services to all users.[55] Yet in practice, water sector reform refers to a much more specific set of measures and principles. This reform in the country was introduced in the context of integrated water management (IWRM), which has been identified as the only way forward by policymakers.[56]

1.5 Integrated Water Resources Management (IWRM):

The concept of Integrated Water Resources Management (IWRM) was introduced to address growing pressures on water resources due to competition amongst numerous users for a limited resource, the recognition of ecosystem requirements, and the threat of decreasing water availability due to climate change and pollution. Many parts of the concept have been around for several decades in fact, since the first global water conference in Mar del Plata in 1977. [57] This conference focused on assessing the status of water resources to ensure that an adequate supply of quality water was available to meet the planet's socio-economic needs; to increase water use efficiency, and to promote preparedness, nationally and internationally, to avoid a water crisis of global dimensions in the future.[58] The objective was to advise a solution that would stop a fragmentary approach to water management and high-handed development decisions made for the benefit of a single user group and emphasised considering water resources holistically, managing it across sectors, and ensuring wide public participation in decision-making. These ideas were later formalised in 1992 and were introduced in the form of a framework, now famously knowns as Integrated Water Resources Management (IWRM).[59] In 1992, the Dublin conference was held to assess the world's freshwater resources and identify priority issues and to solve these issues, develop co-ordinated Inter-sectoral approach, sustainable water strategies, and an action program to be considered by the United Nations Conference on Environment and Development (UNCED), convened later In Rio de Janeiro, Brazil, June 1992 (UNCED 1992). By focusing on these key points, four guiding principles were prepared by the Dublin conference which are as follows: [60]

1. Fresh water is a finite and essential resource to sustain life, development, and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners, and policymakers at all levels.
3. Women play a central part in the provision, management, and safeguarding of water.

[54] Government of India Ministry of Water Resources, River Development and Ganga Rejuvenation Central Water Commission (2016) Guidelines for Integrated Water Resources Development and Management
[55] Asian Development Bank, What are Water Sector Reforms? available at http://www.adb.org/Water/CFWS/Water-Sector-Reforms/default.asp. (Assessed on 25-4-2018)
[56] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.64
[57] United Nations Department of Economic and Social Affairs, International Decade for Action' Water for Life' 2005-2015 available at http://www.un.org/waterforlifedecade/iwrm.shtml (assessed on 4-4-2018)
[58] Report of the United Nations Water Conference, Mar del Plata, 14-25 March 1977
[59] Mark Giordanoa, Tushaar Shahb, From IWRM back to integrated water resources management, International Journal of Water Resources Development (2014) Vol. 30, No. 3, 364–376
[60] International Conference on Water and The Environment 26-31 January 1992 Dublin Ireland, the Dublin Statement and Report of the Conference pp. VII -4 available at https://www.ircwash.org/sites/default/files/71-ICWE92-9739.pdf (Assessed on 20-4-2018)

4. Water has an economic value in all its competing uses and should be recognized as an economic good.

Based on these four guiding principles, recommendations for action at the local level were issued in the UNCED conference in 1992 [61]and were also consolidated into Chapter eighteen of Agenda 21 in Rio de Janeiro, 1992 under which it called for effective implementation of IWRM to the development, management, and use of water resources.[62] Later, the year 2000-2002 was more focused on elaborating these principles, promoting them worldwide, and providing guidelines on how to implement this concept (IWRM) into practice. For instance, The Second World Water Forum & Ministerial Conference (The Hague 2000) discussed the main challenges to its implementation and introduced two documents known as "the vision and the framework for action". With its theme from vision to action, it focused on the steps involved in moving to action and outlines a mechanism for taking forward actions at, or immediately after, the Forum. In this regard it called for institutional, technological, and financial innovations; collaboration and partnership at all levels; establishment of targets and strategies; transparent water governance; and cooperation with international organisations and the UN system. [63] Another two significant steps taken by the Hague forum 2000 was the introduction of the Global Water Partnership, which now plays a central role in coordinating the Framework for Action and the equity criteria (as a part of water pricing) under which to provide appropriate subsidies to the poor when systematically adopting full-cost water pricing.[64] Moreover, the International Conference on Freshwater - Bonn 2001, also focused on practical implementation, by not only identifying challenges and key targets but also recommending action programs to implement policies in the field. The Bonn Conference recommended priority actions in the fields of governance, mobilising financial resources, building capacity, and sharing knowledge.[65] In the field of governance, nothing new was introduced, in fact previously discussed elements such as water security, gender equity, decentralisation of water management, and public participation including all stakeholders were the core of the discussion.[66] Furthermore, like the other two conferences, the World Summit on Sustainable Development - Johannesburg 2002 was not much different. It also provided specific targets and guidelines for implementing IWRM worldwide, including a call for the development and implementation of IWRM and water efficiency strategies, plans, and programs at national and at regional levels. It encouraged support for developing countries to implement national-level IWRM plans by 2005.[67] Based on all these discussions, one of its accepted definitions, proposed by the Global Water Partnership committee is:

[61] International Conference on Water and The Environment 26-31 January 1992 Dublin Ireland, the Dublin Statement and Report of the Conference p. VII available at https://www.ircwash.org/sites/default/files/71-ICWE92-9739.pdf (assessed on 20-4-2018)
[62] UN Water Report, Status Report on The Application of Integrated Approaches to Water Resources Management 2012, p. 3
[63] Muhammad Mizanur Rahaman & Olli Varis (2005) Integrated water resources management: evolution, prospects and future challenges, Sustainability: Science, Practice and Policy, 1:1, 15-21
[64] Ibid
[65] Report Bonn freshwater conference 3-7 December 2001 for DGIS
[66] Bonn 2001, 3-7 December conference report Water – a Key to Sustainable Development, available at https://www.un.org/esa/sustdev/sdissues/water/BonnConferenceReport.pdf (assessed on 20-4-2018)
[67] UN Water Report, Status Report on The Application of Integrated Approaches to Water Resources Management 2012, p.3

"IWRM is a process which promotes the coordinated development and management of water, land, and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." [68]

The central goal of IWRM based on the four Dublin principles is to improve the management of water resources. IWRM advocates the need for a comprehensive view of the water that avoids a sector-by-sector approach. Thus, promoting basin-wide water planning to achieve water security at the river basin level for all purposes. The path toward water security requires trade-offs between meeting various sectors' needs and establishing adaptable governance mechanisms to achieve economic efficiency, environmental sustainability, and social equity, including poverty reduction. [69] The broad framework for IWRM requires the implementation of the following few elements into practice as part of water governance:

1. IWRM intends to move away from top-down, centralised approaches for water security towards a more flexible, decentralised approach that involves a variety of diversified governance structures at a local, basin, national and transnational level. [70] In other words, it involves the setting up of new institutions for the direct management of water demand, as illustrated by the case of Water User Associations in the irrigation sector (WUAs). [71]

2. IWRM focuses on the development of participatory planning and the implementation process. It, therefore, calls for the involvement of decision-makers across the various sectors and stakeholders, who represent a designated group or sector of society to set policy and make sound, balanced decisions in response to specific water challenges.[72]

3. IWRM also tends to move away from command-and-control instruments that focus on supply-side water management such as large–scale water infrastructure, towards incorporating demand-side management with economic instruments. [73]

1.6 Integrated Water Resources Management in Action:

IWRM has been embraced by the international community as a way of moving forward in the water sector. Many countries have adopted or are heading to adopt this approach with the hope to improve

[68] Mark. Smith, Torkil Jønch, Clausen Integrated Water Resource Management: A New Way Forward, A Discussion Paper of the World Water Council Task Force on IWRM, World Water Council
[69] Government of India Ministry of Water Resources, River Development and Ganga Rejuvenation Central Water Commission (2016) Guidelines for Integrated Water Resources Development and Management
[70] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.65
[71] T Shah, "Institutional and Policy reforms" in J Briscoe & RPS Malik, Handbook of Water Resources in India- Development, Management and Strategies (New Delhi: The World Bank and Oxford University Press) 306
[72] Alka Upadhyay, Raveendra Kumar Rai, Water Management and Public Participation: Case Studies from the Yamuna River Basin, India (Springer Briefs in Earth Sciences Book 16) 2013, p.9
[73] Christ White, URS London Integrated Water Resources Management: What Is It and Why Is It Used? 2013 available at Integrated Water Resources Management: What is it and why is it used? | Global Water Forum (assessed on 26-4-2018)

water management practices at the country level. According to the United Nations survey report, based on substantial contributions of information from UN member states, since 1992, 65% of countries reported to have established integrated water resources management plans, and 34% reported being at an advanced stage of implementation. Nevertheless, progress was reported to have slowed or even reverted in low and medium human development index (HDI) countries since the survey in 2008. As 79% of countries reported to have introduced changes in their water policies but implementation remained a slow process. [74] Overall, the survey claimed the popularity of the concept of IWRM to establish effective water management. Nevertheless, the results have not always been as expected. For instance, in 1993, the Sri Lanka government attempted to apply IWRM in the water sector and after due consultation, water policy, and water law were established. As part of the process, existing water organisations were to be replaced by river-basin organisations; water-use rights were established through withdrawal permits, and all water was priced. Despite having followed an open process, the reform program was heavily criticised on many grounds. One of the reasons was that the whole exercise was undertaken to satisfy international donors' interests rather than to serve the national interest. In the wake of intense protest by the public and the media against the proposed national water policy, the government then withdrew the proposals. The result was not simply that the process failed, but also that the opportunity for any reform was greatly rejected by the public at large.[75] Sri Lanka is not the only case of failure of application of IWRM, Barbara Schreiner, former deputy director-general of the South African Department of Water Affairs and Forestry, has also emphasised the problems of implementing the South African National Water Act, despite being welcomed by the international water community, as a major step forward in introducing IWRM.[76] However, despite some failed attempts or criticism faced by some countries, it has not stopped other countries from moving ahead with this approach in the hope to improve the water management system in their country. its examples can be seen In Chile, the Netherlands, and South Africa.[77] It is significant to note that the goals of IWRM differ across countries depending on their needs and personal preferences. For instance, Chile has adopted IWRM to increase economic efficiency, while the Netherlands and South Africa have for social and environmental protection.[78] Moreover, some countries have reported successful outcomes. For instance, in Sudan, the result of adopting IWRM helped villagers to gain access to fresh water. While in Iraq, its implementation successfully helped to upgrade the canal system in the country and purify water for Haiti's flood victims. The UNEP assessment also shows how the implementation of IWRM has impacted ranging from increased water-use efficiency (reducing system losses from 30% to 17% in Estonia) to the establishment of environmental clubs in Rwanda that enforces adherence to environmental law.[79]

[74] UN Water Report, Status Report on The Application of Integrated Approaches to Water Resources Management 2012, p. vii
[75] Mark Giordanoa, Tushaar Shahb, From IWRM back to integrated water resources management, International Journal of Water Resources Development (2014) Vol. 30, No. 3, 364–376
[76] Ibid
[77] Christ White, URS London Integrated Water Resources Management: What Is It and Why Is It Used? 2013
[78] ibid
[79] Mark Giordanoa, Tushaar Shahb, From IWRM back to integrated water resources management, International Journal of Water Resources Development (2014) Vol. 30, No. 3, 364–376

1.7 India and Integrated Water Resource Management:

The concept of Integrated Water Resource Management (IWRM) is increasingly gaining popularity in the current discourse on water in India. The discussion on Integrated Water Resource Management (IWRM) in India is influenced by the two popular perspectives on water: scarcity and crisis management.[80] As a consequence, IWRM constitutes to a considerable extent the framework that informs water sector reforms. It is however vital to note that the concept of IWRM is not new to India. Some of the elements of the concept (IWRM) in the Indian water sector can be traced back to 1956 much before it became a hot topic at the international level. [81] After independence in 1947, India had major challenges ahead, on the one hand, the country was underdeveloped, and on the other hand, was poverty-stricken. To overcome these challenges, led the government to adopt modern scientific and industrial development. [82] Since water plays a vital role not only in social life, and environmental sustainability but also in economic development. Thus, the focus was placed on the comprehensive management of the river basins through River Basin Organisations. This idea was taken from the Tennessee Valley Authority (TVA) in the United States of America. The USA applied the TVA engineer approach to develop the Damodar River valley to regulate floods, use water for irrigation, and produce power. As a result, the Damodar Valley Corporation (DVC) Act was introduced in 1948.[83] By following a similar approach, the government of India introduced the River Boards Act of 1956. [84] Under this act, several river boards have been set up as river basin organisations (RBO) in India so far to regulate and develop inter-state rivers and river valleys or any specified projects. [85] However, this perception was fundamentally flawed. Since all RBOs were constituted to promote water resources development rather than management by constructing and operating the large dam. [86] Later in 1987, the government of India again took some policy-level initiatives by making specific provisions in the National Water Policy. For instance, the National Water Policy 1987, even before the Dublin statement, emphasised recognising the basin/sub-basin as the basic unit for planning, development, and management of water resources.[87] Moreover, the principle of public participation was also introduced under the policy.[88] The National Water Policy was again revised in 2002[89] and 2012 in line with the principles of IWRM.[90] As a result some efforts since then have been made by including some or most of the features of IWRM such as watershed development, sub-basin management, rainwater harvesting, groundwater markets, etc. However, many of these have remained strewed, and have made influence at the local level.[91]

[80] Amita Shah, Anjal Prakash, towards integrated water policies in South Asia: From critique to constructive engagement, (eds) Anjal Prakash, Chanda Gurung Goodrich, Sreoshi Singh, Informing Water Policies in South Asia, (1st edn. Routledge India 2014
[81] River Basins Organisations in India – Institutional Frameworks and Management Options, A Case for Fundamental Review, (Nov. 1999) River Basin Organisations in India: A Case for Fundamental Review
[82] Ibid
[83] Ibid
[84] Ibid
[85] Ibid
[86] J. Harsha, IWRM and IRBM concepts envisioned in Indian water policies, Current Science (2012), Vol 102(7) pp. 986-990
[87] Ibid
[88] National Water Policy 1987
[89] National Water Policy 2002
[90] National Water Policy 2012
[91] Amita Shah, Anjal Prakash, towards integrated water policies in South Asia: From critique to constructive engagement, (eds) Anjal Prakash, Chanda Gurung Goodrich, Sreoshi Singh, Informing Water Policies in South Asia, (1st edn. Routledge India 2014

With this concept (IWRM) gaining more popularity at the international level, the government of India has also become more active to implement this approach in the water sector. as a result, the IWRM Roadmap for the Pamba River Basin was prepared in 2010 by the Government of Kerala. The Pamba Pilot Project aimed to deliver "Policy Support to Integrated River Basin Management" and to contribute to the continuing EU-India policy dialogue in the water sector.[92] In addition, the Guidelines for Integrated Water Resources Development and Management 2016, were introduced to guide the states in the right direction while introducing this approach.[93] besides these guidelines, Central Government has also brought in a final draft of the National Water Framework Bill, 2016[94], (as emphasised in the Nation Water Policy 2012) [95], to provide a uniform national legal framework to manage water in a better and more efficient way by promoting integrated river basin development and management. This Bill also proposes other mechanisms such as a graded pricing system.[96] These initiatives have taken the country halfway toward its dream to implement IWRM. for instance, policy legislations have already introduced all essential principles of IWRM from adopting river basin management[97] to decentralised decision making, public participation to water pricing.[98] Further, setting up of RBOs is also a crucial step to managing rivers as holistic units irrespective of their hydrological boundaries. Though RBOs need to change their perspective from development to management.

However, despite these efforts, a success story is yet to be recorded. Therefore, this research project was set up to investigate the application of IWRM in India more specifically from a legal perspective. The main reason for choosing this topic was because no attempt has been made to see whether the existing legal framework supports the application of IWRM in practice. Therefore, by taking this into consideration the below-mentioned aim and objectives have been set.

It is important to bring into the knowledge of the reader the main reason for choosing to investigate the application of IWRM. As mentioned above water security has become one of the biggest challenges for water managers due to deteriorated water quality, which is having an impact on per capita water availability, and increasing water demand. These problems/water crises have been said to be the result of poor water governance and IWRM has prospered as a solution. It is significant to note that the aim of the research project is not to look for the solution to water-related problems, it on the other hand is to investigate the legal challenges that might occur while implementing the proposed solution/IWRM.

1.8 Aim And Objectives:

"Critical analysis of the Integrated Water Resources Management legal framework in India." Further, the state of Punjab has been used as a case study to identify gaps in the existing legal framework,

[92] EU-India Action Plan Support Facility – Environment Integrated River Basin Planning Developing a Roadmap for the Pamba river 2010
[93] Government of India Ministry of Water Resources, River Development and Ganga Rejuvenation Central Water Commission (2016) Guidelines for Integrated Water Resources Development and Management
[94] Draft National Water Framework Bill, 2016, Draft of 18 July2016
[95] National Water Policy 2012
[96] Sec, 12, 22 Draft National Water Framework Bill, 2016, Draft of 18 July2016
[97] Sec 12 Draft National Water Framework Bill, 2016, Draft of 18 July2016
[98] Section 7, 9 National Water Policy 2012

particularly with public participation and water pricing, and to suggest recommendations accordingly. However, to achieve the aim of this study, a wider view was taken.
The following objectives were set to achieve the set aim:

I. To critically analyse the legislative framework developed to promote decentralised decision-making in water management, particularly the role of gram panchayats in the rural water supply sector.

II. To critically analyse the legislative framework developed to promote rural domestic users' participation in water management, and the challenges faced by them.

III. To critically analyse the policy farmworker developed to promote farmers' role as stakeholders in water management and the challenges faced by them.

IV. To critically analyse the legislative framework and challenges to women's participation as stakeholders in both the rural water supply sector and the irrigation sector.

V. To critically review the policy legislation and the current water pricing system in the water sector of India, particularly in rural, urban, and irrigation sectors to see does it comply with the notion of water pricing promoted in IWRM.

As mentioned above for objectives 1, 2, and 3 focus has been placed on gram panchayats, domestic water users, and farmers only. The reasons for choosing these three stakeholders are provided below: As discussed above IWRM advocates decentralised decision-making that involves a variety of diversified governance structures at a local, basin, national and transnational level. [99] In other words, it involves the setting up of new institutions for the direct management of water demand.[100] When it comes to the water sector in India, decentralisation is one of the essential attributes of water governance. This supports decentralising decision-making to the lowest level by allowing beneficiaries and other stakeholders to play a significant role in the project planning stage. The rationale for decentralisation is to deliver appropriate benefits by changing the role of the government from a service provider to a regulator.[101] One significant form of decentralisation is promoted through the 73rd constitutional amendment. 73rd constitutional amendment introduced three-tier local government bodies such as Gram Panchayat (village council), Panchayat Samiti (intermediary or block), and Zilla Parishad at the district level. These three local governance bodies are also known as Panchayat Raj Institutions (PRIs).[102] These democratically elected local institutions have been put at the centre of the participation

[99] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.65

[100] United Nations Environment Programme, Global Environment Outlook--GEO4--Environment for Development (Nairobi: UNEP, 2007) 154

[101] Philippe Cullet, Water Law in India Overview of Existing Framework and Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre

[102] 73rd Amendment Act 1992, the Constitution of India

framework and confirm that participation is not limited to central/state government-organized participation.[103] When it comes to water management, they have been entrusted with three water-related matters such as minor irrigation schemes, watershed development, and drinking water, with a belief that this leads to better water governance and water management at the local level.[104] It is essential to note that though all three local government bodies have their significance in water-related matters[105], gram panchayat is however the focus of this study, and further, their role is analysed for two main reasons. Firstly, Gram panchayat is the lowest level of governance body that manages water at the village level[106] and as mentioned above one of the aims of decentralised decision-making in IWRM is to manage water demand at the lowest level. [107] Gram panchayats are such governance bodies that have been assigned with this function under the rural water supply sector.[108] Secondly, Gram panchayats are the main stakeholders or vehicles to ensure rural domestic users' participation. Under the drinking water supply sector, gram panchayats have been defined as a medium through which domestic users can participate in water supply schemes.[109] (A detailed discussion is provided in chapter 3).

Moreover, to analyse the principle of "public participation" of IWRM, the focus has specifically been placed on rural domestic water users, farmers, and women. As discussed above IWRM advocates the development of participatory planning and the implementation process. It requires the involvement of decision-makers across the various sector and stakeholders, who represent a designated group or sector of society to set policy and make sound, balanced decisions in response to specific water challenges.[110] It is therefore meant to offer all stakeholders including water users more of a say in decisions related to water resources.[111] When it comes to the water sector in India, both domestic and agricultural sectors are big water consumers as well as polluters (a detailed discussion is provided above). This, therefore, makes domestic water users and farmers essential stakeholders in water management. By considering this fact, it, therefore, was considered necessary to analyse the role of both rural domestic water users and farmers in water management and to see what supportive framework is provided to ensure their role in water management and to what extent their role is developed i.e., from decision-making to implementation. Moreover, it is essential to note that when it comes to domestic water users, the focus is placed on rural water users than urban water users. Based on the literature review, it is found that a separate framework is developed for rural and urban water

[103] International Conference Geneva, 13 December 2013, Public Participation and Water Resources Management, Where Do We Stand in International Law? Available at https://www.zaragoza.es/contenidos/medioambiente/onu/1448-eng-ed2015_Public_participation_and_water_resources_management.pdf(Assessed on 30-4-2018)
[104] Eleventh Schedule (Article 243G of the Indian Constitution)
[105] 73rd Amendment Act 1992, the Constitution of India
[106] Ibid
[107] United Nations Environment Programme, Global Environment Outlook--GEO4--Environment for Development (Nairobi: UNEP, 2007) 154
[108] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013
[109] Ministry of Drinking Water and Sanitation, Government of India, Swajal, A Community Led Approach to Rural Piped Drinking Water Supply Guidelines 2018
[110] Alka Upadhyay, Raveendra Kumar Rai, Water Management and Public Participation: Case Studies from the Yamuna River Basin, India (Springer Briefs in Earth Sciences Book 16) 2013, p.9
[111] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) P.65

sectors. Rural water supply sector reform has given rural water users a significant role[112] while the framework developed for the urban water supply sector has focused on the financial contribution of urban water users to ensure the sustainability of water supply.[113] This, therefore, leaves no choice for the researcher to choose rural water users only.

When it comes to women, they play a significant role in both the domestic and irrigation sector. In the domestic sector, they have a wider range of responsibilities from collecting to managing and maintaining water for a whole array of household purposes, as well as regulating and controlling its social use and safe maintenance.[114] Due to these roles, they have the most information, knowledge, and skills on water availability, reliability, quality, and purity across the contexts of households.[115] Moreover, they also carry different opinions from men on several issues, including hours of service needed and where facilities should ideally be located. Consequently, women's participation in decision-making and water management is considered a valuable contribution to the establishment and maintenance of project facilities.[116] While in the irrigation sector, they are also considered the second most important stakeholder after men with 75% of the agriculture labour force being women in rural India.[117] Given their huge contribution to the domestic and agriculture sector, Women are recognised as essential stakeholders in IWRM to improve the effectiveness and efficiency of the water management system. It is suggested that women's participation in water-related services such as rural water supplies or irrigation management can be beneficial to ensure the project's success as well as sustainable management of the project.[118] By considering the significant importance given to the women in IWRM, it was considered paramount to investigate the legal framework adopted in both the domestic and agriculture sector to promote their role.

1.9 Chapter Structure to Address Each Objective:

The first and second objectives will be addressed in chapter 3. The reason is the reform introduced in the rural water supply sector has interlinked the participation of rural water users and the lower level of local governance bodies knowns as gram panchayat (village-level local governance bodies). Therefore, it is important to discuss these together. The third objective will be discussed in chapter 4. Farmers are a distinct group of water users and the legislative framework developed to ensure their participation is also different from other water users. Therefore, farmers' participation and the corresponding legal framework are analysed separately in chapter 4 to avoid any confusion. The fourth objective on the role

[112] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013

[113] Jawaharlal Nehru National Urban Renewal Mission overview, Ministry of Urban Employment and Poverty Alleviation, Ministry of Urban Development, Government of India

[114] Barrett, H., & Browne, A. (1995). Gender, environment, and development in Sub-Saharan Africa. In T. Binns (Ed.). People and environment in Africa. (pp. 31-35). Chichester: Wiley Publishers

[115] Agarwal, B. (1992). Gender relations and food security: Coping with seasonality, drought, and famine in South Asia. In L. Benería and S. Feldman (Eds.). Unequal burden: Economic crises, persistent poverty, and women's work (pp. 374-378). Boulder, Colorado: Westview Press

[116] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? *Department of Forestry and Natural Resources,* Water Policy (2004) Vol 6 (2) 103–116

[117] National Sample Survey Office Ministry of Statistics & Programme Implementation, Government of India. (2014). Employment and Unemployment Situation in India. NSS 68th Round (July 2011 - June 2012)

[118] WRDMAP. Assessing the Impact of IWRM on Women's Status and Conditions [Thematic Paper 6.3.2]. WRDMAP, China (2010) 24 pp

of women's participation will be addressed in both chapters namely chapters 3 and 4, respectively. Since they are stakeholders in both domestic and irrigation sectors. The fifth objective will be addressed in three chapters i.e chapter 5th rural water pricing, chapter 6th urban sector water pricing, and chapter 7th water pricing in the irrigation sector. The reason for conducting a separate analysis of water pricing policy for both rural and urban water sectors is because drinking water supply sector reform has been introduced both in the rural and urban sectors separately and a separate policy framework has been introduced.

1.10 Why The State of Punjab Is Used as A Case Study:

As mentioned in the aim, the state of Punjab has been used as a case study to identify gaps in the existing legal framework, particularly with public participation and water pricing, and to suggest recommendations accordingly. For this purpose, the state was used to collect data from gram panchayats, domestic water users, and farmers. This data was further used to analyse the legislative framework adopted to promote the role of these stakeholders in water management. The reason for selecting the state of Punjab was because it represents the key issues, IWRM offers to deal with.

State Punjab of India is an agricultural state, with a total geographical area of 50,362 sq. km[119] and is famously known as the Food Basket of India, with its contribution of around two third of the wheat and half of the rice to the central pool.[120] The state has the highest % of irrigated land compared to total cultivable land in India, with around 83% of its geographical area being cultivated with a cropping intensity of 190%. 98% of the net area sown is irrigated.[121] This agricultural growth has led to the over-exploitation of groundwater resources, as the surface water is not adequate to meet the irrigation needs of the State.[122] The present groundwater development in the State is 145%. Out of 137 blocks in total, 103 blocks are reported to be overexploited, 5 blocks are critical, 4 blocks are semi-critical and only 25 blocks are safe.[123] This has made the state of Punjab among the top 10 over-exploited Indian states.[124] Further, the quality of both groundwater and surface water resources is another challenge for the state. The high usage of fertilisers, and pesticides, along with industrialisation, and urbanisation have resulted in both groundwater and surface water pollution over space and time.[125] According to the report of the Comptroller Auditor General of India, 40% of the groundwater in the state is contaminated with chemicals and heavy metals. While 10% of it is not even safe for irrigation purposes, and 30% is

[119] Chopra RPS, Krishan G (2014) Assessment of Ground Water Quality in Punjab, India. Earth Science & Climate Change 5:243
[120] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India
[121] Chopra RPS, Krishan G (2014) Assessment of Ground Water Quality in Punjab, India. Earth Science & Climate Change 5:243
[122] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India
[123] Sushil. Gupta, Ground Water Management in Alluvial Areas, Central Ground Water Board, New Delhi India, available at DEPLETING GROUND WATER RESOURCES OF PUNJAB (cgwb.gov.in) (assessed on 11-11-2022)
[124] The Tribune, just 60% Punjab groundwater fit for use (published on 11-11-2021) available at Just 60% Punjab groundwater fit for use: The Tribune India(assessed on 11-11-2022)
[125] Water Quality Issues and Challenges in Punjab, Central Ground Water Board, Ministry of Water Resources, Government of India 2014 p. ii

marginal to moderately saline/alkaline, but cannot be used for human consumption.[126] When it comes to surface water, the state has three perennial rivers namely Sutlej, Beas, and Ravi, (part of the Indus River system), and one seasonal river Ghaggar.[127] River Sutlej, Beas, and Ghaggar lie within Punjab's territory (India). While River Ravi flows along part of its western border, which separates the state of Punjab from Pakistan.[128] The water quality of all three rivers has deteriorated nearly at all locations due to the disposal of industrial and municipal wastes into them.[129] According to the government report, a huge amount of municipal waste is being generated and disposed of without any treatment in these rivers. [130] The critical situation of its water bodies, therefore, indicates the need for immediate actions in its water sector. By considering the severity of this issue, the state was selected to collect data to see whether its legal framework supports the application of IWRM particularly two principles i.e public participation and water pricing.

The second reason which made this state matter of concern is its transboundary nature and water-sharing problem. As mentioned above the state has three main rivers such as Sutlej, Beas, and Ghaggar. With all these rivers, the state of Punjab is upper riparian, particularly with respect to the states of Haryana, and Rajasthan with whom it shares a border, as well as with Pakistan.[131] Therefore, the pollution these rivers receive in the state also affects the quality of lower riparian states and Pakistan. To understand better, it is important to understand the flow of these rivers. River Beas originates in the state of Himachal Pradesh (India), at 32°21′59″ N lat., 77°05′08″ E long., and an altitude of 2050 m above sea level.[132] it enters the state of Punjab through Hoshiarpur district and after flowing through districts of Gurdaspur Jalandhar, and Amritsar,[133] it merges with river Sutlej at Harike Wetland (Ramsar site).[134] River Sutlej on the other hand originates in Western Tibet in the Kailas Mountain range in China.[135] It enters India through Mansrover (state of Himachal Pradesh) and flows through the state up to Gobind Sagar Lake over which Bhakra dam is constructed,[136] from where river Sutlej enters the state of Punjab[137] , and from here onwards, the river takes the southern direction. After flowing for

[126] The Tribune, just 60% Punjab groundwater fit for use (published on 11-11-2021) available at Just 60% Punjab groundwater fit for use: The Tribune India (assessed on 11-11-2022)
[127] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India
[128] Action Plan for Clean River Sutlej (31st march 2019) Directorate of Environment and Climate Change Department of Science, Technology and Environment, Government of Punjab, available at http://www.ppcb.gov.in/Attachments/Reports%20and%20Documents/SutlejActionPlan2019.pdf (assessed on 11-11-2022) p.6
[129] Water Quality Issues and Challenges in Punjab, Central Ground Water Board, Ministry of Water Resources, Government of India, p. iii
[130] ibid
[131] Punjab Water Resources and Environment Directorate (PHRED), Chandigarh (2014) A Report on "Status on groundwater quality in Punjab" based on PDS HP-II project, HG-WR (201)
[132] Vinod. K, Sharma, Anket. S, Bhardwaj, Renu.B, Ashwani. K (2020) Water Quality of River Beas, India, and Its Correlation with Reflectance Data. Journal of Water Chemistry and Technology Vol 42 (2) 188-197
[133] Beas River - Origin Flow Map History Environment, available at Beas River - Origin Flow Map History Environment (riversofindia.com) (assessed on 11-11-2022)
[134] C. Sharma, R. Jindal, Uday Bhan Singh, and A. S. Ahluwalia, (2018) Assessment of water quality of river Sutlej, Punjab (India) Sustainable Water Resources Management.4.10
[135] FAO. 2011. AQUASTAT Transboundary River Basins – Indus River Basin. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy p.4
[136] Action Plan for Clean River Sutlej (31st March 2019) Directorate of Environment and Climate Change Department of Science, Technology and Environment, Government of Punjab, available at http://www.ppcb.gov.in/Attachments/Reports%20and%20Documents/SutlejActionPlan2019.pdf (assessed on 11-11-2022) p.6
[137] C. Sharma, R. Jindal, Uday Bhan Singh, and A. S. Ahluwalia, (2018) Assessment of water quality of river Sutlej, Punjab (India) Sustainable Water Resources Management.4.10

another about 50 km, it enters the plains near the Ropar district.[138] River Sutlej continues to flow and passes through districts Ludhiana, Jalandhar, Kapurthala, and Firozpur (Punjab) and finally reaches Harike Wetland (Ramsar site) where it meets river Beas.[139] After merging with river Beas, river Sutlej continues to flow and cross over to Pakistan, where it eventually joins the Chenab River close to the Punjab barrage.[140] River Ghaggar, a west-flowing river originates in the Shivalik hills of the state of Himachal Pradesh and flows through the states of Haryana, Punjab, Chandigarh (capital of Punjab and Haryana), and Rajasthan.[141] The Ghaggar River enters Punjab near Mubarakpur from the state of Haryana then flows through Punjab and re-enters Haryana.[142] In the state of Haryana, it flows through the southwest of Sirsa and by the side of Talwara Jheel in the state of Rajasthan.[143] Just Southwest of Sirsa, it feeds two irrigation canals that extend into the state of Rajasthan. Passing through Punjab, Haryana, and Rajasthan, it eventually loses itself in the sands of the Thar Desert (Rajasthan). [144]

Moreover, the water of these rivers not only feeds the state of Punjab, but also provides water to the neighbouring states, Haryana, and Rajasthan using dams and a network of canals.[145] However, the increase in demand for water from agriculture, and deteriorated river water quality along with depletion and pollution of groundwater in the state of Punjab have led to interstate water-sharing disputes.[146] The third reason was its agricultural population. Being one of the biggest agricultural states, 80% of the population is engaged in agricultural activities.[147] As discussed above farmers are one of the biggest water consumers and polluters in India and with the state, Punjab reportedly having a huger rate of the population engaged in agriculture activities was considered an ideal state to collect data from farmers.

[138] Action Plan for Clean River Sutlej (31st March 2019) Directorate of Environment and Climate Change Department of Science, Technology and Environment, Government of Punjab, available at http://www.ppcb.gov.in/Attachments/Reports%20and%20Documents/SutlejActionPlan2019.pdf (assessed on 11-11-2022) p.6
[139] C. Sharma, R. Jindal, Uday Bhan Singh, and A. S. Ahluwalia, (2018) Assessment of water quality of river Sutlej, Punjab (India) Sustainable Water Resources Management.4.10
[140] FAO. 2011. AQUASTAT Transboundary River Basins – Indus River Basin. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy p.4
[141] Swarup Bhattacharya, Vineet Kumar Unprecedented floods in Ghaggar Basin 2010 , available at https://sandrp.files.wordpress.com/2018/03/an_analysis_of_the_flood_disaster_in_ghaggar_basin_in_july_2010.pdf (assessed on 15-11-2022)
[142] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India, p.5
[143] Pollution Problem of River Ghaggar, Assessment and Development Study of River Basins ADSORBS/42/2010, Central Pollution Control Board (Ministry of Environment and Forest, Govt. of India) p.1
[144] Water Quality of Rivers at Interstate Borders, Interstate River Boundary Monitoring Programme SERIES: IRBM/01/2015, Central Pollution Control Board (Ministry of Environment, Forests & Climate Change, Govt. of India) p.43
[145] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India, p. 3
[146] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India, p.8
[147] Chopra RPS, Krishan G (2014) Assessment of Ground Water Quality in Punjab, India. Earth Science & Climate Change 5:243

Chapter 2

Method

2.1 Introduction:

Methodology in research plays a significant role in successfully answering any research question. It is therefore imperative that employed methods and methodology stand up to scrutiny.[148] The distinction between method and methodology is that method refers to the range of techniques that are used to collect evidence about the social world. Methodology, however, concerns the research strategy.[149] The methodology describes methods to be applied to meet the requirements of the study. It clarifies the reason for applying a particular technique to analyse the research results by it defining the scope of the study, an explanation of the research problem, the reasoning to formulate a hypothesis, the tools applied for data collection, and the techniques applied for data analysis.[150] It is often difficult to conduct a research project such as a thesis, particularly one on the subject of law, by applying one particular method, as works of this type involve a hybrid of methods, as is the case for the present study. To find answers to the research questions, this thesis has applied doctrinal methodology, a social legal research approach, comparative law methodology, and a systematised review to collect data.

This research begins with a 'doctrinal' or 'black letter law' methodology. Doctrinal research is recognised as the traditional source of research in law to derive logical conclusions on legal matters.[151] The doctrinal methodology is applied to identify and analyse the sources of law and legal rules governing the public participation and water pricing system in the water sector, by using both primary and secondary data. The aim was to understand the legal provisions and underlying principles to comprehend the legal problem and then find a solution to the problems that have been identified. This thesis, however, is not exclusively about the law in books, it goes beyond this by looking into the implementation of law within the water sector. This part of the thesis required a socio-legal research methodology as black letter law has its limitations.

Socio-legal research is a systematic investigation of the functioning of law that was developed in the nineteenth and first half of the twentieth century. The idea behind this approach was that law originates and functions within society and studying it in isolation has no meaning. The aspects related to the need for a new law or demand for any change in the existing law and the difficulties posed during the implementation can be understood only by conducting a socio-legal inquiry.[152] Socio-legal research

[148] Michael Salter and Julie Mason, Writing Law Dissertations: An Introduction and Guide to the Conduct of Legal Research (Pearson 2007) 31

[149] Matt Henn, Mark Weinstein and Nick Foard, 'A Critical Introduction to Social Research' (2nd edn, Sage 2006) p.10

[150] Kothari, C.R. (2004) Research Methodology: Methods and Techniques. 2nd Edition, New Age International Publishers, New Delhi, p.1

[151] Pradeep M. D, Legal Research- Descriptive Analysis on Doctrinal Methodology, International Journal of Management, Technology, and Social Sciences (IJMTS), (December 2019) ISSN: 2581-6012, Vol. 4(2)

[152] Vijay M Gawas. (2017). Doctrinal Legal Research Method a guiding Principle in Reforming the Law and Legal System towards the Research Development. International Journal of Law, 3(5), 128- 130

employs a wide range of social science methods, including quantitative and qualitative research.[153] These methods aim to decipher the working of legal, social, and cultural processes.[154] The present study has applied the qualitative method to collect data to examine how legal provisions are implemented and whether legal reform achieved its intended outcomes, thereby pointing to further policy and legal reform.

It is important to note that empirical legal scholarship is complementary to doctrinal research and both methodologies are used simultaneously to examine a legal issue as encouraged by lawyers.[155] Though doctrinal methodology has its limitations, the doctrinal method is still significant and forms the basis for the thesis. Valid research is built on sound foundations, so before embarking on any theoretical critique of the law or empirical study about the law in operation, it is important to verify the authority and status of the legal doctrine being examined. The way to accomplish this is by using the doctrinal methodology.[156] Additionally, comparative law methodology is applied as a method to compare domestic law such as statutes enacted by the states to regulate the functioning of Water Regulatory Authorities (WRA), and further to compare national water policy and national framework bill with state water policies. Last but not least, this method is applied to compare the legal provisions regulating the establishment and functioning of two institutions such as Gram panchayats (GP), and Water User Associations (WUAs).

This study finally applied a systematised review to conduct a literature review to achieve the aim of the thesis and enhance the quality of work.

[153] T.E. George, "An Empirical study of empirical legal scholarship: the top law school" (2006) 81 Indiana law journal 141, R Bankar and M Travers, law, sociology and, method "in Bankar and Traver, note 14 above, 17
[154] Michael McConville, Wing Hong Chui (eds), Research Methods for Law, (2nd edn. Edinburgh University Press, 2007 - Law)
[155] Ibid
[156] Terry Hutchinson, The Doctrinal Method: Incorporating Interdisciplinary Methods in Reforming the Law

2.2. Doctrinal Methodology:

The doctrinal research method also known as black letter law has been defined as a "systematic description of the legal rules governing a particular category, analyses the relationship between rules, enlightens areas of gaps and, forecasts future developments".[157] It adopts its name from the tendency to focus solely on the 'letter of the law'.[158] As its name suggests this approach fundamentally provides a descriptive analysis of a large number of technical and coordinated rules found primarily in cases, statutes, or regulations.[159] Nevertheless, secondary sources such as textbooks, and journal-published literature containing analysis and observation of constitutional provisions, and explanation of law can also be mentioned despite not being original sources of law. Consequently, the credibility of the outcome of any research that applies a doctrinal approach depends on the kind of legal resources upon which the conclusions are derived.[160]

The methodology employed for this thesis is fundamental to assist in the critical conceptual analysis of all relevant policies and legislation related to the specific issues under consideration. With the use of this methodology, the thesis aims to provide a thorough, in-depth critical examination of the legal framework developed for two separate subjects, namely public participation, and water pricing in the water sector. This method assisted to systematise, rectifying, and clarifying the law on a particular subject by deep analysis of primary as well secondary sources. Following the legal analysis, ambiguities were highlighted in the existing framework, further, suggesting actions to fill these gaps.

This approach tends to be more popular in legal disciplines including contract, tort, and property law. Nevertheless, its application should not be understood to be restrictive to certain disciplines. Since this doctrine can be applied to any subject that entails legal rules if it fits its criteria.[161] Considering the valuable contribution to the legal field, it was considered appropriate to extend its application to the present study. By excluding analysis of cases, the primary focus was strictly placed on a range of primary sources, such as constitutional provisions, statutes, water law, national water policy, state water policies, and policy frameworks developed by the central government in a joint effort with the World Bank. In addition, secondary sources in the form of textbooks, online published articles, and journals containing the analysis and explanation of these policy frameworks have also been used to evaluate the validity of the discussed rules. It is significant to note that doctrinal methodology does not ordinarily evaluate the hypothesis, [162] but instead verifies the hypothesis by a first-hand study of authoritative

[157] Pearce, Campbell & Harding, above n. 5, 2, 312 [9.17]
[158] Writing A Law Dissertation Methodology' (Lawteacher.net, October 2022) <https://www.lawteacher.net/law-help/dissertation/writing-law-dissertation-methodology.php?vref=1> accessed 20 October 2022
[159] Pradeep M. D, Legal Research- Descriptive Analysis on Doctrinal Methodology, International Journal of Management, Technology, and Social Sciences (IJMTS), (December 2019) ISSN: 2581-6012, Vol. 4(2)
[160] ibid
[161] Leela wright, black letter law Black-Letter Law - LawNow Magazine (updated on 27th august 2017) (assessed on 21st oct. 2022)
[162] Anwarul Yaqin (2008). Legal Research and Writing Methods'. Lexis Nexis, Reed Elsevere Indian Pvt. Ltd., Haryana, India, 29

sources.[163] The thesis also aims to verify the hypothesis first with the use of primary and secondary sources leading to further inquiry.

With the use of doctrinal methodology, legal analysis was conducted to explain the development of law and analyse the authoritativeness of such laws to explain its implication in the water sector. The two examined areas in the water sector are public participation and water pricing, as mentioned earlier. These both are broad subjects, with public participation including examination of legal provisions to promote the wider range of roles of gram panchayats, rural domestic water users, farmers, and women in water management. While for water pricing, the legal analysis is conducted to see how the legal provisions have promoted water pricing mechanisms in the rural water sector, urban water sector, and irrigation sector. An examination of the legal framework, which is ratified and adopted to promote public participation, and the water pricing system entails a critical analysis of legal material to support the hypothesis. In examining these provisions, it is important to ask in a very coherent and precise manner what are the provisions, and what are the underlying principles and once the underlying general rules are identified, it enables the thesis to identify ambiguities and solutions. In doing so, legal provisions are examined to see how they are developed to introduce the concept of public participation in the water sector. Analysis has also focused on the extent of the roles given to each category in water management. Focus on these concerns has helped to verify the hypothesis. For example, the analysis aims to establish if the historical development of the legal framework and underlying provisions promoting the concept of public participation is up to date and whether they require revisions to implement the concept of public participation in line with IWRM. A similar approach is applied to analyse the legislative provisions for the water pricing system in all three sectors.

In examining the legislative provisions, it is necessary to look at the wording of selected legal sources, and the legislative history of that provision. Since the law is an evolving concept, and always changing in response to the circumstance that drives the development of law. It can therefore be modified to accommodate the situation.[164] With the use of primary resources, a thesis can identify the meaning of legal provisions and their relevance to the hypothesis, and how they are validating the research question. However, this is not sufficient to support the argument put forward to see the extent of the role of examined category in water management. Therefore, the use of secondary sources is necessary to examine and review existing explanations and observations on constitutional provisions, and policy frameworks that offer insight into the meanings and possible underlying principles of these legal rules. The purpose of examining existing literature on the subject is to identify ambiguities in the existing framework since a literature review assisted in establishing the historical development of legal provisions and the present approach toward the issue. For example, chapters three and four containing the critical analysis of provisions regarding public participation have helped to understand the legal provisions and with the use of a literature review, it has been easier to understand the underlying

[163] Pradeep M. D, Legal Research- Descriptive Analysis on Doctrinal Methodology, International Journal of Management, Technology, and Social Sciences (IJMTS), (December 2019) ISSN: 2581-6012, Vol. 4(2)

[164] Leela wright, black letter law Black-Letter Law - LawNow Magazine (updated on 27th august 2017) (assessed on 21st oct. 2022)

principles as well as gaps. Additionally, it demonstrates a wider understanding of the relevant issues and helps to clarify the meanings of ambiguous wording and phrases.

Moreover, the legal analysis conducted under doctrinal methodology also assisted to minimise bias by restricting the researcher to explain legal analysis subjectively since the prevalent view of law is objective, neutral, and positivist. Since the scholar must define what law is rather than what could be or what it should be.[165] This approach to the research delivers conclusions on a legal matter, with quality work.[166] Additionally, at its best, it involves rigorous analysis to extract general principles from an inchoate mass of primary materials.[167]

However, the doctrinal approach has been subject to criticism for being too formalistic in its approach.[168] This legal formalism can sometimes lead to oversimplifying the legal doctrine and often does not provide enough of a basis on which to support the thesis and the questions it seeks to answer.[169] Nevertheless, this was not the approach of the thesis, as the doctrinal approach is the starting point. As stated earlier, traditionally constitutional provisions, policies, and statutes are construed as black letter law, but the present study moves beyond this to investigate the operation of law. This requires the adoption of a socio-legal approach.

2.3 Socio-Legal Methodology:

A Socio-legal research methodology is an interdisciplinary approach to studying the subject of law, legal phenomena, and the relationship between these and society by including both theoretical and empirical data. [170] The socio-legal approach was developed between 1966-70 by legal pragmatists and socio-legal scholars who recognised the significance of understanding the gap between law in books and law in operation.[171] Later in the 1980s, critical legal studies combined ideas and methods from other disciplines such as sociology, anthropology, political science, economics, and history.[172] This notion was driven by two factors. Firstly, the law is an integral part of society and is playing a significant role in the process of social change. Therefore, understating a law, and the legal system is the basis to conduct social–legal research. Secondly, legal problems are related to social, political, economic, and psychological issues, and to do justice to the legal inquiry, it is imperative to know other mechanisms of social research methods. Overall, these approaches to legal scholarship not only offered an alternative approach to traditional legal analysis but also encouraged discussions to engage critical cutting-edge research to examine the relationship between law and other relations of power in

[165] Terry Hutchinson, The Doctrinal Method: Incorporating Interdisciplinary Methods in Reforming the Law, DEAKIN LAW REVIEW VOLUME 17, NO 1 2012, Deakin University and Contributors, p. 131
[166] Pradeep M. D, Legal Research- Descriptive Analysis on Doctrinal Methodology, International Journal of Management, Technology, and Social Sciences (IJMTS), (December 2019) ISSN: 2581-6012, Vol. 4(2)
[167] Council of Australian Law Deans, Statement on the Nature of Legal Research (2005), at 3
[168] Salter and Mason (n 1) 99
[169] Salter and Mason (n 1) 108
[170] Dr. Ranbir Singh, Dr. G.S. Bajpai, Dr. Manish Singh, Module IV: Socio-Legal Research, RESEARCH METHODOLOGY, SOCIO-LEGAL RESEARCH, MRD Government of India
[171] J.H. Schlegel, American Legal Realism and Empirical Social Science (Chapel Hill, NC: University of North Caroline Press, 1995), Bankar and Travers, note 14 above
[172] Vick, note 13 above, 184

society.[173] Here the notion of law and society is put into the centre and due to their interlink, this approach is extended to the fields of social sciences. [174]

Interdisciplinary- socio-legal research widens legal discussion in terms of the theoretical and conceptual framework that guides the course of the studies, and its particular research methodologies help to generate empirical evidence to answer a research question.[175] This approach embraces the subjects of law as a social institution and is more concerned with the impact of law on society, and how it influences legal processes, institutions, and services, and involves studying the influence of social, political, and economic factors on the law and legal institutions.[176] Two core elements of socio-legal research are first to define how legal rules operate and what factors shape their implementation and second to define the relationship between law and society by using information gathered by applying other social science disciplines.[177] Here, the law is not viewed as an independent force to which society is subjected, but rather shapes and is shaped by broader social, political, and economic logic, contexts, and relations.[178] As reflected, both theoretical and empirical work is included. The reality is theory is informed by empirical data and vice versa.[179] Work should be theoretically informed and empirically grounded, and therefore socio-legal scholars are often seen to adopt the middle approach.[180] Due to its broader spectrum approach to the subject of law, socio-legal research enhances the doctrinal method and seeks to look beyond the law in books by studying law in a broader social and political sense to understand the external actors which act upon the legal system, thereby making it possible to answer the research question.[181]

Socio-legal research emphasises the use of empirical-based research methods to gain a better understanding of the law. The use of empirical methods in socio-legal scholarship is ever-growing to move beyond narrow doctrinal analysis to large-sample size statistical investigations.[182] This method acts as a tool to serve various purposes depending on the research question it is adopted to serve. Some advocates use this method to discover intellectual information that helps to formulate new theories, frame new laws, mould public opinion, and introduce new legal reform. It helps to widen the outlook of legislators, executives, and the judiciary by bringing new knowledge.[183] While others intend solely to gain more academic knowledge.[184] Empirical research is broader than statistical techniques

[173] R. Collier, The Law School, the Legal Academy and the "Global. Knowledge Economy"- Reflection on a Growing Debate: Introduction" (2005) 14 social and legal studies 259
[174]Dr. Ranbir Singh, Dr. G.S. Bajpai, Dr. Manish Singh, Module IV: Socio-Legal Research, RESEARCH METHODOLOGY, SOCIO-LEGAL RESEARCH, MRD Government of India
[175] J.H. Schlegel, American Legal Realism and Empirical Social Science (Chapel Hill, NC: University of North Caroline Press, 1995), Bankar and Travers, note 14 above
[176] Socio Legal Studies Association, SLSA Statement of Principles of Ethical Research Practice (January 2009) 1.2.1. accessed 27-10-2020
[177] Darren O'Donovan, (May 2016) Chapter 7 Socio-Legal Methodology: Conceptual Underpinnings, Justifications and Practical pitfalls of book legal research methods: principles and practicalities
[178] Socio Legal Studies Association, SLSA Statement of Principles of Ethical Research Practice (January 2009) 1.2.1. accessed 27-10-2020
[179] Darren O'Donovan, (May 2016) Chapter 7 Socio-Legal Methodology: Conceptual Underpinnings, Justifications and Practical pitfalls of book legal research methods: principles and practicalities
[180] C McCrudden 'Legal Research and the Social Sciences' (2006) 122 Law Q Rev 632.
[181] Methodology: social legal research Methodology: Socio-legal research (ebrary.net) (assessed on 27-10-2022)
[182] King, Robert O. Keohane, and Sidney Verba, Designing Social Inquiry: Scientific Inference in Qualitative Research 46 (Princeton 1994).
[183]Dr. Ranbir Singh, Dr. G.S. Bajpai, Dr. Manish Singh, Module IV: Socio-Legal Research, RESEARCH METHODOLOGY, SOCIO-LEGAL RESEARCH, MRD Government of India
[184] King, Robert O. Keohane, and Sidney Verba, Designing Social Inquiry: Scientific Inference in Qualitative Research 46 (Princeton 1994).

and analysis. The word “empirical” signifies evidence built on observation or experience. That evidence can be numerical (quantitative) or nonnumerical (qualitative).[185] In empirical research “data” is a term used for facts. These facts are collected by using primary or sometimes secondary data collection. Primary data collection can be collected in the form of interviews and surveys. Such data can be conducted on any subject such as anthropological, interpretive, sociological, economic, legal, political, etc. It can also be in any form such as specific or vague, certain, uncertain, directly observed, or in the form of proxies. [186]

2.3.1 Quantitative Method:

A quantitative method was applied as a part of the socio-legal approach to collect and analyse data to investigate the effectiveness of the implementation of the legislative framework developed for public participation and the water pricing system in the water sector. Public participation data was collected from three stakeholder groups namely Gram panchayats (village councils), rural domestic water users, and farmers. This contributed to answering objectives one, two, and three. For water pricing, the surveyed groups were rural domestic water users, Municipal Corporations (MCs), and farmers. This data was used to analyse the implementation of water pricing systems in the rural water sector, urban water sector, and irrigation sector (objective five).

Before discussing why, the quantitative method was selected, it is important to understand what the quantitative method is. Quantitative research is regarded as the organised numerical representation and manipulation of observations to explain the phenomena that those observations reflect.[187] In quantitative research, a theoretical framework/discussion is used to identify the variables that are assessed through an empirical study and analysed using mathematically based methods, in particular statistics.[188] This method was suitable for the thesis for several reasons. Following the establishment of a theoretical framework for the thesis, research questions were prepared which have multiple answers, as well as questions that required information on the attitudes, views, and beliefs of the participants, for instance regarding the quality of water. These answers were necessary to evaluate the hypothesis of the framework. The quantitative research method was suitable since it is ideal to quantify opinions, attitudes, and behaviours and find out how the population feels about a certain issue.[189] Moreover, the source of quantitative research is realist or sometimes positivist. Realists advocate objectively discovering an existing reality. The researcher attempts to uncover the truth by detaching themselves from the research as much as possible and using methods that maximise objectivity and minimise the involvement of the researcher in the research.[190] Moreover, positivism brings the element of trust by claiming that the empirical data gained through observations are based on facts. It restricts the involvement of the researcher in data collection and ensures interpretation is conducted

[185] Lee Epstein† Gary King, The Rules of Inference”, University of Chicago Law, Review, vol 69(1) 2000, by the University of Chicago
[186] ibid
[187] Suphat Sukamolson, Language Institute Chulalongkorn University, Fundamentals of quantitative research
[188] Hans E. Fischer, William J. Boone, Knut Neumann (2014) Quantitative Research Designs and Approaches p. 14
[189] Suphat Sukamolson, Language Institute Chulalongkorn University, Fundamentals of quantitative research
[190] ibid

objectively.[191] This method finds its roots in natural science and has recently been adopted in social science.[192]

Following the establishment of research questions, a survey was selected as the research design to collect data. Survey research (one of the research designs in quantitative research) is the systematic gathering of information from the participants through a questionnaire designed to gain knowledge by understanding or making observations about some aspects of the behaviour of the population of interest. The survey research encompasses questionnaires, sampling, questionnaire administration, and data analysis.[193] Each of its components has significant characteristics and is suitable to serve the purpose of the thesis.

2.3.1.1 Questionnaire's Design:

By using questionnaires as research instruments different sets of questionnaires were prepared for each category. In each questionnaire, two different sets of questions were prepared. The first set of questions covered questions on water pricing while the second part consisted of questions on their participation in water management. To encourage the respondents to engage, questions were grouped by relevancy and in an order of descending difficulty. The questions in this survey research consisted of closed-ended and open-ended questions. The closed-ended questions had predefined answer options to cover all possibilities and open-ended questions allowed the respondent to answer the questions in their own words and provide additional information. It was also important to ensure that the questions were clear, precise, and written that was easily understood by the respondent (Appendix ii)

2.3.1.2 Sample Composition and Sample Selection:

The sampling of participants in the study is another major consideration of quantitative research. Sample composition and sample size depend on several factors. Sample composition is tightly connected to the theoretical framework (research question) and expected results. For a sample size to ensure the accuracy of research conclusions requires considering population size, prevalence, margin error, and sampling confidence level[194], as well as subject matter (research question), research method, expected findings, proposed analysis procedures, and the budget available for the research.[195]

In the present study, sample compositions consisted of four categories namely GPs, domestic water users (urban and rural), farmers, and MCs. Each category was essential to evaluate the hypothesis of the framework and was selected accordingly. Furthermore, to collect data from these categories three districts were selected from the state of Punjab, namely Amritsar, Jalandhar, and Ludhiana. The

[191] Sondhi, N. (2011). Jonathan Wilson, Essentials of Business Research—A Guide to Doing Your Research Project. New Delhi: SAGE Publications India Pvt Ltd, 2010, 316 pp. Rs 495 (ISBN: 978-81-321-0567-1[Pb]). *Global Business Review*, *12*(2), 343–344.
[192]Suphat Sukamolson, Language Institute Chulalongkorn University, Fundamentals of quantitative research
[193] ibid
[194] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, pp. 54-56
[195] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, P.55

selection of districts was based on the geographical division of the state. The State of Punjab is geographically divided into three major regions called Majha, Malwa, and Doaba.[196] One district from each region was therefore selected: Amritsar from the region of Majha, Jalandhar from Doaba, and Ludhiana from the Malwa region. This was considered necessary to ensure the accuracy of population generalisation for the state. Another contributing factor was the highest population density of these three districts compared to others in the state.[197]

The sample size is not as easy to determine as the sample composition. The sample size should be a true miniature of the population, which should help to answer the research question without being biased.[198] Before we go into the discussion on how the sample size was selected, it is important to know how many samples were selected per category.

2.3.1.3 Collected Sample Size:

In each district, 10 villages were selected, and data was collected from the Gram panchayats of each village, which brings a total of 30 samples for gram panchayats as a category. Further, these villages were also used to collect data from rural domestic water users and farmers. In this regard, 325 samples were collected from rural domestic water users in each district, for a total of 975. While 100 samples were selected from farmers in each district, 300 in total. Further, data was collected from urban water users and the municipal corporations (MCs) of each district for instance MCs of Amritsar, MCs of Jalandhar, and MCs of Ludhiana district. For urban water users, data samples were restricted to 100 samples from each district.

As stated above, sample size selection is a complex procedure since it is difficult to decide how many samples should be enough to be representative of the population and ensure the accuracy of the conclusion. To select the sample size, an attempt was made to consider all the guiding factors such as population, prevalence, margin error, sampling confidence level, research design as well budget. Population size is the total number of objects in the targeted (researched) population. Prevalence is a proportion of a population that has a specific characteristic for instance age, gender, caste, etc.[199] A good maximum sample size is usually around 10% of the population.[200] This was not achievable with the limitations of the present study since each district has a substantial proportion of the population living in both urban and rural areas. Amritsar has a total of 488898 households, out of which 273905 are urban households (with a total urban population of 53.58%) and 214993 are rural households, (with a total population of 46.42%), while Jalandhar has a total household of 461635, out of which 247953 are urban households (with a total population of 52.93%) and 213682 are rural households (with a total population of 47.7%). In Ludhiana total of households 716826, of which, 436030 are urban households

[196] Punjab Data, Know everything about Punjab, Majha, Malwa, and Doaba,
Majha Malwa Doaba | Majha Malwa Doaba Map | Majha Malwa Doaba Area in Punjab (punjabdata.com)
[197] Punjab data, online Jalandhar District, ਜਲੰਧਰ, History of Jalandhar, Population of Jalandhar (punjabdata.com) (assessed on 14- 10- 2022)
[198] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, pp. 54-56
[199] ibid
[200] How to choose a sample size (for the statistically challenged) online
How to choose a sample size (for the statistically challenged) - tools4dev (assessed on 14-10-2022)

(with a total population of 59.15%) and 280796 are rural households (with a total population of 40.85%).[201] Regarding the Gram panchayats, Amritsar has 860-gram panchayats[202], Jalandhar has 954-gram panchayats[203], and Ludhiana 941.[204] It was practically not possible to collect 10% of the samples due to the limited resources such as budget, and time.

On the other hand, some scholars have suggested that applied research design requires only 100 samples for each major sub-group in the population. This suggestion is however necessary but should not be considered a sufficient requirement.[205] Before making the final decision other factors such as margin error, and sampling confidence level were considered equally. The margin of error is a percentage that describes how close we can expect a survey result to be relative to the real population value. Sampling confidence level show's reliability of the research. It is stated as a percentage, which shows how accurately a sample reflects the population's views/ beliefs/attitudes. The larger the population, the lower the targeted margin of error, and the larger the size of the sample, the higher the desired sampling confidence level.[206] Therefore, by considering all these factors, the above-mentioned numbers were selected. In addition, the geographical division of the state was also considered. As stated above data was collected from three different regions. This means an equal number of samples from each district were collected to ensure the fair representation of the population views from each district.

2.3.1.4 Data Collection Method:

To ensure the accuracy of the research result, the probability sampling method was applied. Probability sampling methods include random, systematic, stratified, and cluster sampling.[207] From these sampling methods, random sampling was applied in which households/ samples were randomly selected that can be related to the entire population with a degree of certainty. This sampling method diminishes the risk of sampling bias and provides a better chance for the generalisation of findings to the entire population.[208] In addition, stratified sampling was also used to evaluate one of the hypotheses. It helps to get an answer from all sections of the population. The population is divided into subpopulations according to their characteristics such as gender, caste, etc. then based on the proportion of their characters in the population, the researcher selects a number of persons with similar characteristics for the sample.[209]

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[201] Census Report of India 2011
Population finder | Government of India (censusindia.gov.in)
[202] Amritsar, government of Punjab online Blocks, Villages and Panchayats | District Amritsar, Government of Punjab | India (assessed on 15-10-2022)
[203] Jalandhar, Government of Punjab online Village & Panchayats | Jalandhar Web Portal | India (assessed on 15-10-2022)
[204] Ludhiana, Government of Punjab online Gram Panchayats | District Ludhiana, Government of Punjab | India (assessed on 15-10-2022)
[205] Ali DELİCE, The Sampling Issues in Quantitative Research, Educational Sciences: Theory & Practice 10 (4) Autumn 2010, 2001-2018 *EJ919871.pdf (ed.gov)
[206] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, pp. 54-56
[207] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, P.57
[208]Suphat Sukamolson, Language Institute Chulalongkorn University, Fundamentals of quantitative research
[209] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, P.58

Further, it is essential to note that the data collection exercise was required to be undertaken within five weeks due to the deadline of the research project. Therefore, to collect such a large number of samples from distinct categories, the two best-used methods of survey research namely interview in persons and self-administered questionnaires were used.[210]

In an in-person interview, face-to-face interaction was conducted by using a door-to-door survey in which the interviewer asked participants questions to fill out the questionnaires. This method was chosen due to its flexible approach since it allowed the interviewer to skip questions that participants were not willing to answer and add extra information provided voluntarily by the participants which were recorded as extra notes on the side. [211] This information was later analysed and information relevant to the issues and objectives of the research was taken into consideration by the researcher. Two voluntary researchers helped to conduct data collection in line with the policy of Bournemouth University. With additional help, a team of three was prepared and each village was divided into three parts. Each person collected at least 10 samples. This helped to complete data collection within the set time frame. However, its drawback was an expensive and long time to code data.[212]

The second method, i.e., self-administered questionnaires, involved respondents filling out the questionnaires themselves. Self-administered questionnaires are distributed through the mail, using magazine and newspaper inserts, or sometimes left and picked up by company personnel. For the present project, a modified version of self-administered questionnaires was applied by using secondary-level schools. Questionnaires were distributed in class 10 (age 16-17) in one school in each district (with the permission of the school principal) and each student was asked to get their parents or any adult member in their family to fill out the questionnaires, which were later collected from the school. It has several advantages such as being inexpensive, saving time by not requiring the physical presence of the interviewer to explain the questions, allowing respondents to maintain their anonymity and reconsider their responses, and it allowed to collect maximum responses. Moreover, it also helped to reduce the risk of bias by including the views of those who have limited reading and wiring skills. Since the questionnaire was distributed to literature children, meaning that illiterate adults had a chance to complete the survey with the help of their children. However, despite these advantages, this method suffered from some disadvantages. Firstly, it made the sample numbers variance for instance from district Jalandhar where 273 collected samples were useful to evaluate one of the hypotheses, from Amritsar only 268, and in Ludhiana 264 were useful. The second biggest disadvantage of this strategy is that it increases the potential risk of age bias to the sample, i.e., there is a possibility that sampled parents with children aged 16-17 may get more opportunities compared to people older or younger than this group. Nevertheless, there are many multi-generational families, grandparents, etc. that may have filled out the form. Moreover, to avoid age bias data was collected from different age groups aged between 18-60.

[210] Suphat Sukamolson, Language Institute Chulalongkorn University, Fundamentals of quantitative research
[211] ibid
[212] ibid

2.3.1.5 Sampling Analysis:

Due to the large sample size, particularly with rural domestic water users and farmers, statistical procedure played a vital role in data handling. Statistical analysis helps to take the full set of information provided by the participants in the study and summarise it to provide information in a form that is required to assess if the research hypothesis is true or not. [213] Statistics can be used in two ways, namely descriptive, and inferential statistics. [214] Based on the requirement of the research questions posed in the present study, descriptive statistics were applied to analyse the data. Descriptive statistics concentrate on describing the data which is a representation of a sample of the population. It consists of three basic categories of measures: measures of central tendency, measures of variability (or spread), and frequency distribution. For data analysis, frequency distribution was used in the present study. Measures of frequency distribution describe the occurrence of data within the data set (count).[215] From the frequency table, it is easy to read the minimum and maximum values, missing data, the pattern of frequencies, and percentages. Categories can be ordered by their frequencies. The frequency table is visualised with bar charts to show the differences between frequencies of categories much better.[216] All data handling and statistical analysis were performed using IBM SPSS Statistics vs 26.

2.4 Comparative Method:

The thesis adopts a comparative approach and applies comparative law as a method of research.[217] Comparative law is one of the flourishing areas in the study of law which has attracted a growing interest in legal scholarships and legal educators.[218] This approach has been adopted to shift the focus from comparing legal systems to conducting a comparative analysis of domestic law to serve the aim and research question of this thesis. Comparative law is generally applied to compare the law of one country to that of another.[219] The key act in comparative analysis is to compare legal data of any size or shape by assessing similarities and dissimilarities to understand the content and range of the data points derived from different legal systems.[220] The concept of comparative law evolved between the end of the nineteenth century and early twentieth century in France, which recognised the importance of comparing domestic law and legal doctrine to modernising the fossilized approach of the still governing Exegetic School to the Civil Code and its interpretation.[221] Later by the end of the twentieth century, this notion was extended by the legal scholars in Europe to bring harmony within EU law.[222] Embarking on

[213] Hans E. Fischer, William J. Boone, Knut Neumann (2014) Quantitative Research Designs and Approaches p.27
[214] INTRODUCTION TO STATISTICS David M. Lane. et al. Introduction to Statistics: pp. 6-56 available at 1_intro.pdf (ioc.ee) (assessed on 20-10-202)
[215] Kaur P, Stoltzfus J, Yellapu V (2018) Descriptive statistics. International Journal of Academic Medicine vol 4 (1) 60-63
[216] Sylwester Białowąs, Blaženka Knežević, Iwona Olejnik, Magdalena Stefańska, Qualitative and quantitative methods in sustainable development, published in 2021, pp. 61,62,65
[217] Text to n 3.
[218] Marie-Luce Paris, Chapter 3 The Comparative Method in Legal Research: The Art of Justifying Choices, To be published in Laura Cahillane and Jennifer Schweppe (eds), Legal Research Methods: Principles and Practicalities (Clarus Press 2016)
[219] Edward J. Eberle, The Methodology of Comparative Law (Winter 2011) - Symposium: Methodological Approaches to Comparative Law, Vol 16(1)
[220] John C. Reitz, How to Do Comparative Law, 46 AM. J. COMP. L. 617, 620 (1998)
[221] Saleilles 1911, p. 22
[222] Mark Van Hoecke, Methodology of Comparative Legal Research (2015) Law and Method

a comparative approach in a thesis implies justification on how this choice of method is legitimate and appropriate to serve the purpose of the research. It is required to identify the benefits that can be obtained from comparing laws.

As stated above comparative law is comparing common principles or legal rules from different jurisdictions to find the best solution.[223] Nevertheless, Collins argues that applying comparative law as an instrument to transplant one nation's law to another is not always effective.[224] This is supported by Kahn-Freund who claimed that legal rules are a product of the historical and social development of that country and that transplanting of a rule or body of law may not have the same measure of success as it does in its home jurisdiction.[225] For example, he cites the Industrial Relations Act 1971, which was based on US labour law but had a significantly very minor influence on labour relations in the United Kingdom[226] as the rules and norms of behaviour in the two jurisdictions were very dissimilar.[227] In light of these criticisms, it is often the case that a research project not strictly involving international or European law would include a comparative law dimension, [228] as happened in this thesis. This thesis has applied this method to conduct a comparative analysis of domestic law without any external comparison. Since the aim of the research questions does not require any external comparisons.

Once the reasoning for selecting the approach is defined, it is important to define how this approach is ideal to serve the purpose of the thesis. Different scholars and comparatists have identified a range of purposes credited to comparative law that can serve the aim of a research project in a number of ways. Patrick Glenn under the heading 'Aims of Comparative Law' has defined the correlation between method and knowledge progression. He states that Comparative law serves as an instrument of gaining knowledge and understating another law and legal system, using this knowledge to improve their legal system, as well as using it as a means for harmonisation of law.[229] For Glenn, there is constructivist trust in using other nations' laws for improving one's own national legal system or harmonising different legal rules or systems.[230]

According to another comparatist, Comparative law as a method goes beyond acquiring mere knowledge of the legal system. It also assists to gain an understanding of the discipline of law, not only in its technicalities, but also in its epistemological and ontological dimensions by having critical reflection on the origin, nature, and limits of the law itself. In other words, comparative law helps to gain a wider understanding and knowledge of the phenomenon of law.[231] The comparative method thus inscribes itself in a scientific framework aimed at knowledge progression. In that respect, several scholars have viewed comparative law as a 'critical method of legal science'[232] because it can generate its own law

[223] Hugh Collins, 'Methods and Aims of Comparative Contract Law' (1991) 11:3 OJLS 396
[224] bid 397.
[225] Otto Kahn-Freund, 'On Uses and Misuses of Comparative Law' (1974) 37 MLR 1
[226] Hereinafter referred to as 'UK
[227] Collins (n 50) 398; See also Kahn-Freund, 'Comparative Law as an Academic Subject' (1966) 82 LQR 40; Kahn-Freund (n 52) 1.
[228] Marie-Luce Paris, Chapter 3 The Comparative Method in Legal Research: The Art of Justifying Choices, To be published in Laura Cahillane and Jennifer Schweppe (eds), Legal Research Methods: Principles and Practicalities (Clarus Press 2016)
[229] Mark Van Hoecke, Methodology of Comparative Legal Research (2015) Law and Method
[230] ibid
[231] Örücü (n 2) 44; Samuel (n 8) 25
[232] Örücü (n 2) 44.

knowledge.[233] Örücü, identifies that these objectives may range from 'aiding law reform and policy development, providing a tool of research to reach a universal theory of law, giving a critical perspective to international law practice, facilitating harmonisation of laws, helping courts to fill gaps in the law and even working towards the furthering of world peace and tolerance'.[234]

Overall, comparative law aims to make suggestions on how the law can be improved. The overarching aim of a quest for better law has led the present study to adopt the comparative law method. This study encompasses three kinds of comparison. The first comparison involves a comparative analysis of statutes enacted by states to regulate the functioning of WRAs in the water sector. The state enactments are analysed to propose similar provisions for all the states to improve the functioning of WRAs. The second comparison is conducted between National Water Policy, National Framework Bill 2016, and State Water Policies (both enacted and drafted) to find similarities and contrast in provisions. The comparative analysis is conducted to see which policy framework has gaps to achieve the aim of water sector reform. Based on lessons learned from policy analysis, suggestions are made accordingly.

The third comparison involves the establishment and functioning of gram panchayats and WUAs. The 73rd constitutional Amendment Act 1992 is analysed and compared with the state rules under which WUAs are established. This comparison enabled the determination of which institutions have a legal mandate better placed to represent farmers in the irrigation sector and are more effective when it comes to water management in the irrigation sector. It is significant to note that the comparison of two institutions should not be considered a topic under the functional–technical perspective of comparative law. That applies when one looks at two or more legal systems presuming that the law would lead to a similar result and chooses the best one (for example, the one which provides more legal certainty).[235] Though the functioning of these two institutions is compared and the solution is found by suggesting constitutional amendments and policy changes which work against the functional method.[236]

2.5 Systematised Review:

A systematised review method was implemented to collect data to answer a specific research question by conducting an assessment in a manner that enhances the quality of the work.[237] Systematised review shares similarities with systematic review by including some of its essential elements while excluding the criteria of group research,[238] which is exceedingly difficult to accomplish in Ph.D. research.

[233] Marie-Luce Paris, Chapter 3 The Comparative Method in Legal Research: The Art of Justifying Choices, To be published in Laura Cahillane and Jennifer Schweppe (eds), Legal Research Methods: Principles and Practicalities (Clarus Press 2016)
[234] Örücü (n 2) 44, 53-56
[235] M Siems, 'Bringing in Foreign Ideas: The Quest for "Better Law" in Implicit Comparative Law' (2014) 9 Journal of Comparative Law 119, 120-24
[236] Mark Van Hoecke, Methodology of Comparative Legal Research (2015) Law and Method
[237] Grant, M. J., & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal*, 26 (2), 91-108
[238] Grant, M. J., & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. Health Information & Libraries Journal, 26 (2), 91-108

A systematic review is a rigorous form of literature review in which existing studies (both published and unpublished) are evaluated in a critical[239], comprehensive, explicit, and transparent manner, and data is analysed, synthesised, and reported in evidence that answers the research question[240] in a manner which minimises bias.[241]

To undertake a systematic review, five key steps are required to be adhered to, and each step follows a set of core principles. The first is to develop a precise, answerable research question. The research question determines the search terms used to capture all the relevant literature but to avoid capturing unnecessary information.[242] The second step is to locate relevant studies. This is achieved through the identification of relevant databases, in conjunction with selected keywords.[243] The third step is to retrieve and review the selected data and then select the most suitable to answer the research question by using the inclusion and exclusion criteria. The next step is to critically appraise the collected data to extract the most relevant data of high quality. This allows review findings to state the quality level of the studies included in the review. The last step is to analyse and synthesis the findings to present the results.[244]

A systematic review found its roots in medical science, which is specifically related to evidence-based practice also known as Evidence-Based Medicine (EBM). It recognises the need to critically appraise evidence to ensure its validity and usefulness. Following its effective use in medicine, recent years have witnessed methodological developments to meet a variety of demands in the domains of research and policy.[245]

A literature review is an integral part of any research project to both map and assesses the relevant evidence-based studies to provide insight into chosen topic and research question and advance knowledge by filling the gaps.[246] A literature review generally comes in different forms and two of the popular forms are the traditional literature review method and the systematic review method.[247] This thesis, however, opted for a systematic review method for a number of reasons. Systematic review for instance helps to ensure the highest standard of evidence synthesis, while the traditional literature review is short of these standards and often suffers to enhance the quality of the research.[248] Moreover, a traditional form of literature review provides a broad overview of the research topic with no clear hypothesis stated and methodological approach,[249] while a systematic review follows an explicit methodology to answer a well-defined research question by conducting a literature search

[239]AK Akobeng ,Understanding systematic reviews and meta-analysis,(2005) Arch Dis Child. 90(8): 845–848, 10.1136/adc.2004.058230

[240] Systematic and other reviews: Criteria and complexities, World J Otorhinolaryngol Head Neck Surg. 2021 Jul; 7(3): 236 239. https://doi.org/10.1016/j.wjorl.2021.04.007

[241] David Tranfield, David Denyer, Palminder Smart, towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review, British Journal of Management, Vol. 14. 207-222 (2003)

[242] Alice H Lichtenstein, Elizabeth A Yetley, Joseph Lau , Application of systematic review methodology to the field of nutrition, (dec. 2008) J Nutr,138(12):2297-306

[243] Rob B Briner and David Denyer, (Jan 2012) chapter 7 Systematic Review and Evidence Synthesis as a Practice and Scholarship Tool

[244] ibid

[245] Grant, Andrew, (2009) A typology of reviews: an analysis of 14 review types and associated methodologies A typology of reviews: an analysis of 14 review types and associated methodologies (wiley.com)

[246] Rob B Briner and David Denyer, (Jan 2012) chapter 7 Systematic Review and Evidence Synthesis as a Practice and Scholarship Tool

[247] ibid

[248] Weyinmi Demeyin (2016) Traditional reviews vs. systematic reviews, Traditional reviews vs. systematic reviews - Students 4 Best Evidence (cochrane.org)

[249] ibid

comprehensively.[250] It is significant since well-defined questions are critical to addressing the intended goal, scope, and need of the project.[251] In a systematic review, the question is asked in a precise manner by following the criteria of inclusion and exclusion.[252] Additionally, systematic review reduces the risk of bias by using exhaustive literature searchers of both published and unpublished data that provide an audit trail of the various studies including those that show negative or contradictory findings.[253] It is recognised that including grey literature (working documents, conference papers, pre-prints, statistical documents, and other difficult-to-access materials that are not controlled by commercial publishers) [254] broaden the scope to more relevant studies, thereby providing a more complete view of available evidence.[255] However, the traditional review method often lacks a rigorous approach and has the risk of bias. Since the source of literature are well-known articles and follows selection criteria to collect data that is prone to bias. An analysis is conducted influenced by the personal views of the researcher. the findings concluded by using this criterion is more subjective.[256]

Another significant element of systematic review is its explicit, and critical approach to appraising the evidence for its validity[257], which distinguishes this method from a traditional literature review. Being clear about what we and how we know gives a clear vision of the evaluative judgment, the evidence we select, and the way is it appraised and used. Consequently, this method brings certainty, consistency, and confidence to the research.[258] The benefit of this approach to reviewing is that it is organised and replicable, enhancing the confidence of the researcher[259] by providing information on what is and is not known about the research question.[260] This type of review also adopts the rigours approach to synthesis and evaluating evidence. This rigorous approach is adopted by assessing the procedural quality of the included studies and overall strengthening the evidence to ensure the validity of the outcome.[261] This method is also ensuring transparency by providing detailed documentation.[262] This gives liberty to the researcher to look for any potential bias and take necessary measures to improve the reliability and accuracy of conclusions.[263] Moreover, unlike the traditional form of literature review,

[250] Systematic and other reviews: Criteria and complexities, World J Otorhinolaryngol Head Neck Surg. 2021 Jul; 7(3): 236 239. https://doi.org/10.1016/j.wjorl.2021.04.007
[251] Alice H Lichtenstein, Elizabeth A Yetley, Joseph Lau , Application of systematic review methodology to the field of nutrition, (dec. 2008) J Nutr,138(12):2297-306
[252] 9 Priscilla Robinson and John Lowe, 'Literature Reviews vs Systematic Reviews' (2015) 39 Australian and New Zealand Journal of Public Health 103
[253] Rob B Briner and David Denyer, (Jan 2012) chapter 7 Systematic Review and Evidence Synthesis as a Practice and Scholarship Tool
[254] ibid
[255] Quenby Mahood , Dwayne Van Eerd , Emma Irvin , Searching for grey literature for systematic reviews: challenges and benefits, (sep 2014) Res Synth Methods, 5(3):221-34
[256] Robert H. Fletcher and Suzanne W. Fletcher, 'Evidence-Based Approach to the Medical Literature' (1997) 12 J Gen Intern Med S5
[257] AK Akobeng, Principles of evidence-based medicine, (2005) *Archives of Disease in Childhood* 90:837-840
[258] Rob B Briner and David Denyer, (Jan 2012) chapter 7 Systematic Review and Evidence Synthesis as a Practice and Scholarship Tool
[259] Rousseau, Manning, & Denyer, 2008, p. 500
[260] Briner, Denyer, & Rousseau, 2009, p. 27
[261] Alice H Lichtenstein, Elizabeth A Yetley, Joseph Lau , Application of systematic review methodology to the field of nutrition, (dec. 2008) J Nutr,138(12):2297-306
[262] ibid
[263] AK Akobeng ,Understanding systematic reviews and meta-analysis,(2005) Arch Dis Child. 90(8): 845–848, 10.1136/adc.2004.058230

a systematic review can be updated to include new evidence and also keeps a record of its documentation that can be used to reproduce the result.[264]

Based on the findings of the systematic review, this systematised review research was conducted, following some elements of systematic review while excluding the others that did not serve the purpose of this research. To start with, a well-defined answerable research topic was decided, and following the topic, well-defined precise research questions were prepared for each research chapter following the inclusion and exclusion criteria. Following the notion of EBM, this research attempts to apply the best available evidence to policy-related issues presented in each chapter and favour the functional practices while excluding the ineffective ones to present a conclusion. A rigorous approach was adopted to synthesise and evaluate the evidence to minimise bias. The collected studies were further critically analysed to enhance the quality of the work.

1. Literature Search:

Search terms were developed in relation to the research questions. The search selection criteria were developed according to the importance, relevance, and applicability to the research question of each chapter (including chapters 1,3,4,5,6, and 7). A search was conducted by combining individual words using the Boolean operator ‘‘AND’’ The use of AND helped to retrieve articles containing both words.

Search terms for chapter one (introduction) included water resources, water resources, and India, water pollution and India, water quality reports and CPCB, IWRM, IWRM and India, and the state of Punjab. while Search terms for the research chapters included the following: Gram Panchayats and water management, rural domestic water users and water management, farmers and water management, 73rd Amendment Act, National Water Policy India, National Framework Bill India, AWRSP, NWRDP, water pricing, water pricing and IWRM, WUAs India, WUAs and state Punjab, PIM, PIM India, Irrigation Commission and water pricing India, Water regulatory authority India, Water Regulatory Authority Act with the state name, Northern Drainage Punjab Act 1872.

2. Finding The Evidence:

A comprehensive literature search was conducted by using both traditional information sources and an online electronic bibliography database, to seek relevant evidence to answer the research question. The traditional source of information included textbooks and journals, while the online electronic database included online available data in the form of online textbooks, chapters, journals, articles, Indian government reports, UN and World Bank reports, web documents, news reports, statutes, as well as non-binding policy frameworks. This assisted to retrieve relevant data within the limited possible time.

[264] Weyinmi Demeyin (2016) **Traditional reviews vs. systematic reviews,** Traditional reviews vs. systematic reviews - Students 4 Best Evidence (cochrane.org)

Online databases searched included ResearchGate, JSTOR, Science Direct, Google Scholar, and LexisNexis. Access was also gained to the Oxford University and Bristol University libraries via Bournemouth University. Transparency of the research review is ensured through detailed documentation of the process. It is significant to note that to find Acts and policy frameworks, a search was conducted on google to find the website of the Indian government, and all the relevant acts were downloaded from the website by following the exclusion criteria and were saved as pdf for continuous use. For instance, the search term “National Water Policy India was used to specifically look for this policy and to avoid others.

With the help of both the above-mentioned search terms and database 210 articles/ journals, 20 books, 18 chapters in books, 80 Indian government reports, 180 UN and World Bank reports, and 150 web documents, were found by following the exclusion criteria. The abstracts of all these documents were previewed to check relevancy with the aim and research question. Documents relevant to the study were selected for further review. Moreover, documents containing similar information were also excluded. In total 91 articles/ journals, 11 books, 6 chapters in books, 50 Indian government reports, 25 UN and World Bank reports, and 42 web documents were selected for a full review. In addition, 3 National Water Policies, 16 State Water Policies, 25 State Acts, Panchayat Raj Act 1992, Indian Easement Act 1882, 6 Indian Constitutional Provisions, and 5 news reports, were selected by following the exclusion criteria.

Some articles included relevancy to more than one objective or research question. These were included as long as there was a specific discussion on issues. for example, nation water policies are referenced in all research chapters. A similar practice was repeated with some articles, constitutional provisions, web documents, and government reports.

3. Data Analysis:

Following the data selection, the literature was critically reviewed to extract the most relevant data of high quality. This was further used to construct rigorous evidence-based arguments to present the policy-related challenges in each research chapter. These analyses assisted to highlight the gaps and suggest measures to fill these gaps that would eventually help to improve the effectiveness of the examined legal framework in the future.

2.6 Conclusion:

This chapter has provided a detailed discussion to explain the reasoning behind applying each selected methodology and method. Each methodology has provided a significant contribution to achieving the aim of the thesis and has complimented each other. For instance, a doctrinal methodology played a significant role in providing detailed and constructive discussion on law and social-legal research further helped to evaluate the validity of this law. It helped to see the gaps by investigating its implementation in society and based on the outcome suggestions were made to improve the water sector Further, comparative law methodology assisted to investigate the different state laws not only to find the

similarities and dissimilarities but also to see which ones are more in line with the principles of IWRM. This helped to make suggestions firstly to improve the effectiveness of the state laws by bringing the best ones and further to bring uniformity in state laws that would eventually lead to the effective implementation of IWRM in the future. Moreover, the systematised review approach helped to achieve the aim of the thesis with evidence-based high-quality data.

Chapter 3

Analysis of the participatory approach in the water sector in India

3.1 Introduction:

A participatory approach in water management is recognised as an essential element for effective water governance. This has been linked to effective water governance as it brings together elements of transparency, long-lasting collective agreement, and accountability. The interaction between policy makers and the public enhances the understanding of the public about the impact of their actions on other water users/sectors, aquatic ecosystems, environment and thus recognising the need for change to improve the efficiency of water resources by following the principle of sustainable management of the resources.[265] many international conferences including the Dublin statement 1992[266], the Rio 1992[267], the Hague, and the Bonn 2001 have recognised participation as the first essential feature for effective management of the environment and water resources.[268] as result, IWRM has also put significant emphasis on stakeholder participation in water management.[269]

In India, the study of a participatory approach in the water sector is a little more complex. This approach is understood and implemented in diverse ways and contexts under the legal framework of India. the participation of democratically elected local governance bodies known as the Panchayat Raj Institutions (PRIs), has been strengthened through the 73rd constitutional Amendment Act 1992, within which water has a prominent place. It is also known as decentralised decision-making.[270] Domestic water users have been given the right to participate as a result of water sector reform that was introduced by the central government in a joint effort with the internationally funded agency World Bank. This reform was introduced in the rural drinking Water supply sector and has significant consequences with regard to the kind of participation that is proposed and the mechanism for enforcing the same.[271] The key principles introduced under this reform were to shift from a supply-led (top-down) to a demand-led management approach with rural domestic water users given a number of roles from planning to implementation, and management of water supply programs within their areas. The essential element of this reform was participation and decentralisation under which Gram panchayats (village councils) are the main stakeholders or vehicles to implement water supply schemes at the ground level, and

[265] Cap Net UNDP, TUTORIAL ON BASIC PRINCIPLES OF INTEGRATED WATER RESOURCES MANAGEMENT http://www.pacificwater.org/userfiles/file/IWRM/Toolboxes/introduction%20to%20iwrm/Tutorial_text.pdf p.8(assessed on 20-2-2018)

[266] Dublin statement on water and sustainable development, international conference on water and the environment Dublin 31 January 1992, principle 2

[267] Krchnak, Karin M. "Improving Water Governance Through Increased Public Access to Information and Participation." Sustainable Development Law & Policy, Winter 2005, 34-39, 48.

[268] Philippe cullet, Water Law Poverty, And Development, Water Sector Reforms in India P.77

[269] Alka Upadhyay, Raveendra Kumar Rai, Water Management and Public Participation: Case Studies from the Yamuna River Basin, India (Springer Briefs in Earth Sciences Book 16) 2013 p.9

[270] 73rd Amendment Act 1992, the Constitution of India

[271] Philippe Cullet, Water Regulation and Public Participation in The Indian Context, Public Participation and Water Resources Management: Where Do We Stand in International Law? 2013, pp. 20-29

domestic user's participation is then secured through the local Village Water and Sanitation Committee (VWSCs) (a sub-committee of the Gram panchayats) (see figure 2).[272]

in addition, a participatory framework was introduced as a result of the adoption of the international participatory agenda, known as PIM (Participatory Irrigation Management System). This model has become one of the cornerstones of irrigation management throughout the world and has strengthened the role of farmers in irrigation water management under water law in India.[273] Thus, a different form of participatory approach has been developed under different legal instruments within India.

In addition to these legal frameworks, the National Framework Bill 2016 (draft)[274], but most importantly the National Water Policy has also been a guiding factor to introduce a participatory approach in the water sector.[275] However, despite these efforts, the participation of all these three stakeholders (Gram panchayats, domestic water users, and farmers) is far from effective in reality. There are a number of impediments arising from both the constitutional amendment and the National policy framework, as well as water law that challenge the effective implementation of a participatory approach at the state level which needs to be addressed. This chapter, therefore, aims to identify the gaps in the legislative framework, and the findings are understood to help the implementation of the participation approach by making necessary legislative changes to the existing legal framework. It is important to note that the primary focus of this chapter is to analyse the participatory approach with respect to gram panchayat and rural water users, whilst the farmer's participation and challenges to their role will be covered in the following chapter (chapter 4).

This chapter will start by giving a brief description of how the participatory approach was introduced at the international level and the reasoning behind its adoption under IWRM. The discussion will then focus on explaining the legal instruments which allow Gram panchayats and rural water users to participate and then analysis of four principal areas of concern which are essential to the effectiveness of the participatory approach.

The first area of concern is the participation of both gram panchayats and rural water users in the decision-making process of water supply programs. The challenges that arise from the constitutional amendments and the policy framework and how they have affected these groups' participation. The second area is capacity-building programs and the gaps in their institutional setup, to conduct capacity-building programs whilst ensuring gram panchayats and rural water users' participation. This is because an informative mechanism is particularly important to enable the participants to perform their roles effectively.[276] Suggestions are made on how to strengthen the informative mechanism to improve the participation in future. The third area of concern is the role given to the gram panchayats in the water quality monitoring under the drinking water supply programs and how it is implemented at the state level both in practice and in the policy. This is important since their role in water quality monitoring would also

[272] Government of India, Ministry of Rural Development, Department of Drinking Water Supply, Guidelines on Swajaldhara, 2002

[273] Philippe Cullet, Water Regulation and Public Participation in The Indian Context, Public Participation and Water Resources Management: Where Do We Stand in International Law? 2013

[274] Draft National Water Framework Bill, 2016, Draft of 18 July 2016

[275] Philippe Cullet, Water Regulation and Public Participation in The Indian Context, Public Participation and Water Resources Management: Where Do We Stand in International Law? 2013

[276] Ministry of Panchayati Raj Government of India, National Capability Building Framework- 2014

help to ensure water security by handling water quality problems at an early stage. The fourth area is to address issues of fiscal devolution, where systems of due diligence must be put in place such that panchayat finances have sound legal and auditing underpinnings. In the absence of the transfer of financial powers (including revenue-raising) and untied funds, Gram panchayats will not be able to conduct their functions and have credibility at the local level.

Moreover, the role of women in the drinking water supply program has also been analysed. The participation of women in local water governance is currently envisaged as a necessity for achieving sustainable management of water resources both under the Indian constitution and drinking water supply sector reform. Towards this end, reservation provisions have been made both under the constitutions[277] and drinking water supply policy to secure women's participation However, despite these legal provisions, women's participation is seeming to be exceptionally low in India.[278] This part of the chapter will look at factors that are stopping women from participating. The role of women has been analysed under two capacities, first as members of local governance secured under the Indian constitution and secondly as a water users recognised under the dirking water supply sector. the aim is to see the extent of their roles and factors affecting their participation.

The state of Punjab has been used as a case study to understand the extent of the role of these three stakeholders (gram panchayats, rural water users, and women) in the decision-making process. Further, to analyse the role of gram panchayats in water quality monitoring programs and to determine the gaps in the regulatory framework to support the capacity building component. The data collected from three districts, namely Amritsar, Jalandhar, and Ludhiana, have been analysed to evaluate the gaps in the existing legislative framework that hindered a participatory approach in achieving its intentions, particularly with respect to decision-making and water quality monitoring. Any gaps in the data have been filled by using previously conducted studies by the World Bank, specifically with women's participation.

[277] Baljit Kaur, Panchayati Raj Institutions and Women Empowerment: A Case Study of Gram Panchayats of Malwa Region of Punjab 2019

[278] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? Department of Forestry and Natural Resources, Water Policy (2004) Vol 6 (2) 103–116

3.2 Introduction of Participatory Approach at The International Level and Under IWRM:

Public participation and water governance have been a topic of discourse over several years at many international conferences. The Dublin statement of 1992, for instance, called for the involvement of users, planners, and policymakers. Involvement is understood as a procedure that leads to decisions being taken at the lowest level with full public consultation and involvement of users.[279] This principle was later formally incorporated in principle 10 of the Earth Summit in Rio de Janeiro in 1992.[280] The concept of public participation since then has been promoted in many international conferences including the Hague 2000[281], and the international conference in freshwater Bonn 2001.[282] As a result, participation is understood today as abroad-ranging rights that extend from the planning of a project to its implementation as well as to the preparation of plans, policies, and legally binding instruments.[283] IWRM has also recognized its link to sustainable water management and has put significant emphasis on stakeholder participation. it emphasises involving a wide range of stakeholders from decision-makers across the various sectors to all stakeholders including water users that impact water resources, together to set policy and make sound, balanced decisions in response to specific water challenges.[284] The rationale behind this is that this approach can use and apply knowledge from various disciplines, as well as gather insights from diverse stakeholders to develop more innovative solutions due to the diversity of viewpoints.[285] This would also encourage cooperation and reduce the risk of conflicts over water resources, which will then lead to ownership and acceptance of the project.[286] Another benefit of wider collaboration is to avoid the cost of third-party enforcement since the stakeholders involved will be willing to implement their decisions to benefit themselves.[287] As such, IWRM is a comprehensive, participatory planning and implementation tool for managing and developing water resources in a way that balances the social and economic needs and which ensures the protection of ecosystems for future generations.[288]

3.3 Development of Panchayati Raj Institutions and Their Role in The Rural Water Supply Sector:

In India, water is fragmented into sub-sectors for management depending on the sources (surface water, groundwater) and use of water (drinking water, irrigation, fisheries, etc). Consequently, in India today there is a cross-state heterogeneous picture of devolution on water that within a state is partly

[279] Dublin statement on water and sustainable development, international conference on water and the environment Dublin 31 January 1992, principle 2

[280] Krchnak, Karin M, Improving Water Governance Through Increased Public Access to Information and Participation, Sustainable Development Law & Policy, Winter 2005, 34-39, 48

[281] Muhammad Mizanur Rahaman, Olli Varis (2005) Integrated water resources management: evolution, prospects and future challenges, Sustainability: Science, Practice and Policy, vol 1(1) 15-21

[282] Report Bonn freshwater conference 3-7 December 2001 for DGIS

[283] In an environmental context, Arhus, Convention (n 83 above) arts 6-8

[284] Alka Upadhyay, Raveendra Kumar Rai, Water Management and Public Participation: Case Studies from the Yamuna River Basin, India (Springer Briefs in Earth Sciences Book 16) 2013 p.9

[285] Ibid

[286] CRIDF, Stakeholder Participation and Gender Equity 2014

[287] Louka, Elli, 'Case Studies', Water Law and Policy: Governance Without Frontiers Oxford University Press 2008) p.63

[288] Alka Upadhyay, Raveendra Kumar Rai, Water Management and Public Participation: Case Studies from the Yamuna River Basin, India (Springer Briefs in Earth Sciences Book 16) 2013 p.9

devolved into various levels across sub-sectors. Thus, Decentralisation has been a core theme in water governance reforms.[289] One significant form of decentralisation is the devolution of powers to the local government bodies, also known as Panchayati Raj Institutions (PRIs), introduced under the 73rd Constitutional Amendment Act, 1992 (see figure 2)[290] under the 11th schedule of the Constitution, these three-tier democratically elected bodies of local governance have been given a significant role in water-related subjects, namely minor irrigation schemes, watershed development, and drinking water, with a belief that this will lead to better water governance at the local level. [291]

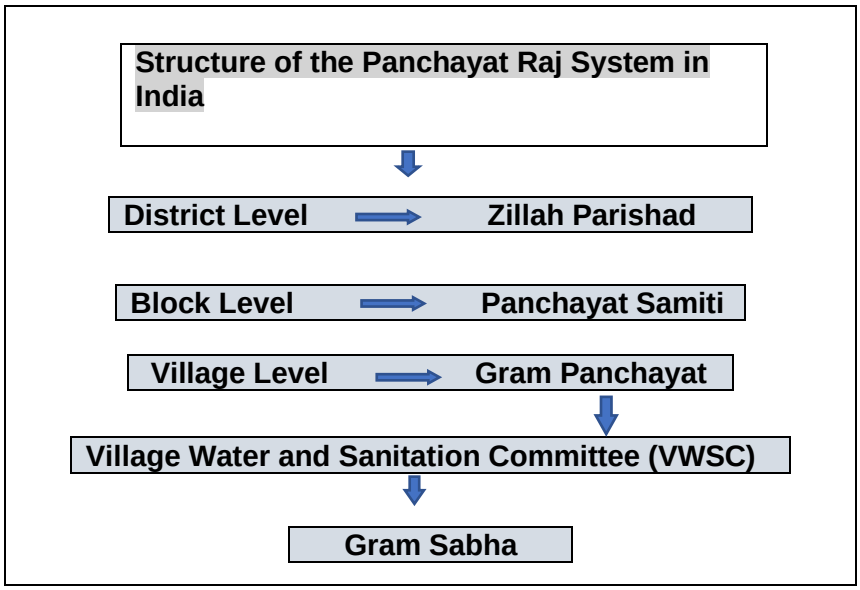

Figure 2 Structure of PRIs in India[292]

In the spirit of the principle of decentralisation, the role of gram panchayats is of particular importance in the drinking water supply sector.[293] In this sector, their role as manager was further elaborated under the Sector Reform Project (SRP) 1999, in which Gram Panchayats and their statutory subcommittee, known as Village Water and Sanitation Committee (VWSCs), were to take responsibility for water supply programs from planning to implementation, and management. Significantly, principles introduced to promote decentralisation in the sector reform program (SRP) drew on the lineage of the World Bank-assisted project called Swajal instituted in the 1990s. This Pilot project was carried out in two regions of then undivided Uttar Pradesh, and Bundelkhand from 1996-2002.[294] The key principles of the Swajal project and sector reform projects (SRP) were later scaled up under the Swajaldhara program launched in 2002 and extended to the whole country.[295] Swajaldhara Guidelines strengthened the decentralisation approach by allowing Gram panchayats/ VWSCs to take full ownership of drinking

[289] Sundararajan, Rajnarayan.Indu, Arriving at principles for effective water management by the panchayats in India
[290] 73rd Amendment Act 1992, the Constitution of India
[291] Eleventh Schedule (Article 243G of the Indian Constitution)
[292] 73rd Amendment Act 1992, the Constitution of India
[293] Department of Drinking Water and Sanitation, Ministry of Jal Shakti, Handbook for Sarpanch & Gram Panchayat Functionaries Capacity Building of Gram Panchayats
[294] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) Pp.171-174
[295] World Bank Report (January 2006), India Water Supply and Sanitation, Bridging the Gap Between Infrastructure and Service, Background Paper Rural Water Supply and Sanitation

water assets.[296] In 2009, this program was reintroduced under the name of the National Rural Drinking Water Programme (NRDWP) during the twelfth five-year plan (2012-17).[297] The NRDWP guidelines enjoin the decentralised approach in water security planning, implementing the plan, maintaining the water supply infrastructure, as well as monitoring water quality. Thus, today Gram Panchayats own/manage the water supply scheme for the community and are responsible for a number of tasks such as approving investment plans and getting financing, annual budgets, and user fee charges after discussion with the domestic users.[298]

3.3.1. The Role of Water Users in The Water Supply Sector:

It is essential to note that the reform aimed to move away from a supply-driven approach to a demand-driven approach, to ensure the water supply to the rural population has the adequate quality and is safe to drink.[299] To ensure its implementation, the participation of water users was also introduced along with the Gram Panchayats. Domestic users were given equal roles to participate in the planning, management, and implementation of the program. The responsibility for ensuring their participation was left with the Gram Panchayats/ VWSCs. The main aim of this reform was to introduce a demand-led paradigm by bringing a change from government-led initiatives to water user-led initiatives. [300] It cantered around a concept of decentralisation and participation that would see local users taking ownership as well as control over decisions made at the local level in return for their participation in financing and operating the scheme through local governance bodies.[301]

So far, several states have introduced a decentralised water supply management under which the role of the state government is changed from manager to facilitator, and the actual implementation and management of the program are run by the Gram Panchayat with the help of the community.[302] The State of Maharashtra was the first state to introduce this reform. Later, other states such as Uttar Pradesh, Rajasthan, Uttaranchal, etc also decided to transfer the ownership of water supply programmers to the Gram Panchayats and community for better management.[303] However, despite these success stories, the participation of Gram Panchayats and domestic users suffers from a number of challenges as revealed by data collected for this study which impacts implementing an effective decentralised water supply management program. To fully understand the reasons accountable for such challenges, the State of Punjab has been used as a case study.

[296] Ministry of Rural Development, Guidelines on Swajaldhara 2003, s 5)1)
[297] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013
[298] Ibid
[299] Ibid
[300] Ibid
[301] Ibid
[302] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) pp. 150-51
[303] World Bank, Project Appraisal Document---Maharashtra Rural Water Supply and Sanitation "Jalswarajya project (Report No 2624-IN, 2003)5

3.3.2 The State of Punjab:

The State of Punjab, with the passage of the 73rd Constitutional Amendment Act, 1992, enacted, the Punjab Panchayati Raj Act, 1994, to replace its existing Gram Panchayat Act, of 1952. The Act proposed to endow the Gram Panchayats with such powers and authority as may be necessary to enable them to function as institutions of self-government. [304] Under the 1994 Punjab Panchayati Raj Act, it is envisaged that gram Panchayats (GPs) will discharge duties and responsibilities related to the subjects mentioned in the 11th Schedule of the Constitution.

The role of Gram Panchayats in the drinking water sector was widened for the first time with the World Bank-funded project (Punjab Rural Water Supply and Sanitation Project (PRWSSP) 2007-14), which promoted a sector-wide approach (SWAp) in the State.[305] This changed the role of the Department of Water Supply & Sanitation (DWSS) from that of provider to the role of facilitator by institutionalising a bottom-to-top multi-tier institutional system including State Water & Sanitation Mission (SWSM), District Water Sanitation Committee (DWSC), District Programme Management Cell (DPMC), Gram Panchayat/Gram Panchayat Water and Sanitation Committee (GPs/GPWSCs) (see figure 3), with the GPs/GPWSCs being the grassroots level body, who would have full responsibilities for all activities including planning, implementation, operation, maintenance, and management related to Rural Water Supply Sector (RWSS) at the village level. [306]

Another important feature of this program was community involvement in capital cost sharing, planning, construction, and operation & maintenance of the RWSS infrastructure. This project focused on transitioning away from past state-led projects toward a model where operations, maintenance, and funding are decentralised to the village level. [307] The project's successful implementation led to the acceptance of the decentralised service delivery approach by the Government of Punjab (GOP) as reflected in the approval of Punjab State Rural Water Supply and Sanitation Policy 2014.[308] Within the framework, the demand-driven, and decentralisation approach was implemented in some 4,000 villages funded both by the GOI's National Rural Drinking Water Program (NRDWP), and Punjab Rural Water Supply and Sanitation Project (PRWSSP).[309] The GOP later scaled up and consolidated the gains of the first project, adopting a demand-responsive approach and decentralisation under the PRWSS II project.[310] However, the transfer of schemes to the gram panchayats should not be understood as the absolute participation of this group in water supply schemes as defined in the policy programs funded by the central government and international donors.

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[304] CHRI 2006, the right to information and panchayat Raj Institution: Punjab as a case study

[305] Document of The World Report No: PAD 1174 (March 3rd, 2015), PUNJAB RURAL WATER AND SANITATION SECTOR IMPROVEMENT PROJECT, p.2

[306] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015 p. IV

[307] Department of Water Supply & Sanitation, Final Report - Updated Environment Management Framework, (January 2015), Environment & Social Assessment Studies for PRWSS II Program, P. I available at http://documents.worldbank.org/curated/en/165181468035464831/pdf/E47250V20Punja00Box385422B00PUBLIC0.pdf (assessed on 12-8-2018)

[308] Punjab State Rural Water Supply and Sanitation Policy 2014

[309] Document of The World Report No: PAD 1174 (March 3rd, 2015), PUNJAB RURAL WATER AND SANITATION SECTOR IMPROVEMENT PROJECT, p.2

[310] The World Bank, IN Punjab Rural Water and Sanitation Sector Improvement Project (P150520), available at India - SOUTH ASIA- P150520- IN Punjab Rural Water and Sanitation Sector Improvement Project - Procurement Plan (worldbank.org) (assessed on 21-8-2018)

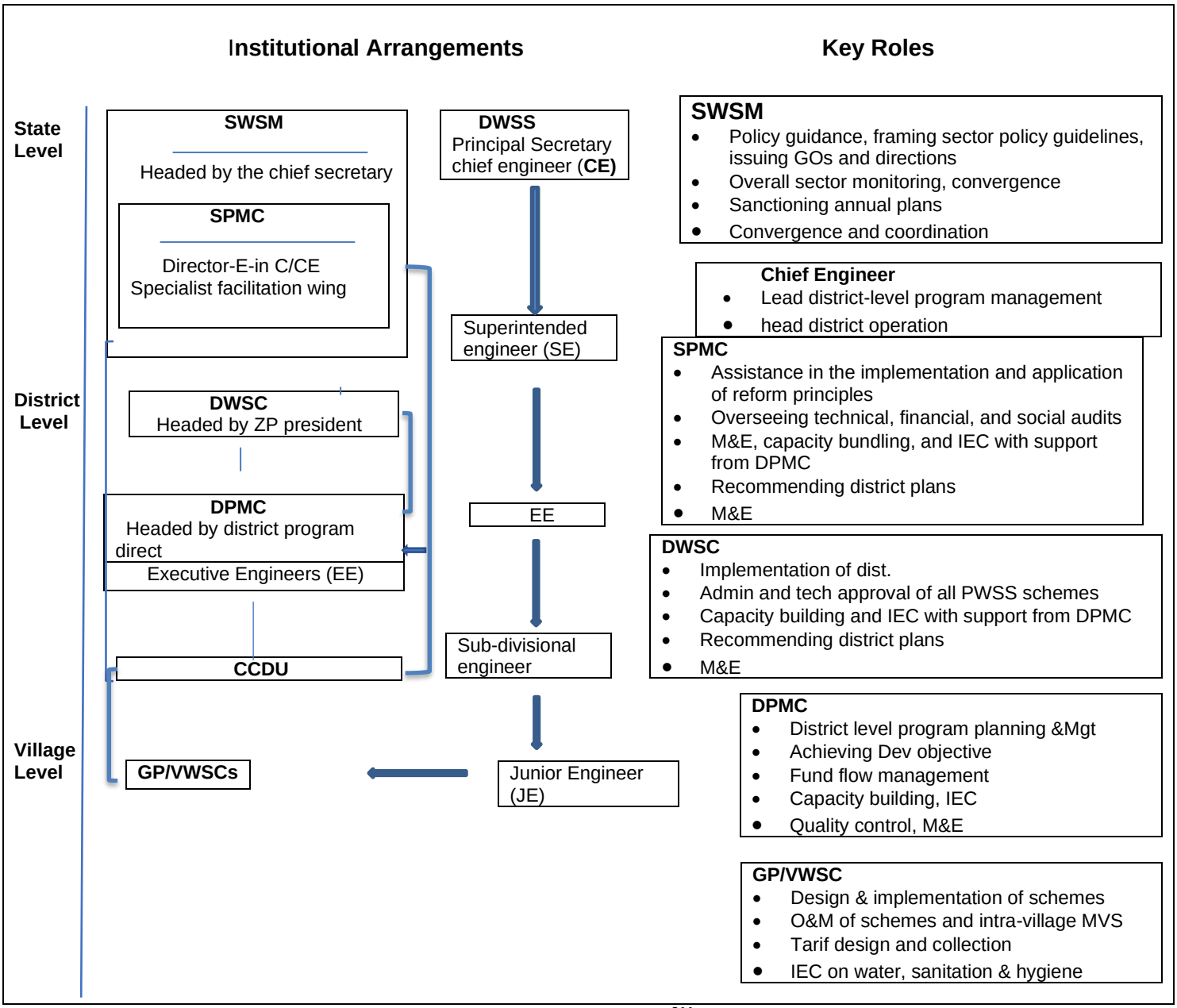

Figure 3 Institutional Arrangement of The State of Punjab[311]

3.4 Constitutional Challenges and Lack of Policy Support to Ensure Decentralised Decision-Making:

One of the aims of water sector reform is to give gram panchayats a role in the decision-making process of water-related matters. This has, however, happened to a limited extent since a limited form of decentralisation has been conceived in particular the democratisation of decision-making. The village water security planning process includes several elements such as:

[311] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015, p. 63

- Preparing a water budget including water rates for management, operation, and maintenance of the systems.
- Details of the village include demographic and physical features such as the size of the village's
- available water sources.
- Gaps in available drinking water infrastructure, and proposed work to fill these gaps.
- Description of various funds available at the village level and requirement of more funds from rural water supply programs etc.[312]

Gram panchayats, however, have little say about many aspects that are relevant for local-level decision-making. This can be seen in the State of Punjab, where according to the data gathered for the present study from the Gram Panchayats in three districts of Amritsar, Jalandhar, and Ludhiana, decentralisation of limited functions has taken place and local bodies have little or no say when it comes to decision making. As per the data provided by the 8 sarpanches (head of the village committee) from the villages of Walipur Kalan, Gazipur, Rayya, Buter Sidiya, Nangli, Kangniwal, Jandu Singha, and Maddar, they have no role to play in the planning of the drinking water supply schemes, and all the decisions are taken by the Department of Water Supply & Sanitation (DWSS). While 9 sarpanches from the villages of Bagga Kalan, Pheruman, Tong, Kherawaat, Bagga Khurd, Rajowal, Mander, Kapoor Singowal, and Kutbewal Arhia said that they do participate in the planning process, but it is a joint effort with the DWSS, and their role is more like a facilitator and the main decisions, such as water rates, are taken by the DWSS. However, the 13 sarpanches from the villages of Bhatia Wait, Chudwali, Arjanwal, Chumo, Fatehpur, Jaitewali, Kaler Ghuman, Maj Phaguwala, Cheema Bath, Baba Bakkala, Tathiyan Rajpura, and Hussain Pura and Qadian said that on the contrary, they participate in the decision-making process and enjoy full power over it. These findings, therefore, confirm those of Philippe Cullet et al. that bureaucracy hampers the implementation of the decentralisation within which GPs have been given ultimate power to participate in the decision-making process.[313] In other words, it shows that the functionaries of the line department are reluctant to share authority with the gram panchayats.

The two main reasons for this are Firstly the way decentralisation has been conceptualised at the level of both central and state governments in the Indian constitution. The constitution of India has divided the functions and powers between the central and state governments under the seventh schedule. The seventh schedule contains three lists called the union list, state list, and concurrent list and as per the list, functions are assigned to the centre and states while the concurrent list is shared by both. Thus, the central Government and the State Governments together or separately exercise a monopoly over legislative powers over subjects mentioned in the seventh schedule and water is one of these subjects, falling in the state list. [314] In compliance with the seventh schedule, article 243G of the constitution (11th

[312] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, p. 27

[313] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) p.151

[314] M.S. Vani (2002), Panchayat Raj and Water Resources Management in India: Law and Policy p.13

schedule) emphasises that the Legislatures of States may endow Panchayats with powers, subject to such conditions as may be specified therein. The Panchayats thus may be endowed with such powers as may enable them to function as institutions of self-government, but this depends on the discretion of the state government and political alignment at the state level. This implies that the powers of local bodies to manage water and other natural resources will be subsidiary to those of the States.[315] In other words, it can be said that the functions listed under the 11th Schedule (article 243G), including drinking water for PRIs, do not in any way reduce the executive and legislative powers of the State conferred under the Seventh Schedule. In reality, the system of centralised planning that the country has followed for over four decades has severally constrained local autonomy. [316] As a result, there are several instances where the role of Gram Panchways has remained merely as a facilitator despite the policy guidelines introduced under the drinking water supply programs, as can be seen from the findings of the present study in the state of Punjab, discussed in the above-mentioned paragraph of this section. Therefore, to minimise interference of state governments in decentralised water supply decision-making would require additional amendments to the subject-matter list that will enable Gram Panchayats to have independent control at the ground level.

The second reason is the lack of clarity in the National Water Policy (NWP). This Policy is intricately linked to the introduction of water sector reform and is also significant from decentralization and participatory perspective. In 2002, the national water policy for first time introduced a decentralised water management/ participatory approach to water resources management[317], with the aim of involving local bodies so management of such facilities could eventually be transferred over but with no mention of ownership of the facilities by local groups.[318] The NWP 2012 again emphasised involving PRIs in the planning of water resources management, but it failed to explain the role of Gram panchayats comprehensively.[319] A similar approach has been followed in the National framework Bill 2016, under which Panchayats have been empowered to participate in project planning, but without elaborating on their role such as how and to what extent they can participate in the decision-making process. [320] In the wake of this policy framework, the State of Punjab has introduced the "Punjab State Rural Water Supply and Sanitation Policy 2014", that emphasised decentralization in the decision-making and a participatory approach but again has been very vague regarding the actual role of gram panchayats in the decision-making process itself.[321]

3.5 No Meetings of Gram Sabha Causing a Lack of Participation by The Community:

When it comes to community participation, the role of the Gram Sabha is important. The Gram Sabha comprises all the villagers registered in the electoral roll within the area of a panchayat.[322] Under the

[315] Ibid
[316] UNDP, Discussion Paper Series – 1 Decentralisation in India Challenges & Opportunities, Human Development Resource Centre, p. 18
[317] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) p.151
[318] Sec.12 National Water Policy 2002
[319] Section 9, National Water Policy 2012
[320] Section 13, Draft National Water Framework Bill, 2016, Draft of 18 July2016
[321] Section 3a of the Punjab State Rural Water Supply and Sanitation Policy 2014
[322] Article 243 of the Indian constitution 1949

NRDWP Guidelines 2013, the meeting of the Gram Sabha is required to be called in the planning, implementation, and management phases of water supply schemes as well as discuss and agree on issues like water demand, level of service delivery, sources of drinking water available, the monetary value paid by households to build the scheme, user charges, decision on concession to Schedule Castes (SCs), Schedule Tribes (STs) and Below Poverty Line (BPL) households. The Gram Sabha also has the responsibility to approve village plans, and reports from the GP/VWSC on financial accounts, role in implementation progress, and operational performance. It is also an institution for social audits. [323] However, the participation of the community has remained one of the biggest challenges in water supply programs. As per the data collected for the present study at the district level, all respondents from three districts, in total 804 (581 government water supply users, and 223 those who use both groundwater and tap supply) said that they have never participated in the decision-making process for water supply schemes. Community participation in the decision-making process was also recorded as very low under the previously conducted Social Assessment Study by the State Program Management Cell (SPMC) (under the State of Punjab Water Supply and Sanction Department), where nearly 80.5% of households declared that they have never participated in any decision-making meetings.[324] According to the Centre for Research in Rural and Industrial Development (CRRID), (which conducted training programs for the representatives of PRIs in five districts of Punjab), several reasons are accountable for such failure, namely Gram Sabha meetings in most of the gram panchayats do not take place regularly and quite often even the quorum has not adhered, with the proceedings of Gram Sabha largely manipulated by sarpanches (Head of the Gram Panchayat) and panchayat secretaries. the notice and agenda of Gram Sabha meetings are not circulated to the members of Gram Sabha as stipulated in the Punjab Raj Act 1994.[325] The CRRID, further stated that lack of community awareness regarding their role as a member of the Gram Sabha was also a contributing factor.

Besides the state of Punjab, the picture in other states is not very promising either.[326] In addition, the complicated structures of Gram Sabhas have also been responsible for their failure in some states. In some states, Gram Panchayats consist of more than one village. In such cases, only one composite Gram Sabha is convened for all the villages which constitute the Gram Panchayat. Since this composite gram Sabha is usually held in the headquarters village of the panchayat, citizens from other villages either do not attend the gram Sabha or are reluctant to articulate their needs. Unless each village has a gram Sabha of its own, the purpose of accountability and participation may not be served.[327]

There are also some legal challenges from the panchayat Raj acts and the policy framework that does not support the Gram Sabha in their decision-making process for a water supply program. For instance, decision-making is a process and requires Gram Sabha to have six meetings to discuss all the elements in detail so any decisions can be made. The first meeting is to understand the goals of the water supply

[323] Ministry of Rural Development Department of Drinking Water Supply, A Handbook for Gram Panchayats to Help Them to Plan, Implement, Operate, Maintain and Manage Drinking Water Security, p. 5

[324] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015, p.47

[325] JP Gupta, B.K. Pattanaik, Key Paper on Rural Local Self-Government in Punjab: Its Evolution, Functioning and Functional Deficiencies, Centre for Research in Rural and Industrial Development 2006, pp. 31-32

[326] Ibid

[327] UNDP, Human Development Resource Centre, Discussion Paper Series – 1, Decentralisation in India Challenges & Opportunities pp. 7-8

program, the second is with the VWSC to assess the need, the third is for resource mapping, the fourth is to discuss the Village Water Security Plan, and the fifth is to approve the operating plan, and the sixth to set up tariffs, concession, a mechanism for collection, presentation of accounts and social audit. [328] However, the legal provisions in most States' panchayat Acts required gram Sabha to meet only twice a year, as recorded in the case of the states of Punjab, Haryana, Rajasthan, Gujarat, and Karnataka. While the State of Kerala Panchayat Raj Act 1994 has stipulated provisions for Gram Sabha to meet at least once in three months. Although these acts, except for the Gujarat state, provide for provisions for another meeting, this is only at the request of the Gram Sabha with a certain percentage of members.[329] Secondly, states have discretionary power under the Indian constitution, and it, therefore, depends on their will whether to endow Gram Sabha with such a right or not.[330]

To bring the concept of community participation into practice in a meaningful way, Panchayat raj acts need to be amended to provide provisions for Gram Sabha to have meetings as many times as required depending on the need of the program and planning process. Moreover, the gaps in National Water Policy also need to be addressed. The National Water Policy 2002 played a significant role in introducing a participatory approach into the water sector by emphasising that beneficiaries and other stakeholders should be encouraged to participate in the project planning stage[331], but the nature of this participation and who are the beneficiaries and stakeholders that need to be engaged needs to be defined as it is currently unclear. [332] Further, the National Water Policy 2012 states that beneficiaries and stakeholders impacted by projects should be consulted, but there is no mention of their participation in the planning process.[333] In addition, the National framework Bill 2016 has completely ignored community participation not only in planning but also in the implementation of the program.[334] With this lack of a guiding framework concerning participation, the State of Punjab Rural Water Supply Policy 2014 has also failed to recognise the domestic user's role in the planning process effectively and has more focused on ensuring financial contribution is registered.[335]

3.6 Capacity Building Challenges:

Participation in drinking water supply schemes requires participants to have sufficient knowledge, skills, education, innovation, and technologies to perform all the roles effectively.[336] In this regard, the human resource development (HRD) and Information, Education, and Communication (IEC) programs were merged in 2004-05 with an aim to enhance the capacity of the Local gram panchayats/VWSCs, and the community, to enable them to take up planning, implementation, and operation & maintenance activities

[328][328] Ministry of Rural Development Department of Drinking Water Supply, A Handbook for Gram Panchayats to Help Them to Plan, Implement, Operate, Maintain and Manage Drinking Water Security, p.8

[329] Section 5 of the Punjab Panchayat Raj Act 1994, section 11 of the Haryana Panchayati Raj Act 1994, section 8A of the Rajasthan Panchayati Raj Act, 1994, section 93 of the Gujarat Panchayats Act, 1993, section 3A Karnataka Panchayat Raj Act, 1993, section 3 of the Kerala Panchayat Raj Act 1994

[330] Article 243 A of the Indian constitution 1949

[331] Sec 6.8 National Water policy 2002

[332] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) p.151

[333] Section 9.2 of the National Water Policy 2012

[334] Draft National Water Framework Bill, 2016, Draft of 18 July2016

[335] Section 3a of the Punjab State Rural Water Supply and Sanitation Policy 2014

[336] Ministry of Panchayati Raj Government of India, National Capability Building Framework- 2014

related to rural water supply systems. The Communication and Capacity Development Unit (CCDU), has to be merged with the Water and Sanitation Support Organisation (WSSO) in most states, with its primary aim of enhancing the capacity building of the multi-tier institutions established at the apex, district, and intermediate, and grassroots/ project level through structured training programs, including HRD, and IEC activities.[337] This unit provides a range of activities such as software support in areas like water quality monitoring, surveillance, evaluation, behavioural change, capacity building activities, etc.[338]

The State of Punjab has also established a CCDU under the DWSS, to meet the capacity building and training (CB&T) related requirements of the functionaries/Institutions including SPMC, DPMC, and GPs/VWSC established under the demand-driven and decentralised service delivery system. CCDU works from the top down, supplementing SPMC (at the state level) to DPMC (at the district level) through structured training programs including IEC activities, to enhance/ develop knowledge, skills, and management practices. At the grassroots level, capacity-building activities are conducted through DPMC, to enable GPs/ VWSCs in the selection of sources and systems, estimating demand quantity, planning, monitoring, construction, operation, maintenance, etc (see figure 3).[339] Gram Panchayats/ VWSCs have further help from ASHA workers[340], and Anganwadi school workers, who provide the required assistance to the community.[341] Despite all these efforts, several gaps have been identified during the Social Assessment Study conducted by the State Program Management Cell (under the State of Punjab Water Supply and Sanction Department). It was revealed by this study that DPMC has the sufficient technical knowledge and a mix of professionals from different sectors to assist the Community-Driven Development approach for planning, implementation, and management of schemes. However, they are facing staffing challenges as many posts are lying vacant and they are not able to extend regular support to the gram panchayat.[342] This study further revealed that implementation-level staff who regularly interreact with the community to support project delivery are lacking knowledge about the dynamic project needs, thus their softer skills would need augmentation for better service delivery. Posts of several IEC specialists, senior HRD specialists, communication specialists, etc. are similarly vacant or not even created as more than 50 % of IEC specialist positions at the district level are vacant. There is no dedicated institutional structure looking after social development at the divisional level which is the most critical level as all basic planning and implementation happen at this stage. Thus, they are not able to extend regular support to the Government of Punjab. There is also a need to set up institutions at the block level. [343] These institutions are important since they function as an intermediator between DPMC and the village, and work as the closest unit to the village community, by coordinating

[337] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, pp. 15-16

[338] Vishal Narain, Annasamy Narayana Moorthy (eds) Indian Water Policy at the Crossroads: Resources, Technology and Reforms, Global Issue in Water Policy 16 (1st edn springer 2016) p.58

[339] Punjab Rural Water Supply and Sanitation Project, Department of Water Supply and Sanitation (Assisted by World Bank), CCDU at a Glance, http://pbdwss.gov.in/prwssp/CCDU/CCDU.html (assessed on 14-9-2018)

[340] Accredited Social Health Activist

[341] Section 13b of the Punjab State Rural Water Supply and Sanitation Policy 2014

[342] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015, Pp. 64-69

[343] Ibid

and providing necessary capacity-building support to the GPWSCs. [344] Currently, Punjab state uses Block Resource Coordinators to fulfil this role. The Block Coordinator is responsible for guiding the preparation of GP plans, collection, & collation of information, monitoring the progress of implementation, and reporting to the Assistant Engineer, and higher departments. The problem with these coordinators is they manage only 142 blocks out of 284 blocks and are working on a contractual basis. Thus, the reform program requires strong and sustained capacity-building support at all levels within government, PRIs, and local communities for conceptualising, designing, conducting, and managing training programs on capacity-building.[345]

3.7 Finance And Gram Panchayats:

It has been recommended that the devolution of functions be accompanied by adequate fiscal powers to make the Gram Panchayats an effective institution of local self-governance.[346] The Indian constitution has granted Gram Panchayats three main sources of income to help them to be financially independent. These Recognised financial resources are direct taxation powers; a share in taxes, duties, tolls, and fees charged and collected by the State Government; and thirdly, grants in aid from the Consolidated Fund of the State.[347] Financial autonomy, however, provided to the Panchayats varies from State to State as discretionary power is invested with the state governments. As a result, some states, for instance, Kerala, Maharashtra, and Andhra Pradesh can be considered to provide the highest financial independence while others do not.[348] Nevertheless, PRIs in all the states of India have faced problems with finance in one way or another and financial paucity has still been one of the main reasons for the failure of PRIs in India [349]

Some challenges have been highlighted which have stopped gram panchayats from enjoying financial independency and therefore need to be addressed. the first recognised challenge is the state government's discretionary power and bureaucratic control that has hindered PRIs from enjoying their taxation power conferred under article 243-H of the Indian constitution. Under this article PRIs have been given the power to generate their income by levying and collecting taxes, duties, tolls, fees, etc.[350] However, the extent to which PRIs can raise funds through local taxation is limited. This is because the power to decide which taxes, duties, tolls, and fees should be assigned to local government bodies rests with the state legislatures.[351] This can be seen in the State of Punjab Panchayat Act 1994, under section 88 of the Act, Gram Panchayats have been given taxation power on several subjects, but the final decision remains with the state government. Therefore, they have no authority to impose any tax unless the state government issues an order to this effect. The situation is further aggravated by

[344] Vishal Narain, Annasamy Narayana Moorthy (eds) Indian Water Policy at the Crossroads: Resources, Technology and Reforms, Global Issue in Water Policy 16 (1st edn springer 2016) P. 58
[345] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015, Pp. 64-69
[346] Mahi Pal, Mobilisation and Management of Financial Resources by Panchayati Raj Institutions – A Study of Haryana State, Planning Commission Govt. of India, p.1
[347] Article 243-H of the Indian constitution 1949
[348] Nesar Ahmad, Decentralisation of Finance A Study of Panchayat Finances in India (Draft Version), Centre for Budget and Governance Accountability (A Programme of NCAS)
[349] Ibid
[350] Article 243-H of the Indian constitution 1949
[351] Shikha Jha, Panchayats – Functions, Responsibilities and Resources, Indira Gandhi Institute of Development Research, draft 2004 Indira Gandhi Institute of Development Research (IGIDR)

bureaucratic control. Even though the delegation of taxation has been granted to the gram panchayats, only a few taxes are managed by them in reality. In practice, the state tax department functionaries continue to exercise power and authority over the vast majority of them. For instance, the State of Punjab Panchayat Act 1994 has vested the power to gram panchayats to collect tax on land and buildings, tax on profession, trade, calling, employment, additional stamp duty on all payments for admission to any entertainment, fees for registration of the vehicle, fees for sanitary arrangements, water rates for drinking water supply**,** lighting rate, and conservancy rate, etc.[352] However, in practice, except for the collection of house tax and water rates in some villages, no other tax as envisaged in the 1994 Act is either levied or collected by most Gram Panchayats.[353] This is similar in other states when it comes to the transfer of enough taxation powers to the Panchayats to raise revenue and conduct their affairs autonomously.[354] As a result, only 5% of Gram Panchayat's revenue is generated from their resources, while 95% of their revenues come from the devolved funds from the centre and state governments, in India as stated by the Finance Ministry.[355] One of the main reasons for this is discretionary power given to the state government under the Indian constitution. Article 243H of the Indian constitution states that devolving any taxing power to the gram panchayat depends on the wish of the state government.[356]

Grants in aid are another recognised source of income, which is yet to be given to the PRIs to the full extent.[357] Two types of grants are accessible by a gram panchayat, The basic grants are untied and can be used for location-specific felt needs but cannot be used to pay salaries or for other establishment expenditures. The tied grants, on the other hand, can be used for basic services of sanitation and maintenance of open-defecation-free (ODF) status and supply of drinking water, rainwater harvesting, and water recycling.[358] In reality, a transfer of a few water schemes with related tied grants from the State Government to the PRIs has happened. [359] One of the main issues with tied grants is how money flows to the panchayats. Government funding is passed to state departments and is not given to the panchayats directly. Moreover, the panchayats are given money in dribbles and there is a lack of continuous and sustainable flow of grants, which hampers the development works of the panchayats.[360] To augment the available resources to the gram panchayats, all plan funds must be placed at the disposal of the concerned panchayat with a clear mandate to implement the scheme for which the funds are meant. A great deal of streamlining is also needed in the procedure associated with the release of

[352] Section 88, The panchayat Raj act 1994
[353] JP Gupta, B.K. Pattanaik, Key Paper on Rural Local Self-Government in Punjab: Its Evolution, Functioning and Functional Deficiencies, Centre for Research in Rural and Industrial Development 2006, p. 22
[354] The Economic Times, Low tax collection at panchayats a challenge to fiscal federalism: Survey, updated on 29TH Jan 2018 available at Economic Survey 2018: Low tax collection at panchayats a challenge to fiscal federalism: Survey - The Economic Times (indiatimes.com) (assessed on 20-9-2018)
[355] Ibid
[356] Article 243H of Constitution of India 1949
[357] Ministry of Panchayati Raj Government of India, 2019 Basic Statistics of Panchayat Raj Institution, p.4
[358] No. 15(2) FC-XV/FCD/2020-25, Government of India, Ministry of Finance, Department of Expenditure (Finance Commission Division)
[359] UNDP, Discussion Paper Series – 1 Decentralisation in India Challenges & Opportunities, Human Development Resource Centre P. 20
[360] JP Gupta, B.K. Pattanaik, Key Paper on Rural Local Self-Government in Punjab: Its Evolution, Functioning and Functional Deficiencies, Centre for Research in Rural and Industrial Development 2006, p. 28

funds to the PRIs before the transfer of funds can confer any reasonable degree of financial autonomy on the panchayats.[361]

Moreover, tax sharing between the state government and gram panchayats, another source of income for the gram panchayats also faces some challenges. These challenges are due to the lack of effective functioning of State Finance Commissions (SFCs). SFCs are the constitutional counterpart of the Union Finance Commission (UFC), which advises the state governments in determining the allocation of funds, grants in aid, range of taxes, and non-taxes to be devolved to the local bodies. It is, therefore, essential that the SFC as an institution function in a manner that enables local governments to conduct their constitutional obligations. However, SFCs in India have been facing difficulties with timeliness. According to the report presented by the National Institute of Public Finance and Policy, New Delhi, India, the average delay in report submission by the SFCs has been close to around 16 months, but for ten SFCs the delay has been more than 18 months.[362] Delay in the submission of reports by SFCs along with the delay in tabling the action taken reports in the legislature by state governments effectively means very little time remains to be governed by the recommendations of SFCs. This directly affects the steady and predictable flow of funds which is essential for the effective functioning of gram panchayats. In addition, irregularity in the constitution of the SFCs also needs to be addressed. While the Constitution (Article 243I) provides for the setting up of SFCs at the expiration of every fifth year[363], this has not been adhered to by the states. Since only thirteen states have managed to constitute their 5th SFCs, while several states are still in their 3rd and 2nd SFCs, and two states, Telangana, and Mizoram, and one union territory namely Jammu & Kashmir are in their 1st SFCs. Among these issues, the non-availability of office space, technical staff, and basic facilities like computers, office furniture, and limited capacity have also affected their functioning.[364]

3.8 Water Quality Monitoring:

Water quality monitoring and surveillance are essential components of a water supply scheme. Monitoring was introduced to ensure that the quality of water is safe to use and meets the Bureau of Indian Standards (BIS) for drinking, cooking, and other household tasks, as well as for animal needs.[365]

In this regard, the National Rural Drinking Water Quality and Monitoring & Surveillance Programme launched in February 2006, was merged with the National Rural Drinking Water Programme (NRDWP). The primary objective of the program is to develop an understanding of safe and clean drinking water among rural communities, enable them to monitor and keep surveillance on their drinking water sources, and involve gram panchayats/ VWSCs to monitor the quality of water at the ground level. Routine water quality monitoring would help to identify the sources of inferior quality at an early stage

[361] UNDP, Discussion Paper Series – 1 Decentralisation in India Challenges & Opportunities, Human Development Resource Centre P. 20
[362] Pinaki Chakraborty Manish Gupta Rakesh Kumar Singh, Overview of State Finance Commission Reports, National Institute of Public Finance and Policy (draft report) 2018
[363] Article 243I in The Constitution of India 1949
[364] Manish Gupta, Pinaki Chakraborty, Working Paper No. 263 State Finance Commissions: How successful have they been in Empowering Local Governments? 2019, National Institute of Public Finance and Policy
[365] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, P. 13

and to determine appropriate control measures. This would then help to conserve water resources and tackle water scarcity at the ground level.[366] Under this program, Gram Panchayats are provided with a field-testing kit (FTK) to test all drinking water sources at least twice a year for bacterial contamination and once a year of chemical contamination.[367] Through this many physicals, chemical, and microbiological contaminants can be identified.[368] However, data collected from three districts for the present study has depicted a different picture. As per the information shared by the respondents, no water samples have ever been collected from their houses by the Gram Panchayats. In fact, they even complained to the Gram Panchayat in the past regarding the poor quality of water, but no attention was paid to them. As a result, the respondents report the quality of drinking water to be bad to very bad. A total of 448 respondents from three districts said that the quality of their water is bad and 249 said it is very bad, while only 108 respondents said it is good. While 170 respondents did not answer because they don't have a government water supply. (District-wise data description is provided in Figure 4). The definition of bad and very bad water quality was defined by the respondents by indicating the following points:

1. Color of stored water changes to dark yellow
2. Sand in the water
3. They have also experienced getting earthworms in water, and
4. Sometimes water smells very bad, probably mixed with sewerage water.

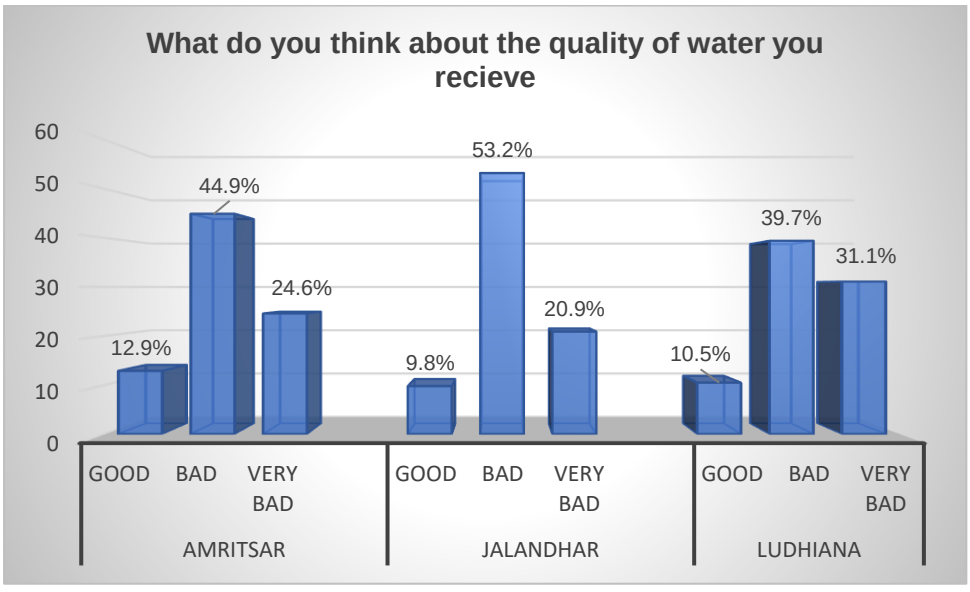

Figure 4 Responses of The Villagers in Three Districts of The State of Punjab to A Question About the Quality of Water They Receive

This indicates negligence on the part of the gram panchayats as well as the huge failure of policy guidelines promoted under NRDWP. To improve the situation in the future, some essential steps need

[366] Ministry Of Panchayati Raj Government of India, Active Panchayat Book II on Drinking Water in Gram Panchayat, p. 31
[367] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, P.17
[368] Ministry Of Panchayati Raj Government of India, Active Panchayat Book II on Drinking Water in Gram Panchayat

to be taken by the government. Firstly, changes are required to the state rural water supply policy 2014. This policy emphasised the need to transfer drinking water supply-related matters to the gram panchayats/ VWSCs but has yet to recognise their role in water quality monitoring and surveillance programs. On the contrary, it has vested the DWSS with the role of monitoring the water quality of drinking water resources, along with the community at large.[369] Capacity building is another issue that needs to be addressed. Under the NRDWP, WSSO (CCDU) is required to take IEC, and HRD programs to provide training to five-gram panchayat level workers for testing drinking water resources.[370] However, as mentioned above, the capacity-building department in the State of Punjab is facing challenges due to a lack of staff and consequently, this requires urgent attention to improve its quality in the future.

Another challenge is the lack of laboratories available to undertake water analysis. All water quality-related data should be integrated with well-defined procedures and formats to ensure online updating and transfer of data to assist the development of a database for informed decision-making in water management.[371] Therefore, to have accurate water quality data for initiating action, Gram Panchayats are required to send preliminary test results to the testing labs. States are normally required to have water testing laboratories at the district and sub-district level, either established with NRDWP funds or existing labs of other departments / educational institutions with appropriate testing facilities duly identified for this purpose. [372] At present, the State of Punjab has 21 water testing laboratories at the district level and 8 labs at the sub-district divisional levels.[373] Besides these labs, the state has two state-level water laboratories set up at Patiala, and the Regional Advance Water Testing Lab (RAWTL) at Mohali.[374] However, the problem with state-level laboratories is their limited capacity to test different parameters. The Patiala lab can test only 5 metals and 1500 samples a year, which further increases the burden on RAWTL.[375] The RAWTL lab, which is equipped with an Ion chromatograph system, and an inductivity coupled plasma mass spectrometer (ICP-MS) is more advanced and can test many parameters simultaneously in one run of a sample, including heavy metals down to a level of 4 ppt (parts per trillion) and radioactive elements. [376] However, this lab also has its limitations since the testing capacity of one of its high-level equipment, the Ion Chromatograph, is very limited, with only up to 1500 samples per year for anions and cations samples compared to the quantum of samples taken in for testing.[377] Thus, the testing capacity of both the labs for samples like anions (like nitrate, sulfate, fluoride, chloride) and cations (calcium, magnesium), was recorded only up to 3000 samples a year in total against the requirement of testing 12000 samples per year. [378] Further, due to having substandard equipment, which is not scalable, laboratories at the district/sub-divisional level are now facing an

[369] Sections 6a,6b of the Punjab state rural water supply and sanitation policy 2014
[370] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, Pp. 17, 56-60
[371] Section 14.3 of the National Water Policy 2012
[372] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, p. 48
[373] Department of Water Supply and Sanitation, Government of Punjab (Water Quality Monitoring and Surveillance), p. 15
[374] Ibid
[375] Department of Water Supply and Sanitation, Government of Punjab (Water Quality Monitoring and Surveillance), p.21
[376] Department of Water Supply and Sanitation, Government of Punjab (Water Quality Monitoring and Surveillance), pp. 19-23
[377] Ibid
[378] Department of Water Supply and Sanitation, Government of Punjab (Water Quality Monitoring and Surveillance), p.22

excessive workload. [379] These laboratories are required to analyse approximately 1000 schemes in the state of Punjab. These are made up of 9595 total water supply schemes, of which 8691 are based on groundwater and 904 on surface water, and the remaining are linked to reverse osmosis (RO) treated water. In addition, during the pre-and post-monsoon season volumes doubles this load to 20,000. Samples.[380] This shows the need to set up more laboratories and provide adequate types of equipment to the existing ones.

3.9 Women's Participation in Rural Water Supply Programmes:

Women are another significant stakeholder group in drinking water supply programs. As discussed in chapter one women have a range of responsibilities from collecting to managing and maintaining water for a whole array of household purposes, as well as regulating and controlling its social use and safe maintenance.[381] This helps women to gain information, knowledge, and skills on water availability, reliability, quality, and purity across the contexts of households.[382] Moreover, they also carry different opinions from men on several issues, including hours of service needed and where facilities should ideally be located. Consequently, women's participation in decision-making and water management is considered a valuable contribution to the establishment and maintenance of project facilities.[383] Several case studies conducted by international organisations such as WHO, and some independent researchers have confirmed that women's participation is an important component of project success, and their involvement has benefited the projects by identifying reliable water sources that can lead to reductions in construction costs, an adaptation of equipment for better use and long-term sustainability. As a consequence, international institutions such as the World Bank, and the United Nations have advocated for more women's participation in water supply projects.[384] Women's role as providers and managers of water were recognised for the first time at the United Nations water conference in 1977 in Mar del Plata.[385] This prompted the UN to declare the decade of 1981-1990 as the "international drinking water supply and sanitation decade." It called for the "full participation of women in the planning, implementation, and application of technology for water supply projects." [386] This sentiment was reiterated during the international conference on water and environment held in Dublin in 1992 and the United Nations conference on environment and development known as Rio de

[379] **A monitoring system** by means of a colorimetric equipment allows the presence of free chlorine in the water to be easily determined available at https://www.novagric.com/en/water/water-recycling/chlorination-equipment (assessed on 20-9-2018)
[380] Department of Water Supply and Sanitation, Government of Punjab (Water Quality Monitoring and Surveillance), p.16
[381] Barrett, H., & Browne, A. (1995). Gender, environment, and development in Sub-Saharan Africa. In T. Binns (Ed.). People and environment in Africa. (pp. 31-35). Chichester: Wiley Publishers
[382] Agarwal, B. (1992). Gender relations and food security: Coping with seasonality, drought, and famine in South Asia. In L. Benería and S. Feldman (Eds.). Unequal burden: Economic crises, persistent poverty, and women's work (pp. 374-378). Boulder, Colorado: Westview Press
[383] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? *Department of Forestry and Natural Resources,* Water Policy (2004) Vol 6 (2) 103–116
[384] Ibid
[385] Lundquist, J., & Gleick, P. (1997) Sustaining our waters into the 21st Century. Scientifically based document prepared for the UN Commission for Sustainable Development's Comprehensive Assessment of the Freshwater Resources of the World. Sweden: Stockholm Environment Institute
[386] Boateng, J. D., Kendie, S. B. (2015). Factors Influencing the Participation of Women in Rural Water Supply Projects in the Asante Akim South District. Journal of Arts and Social Science,3 (1), 220-242

Janeiro in 1992, and the World Conference on Women organized by the UN in Beijing in 1995.[387] At these conferences, concerns were raised to enable the involvement of women in all decision-making processes particularly indigenous people in rural areas and women. [388] At the Dublin conference in particular, women's role as providers and users of water were recognised in institutional mechanisms for the development and management of water resources. It recommended positive policies be issued to facilitate their active involvement at all levels in water resources programs, including decision-making and implementation.[389] Since then, more attention has been turned towards changing a woman's role from Chooser to maker and shaper. This repositioning of how they participate has allowed them to have a more prominent and influential role in decisions-making particularly in local governance.[390] This is because when rural women are given the platform to voice their concerns about matters that affect their daily livelihood or are involved at all levels of water management and policy formulation, they can help mobilise the potential of water for development and ensure that water does not become a constraint to sustainable development. [391] Moreover, at the individual level, participation can lead to women's empowerment, a greater sense of self-confidence, and a positive attitude to undertake new activities.[392]

3.9.1 Women's Participation in The Local Governance in The Water Sector in India:

In India, women's participation is perceived as a basic attribute to achieving effective water governance. The first systematic recognition of women's role in the water sector was recognised under the 73rd constitutional Amendment Act 1992. Under this Act, one-third (33%) of seats are required to be reserved for women to ensure their participation in local governance (Panchayati Raj Institutions) both at the membership and headship levels including SCs and STs. [393] Some states, such as Orissa, have taken it further by making it mandatory to have the vice chairperson's post reserved for a woman in the case of the chairperson being a male.[394] Besides these provisions, further progress has been made under the dirking water supply programs with due representation being given to women by ensuring that 50% of GPs/VWSCs members are women.[395] This has increased women's representation in local governance, where they can equally participate in the decision-making process to decide on water-related matters. Reservation, however, should not be confused with effective

[387] Agarwal, A., Delos-Angeles, M. S., & Bhatia, R. (2002). Integrated water resources management. Global Water Partnership Technical Advisory Committee (TAC). Background Paper, 4, Denmark: Global Water Partnership
[388] Verhasselt, Y. (Ed.). (1998). Water: Worldwide and worthwhile. Brussels: United Nations Office
[389] Boateng, J. D., Kendie, S. B. (2015). Factors Influencing the Participation of Women in Rural Water Supply Projects in the Asante Akim South District. Journal of Arts and Social Science,3 (1), 220-242
[390] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? Department of Forestry and Natural Resources, Water Policy 6 (2004) 103–116
[391] Boateng, J. D., Kendie, S. B. (2015). Factors Influencing the Participation of Women in Rural Water Supply Projects in the Asante Akim South District. Journal of Arts and Social Science,3 (1), 220-242
[392] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? Department of Forestry and Natural Resources, Water Policy 6 (2004) 103–116
[393] Baljit Kaur, Panchayati Raj Institutions and Women Empowerment: A Case Study of Gram Panchayats of Malwa Region of Punjab 2019
[394]Mohanty, Bidyut, Panchayati Raj, 73rd Constitutional Amendment and Women, Economic *and Political Weekly* 1995, vol 30 (52): 3346-50
[395] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013

participation because, despite these provisions, women's participation has been recorded as extremely low in local governance as per the study conducted in two states of India i.e state of Uttar Pradesh and the state of Karnataka with the help of World Bank. According to this study, participation of women as a member of local governance was recorded as extremely low, with only 45% said to be participating in the decision-making process related to water supply programs in the state of Karnataka. While only 36% of women were said to be supervising the construction work. The situation in the state of Uttar Pradesh was not much different.[396] This study has identified two factors accountable for preventing women from reaching higher levels of participation. First, there are individual factors such as low education, lack of leadership and professional experience outside the household, and lack of confidence. Secondly, there are institutional factors that include a lack of support from their spouse or family concerning domestic responsibilities, cultural, religious, and patriarchal norms, and values that either expressly forbid them or at least discourage them from attending male meeting places.[397] Examples of a patriarchal society were noticed in the state of Uttar Pradesh, where the practice of purdah is quite common. this means women cover their faces and have no say in any matters in front of men who are not family members. some incidents were also recorded where the name of female committee members also has the name of their husbands above their names. However, despite the lower level of women's participation, this study has also revealed the positive impact of reservation provisions that have eventually started to increase women's participation to some extent. As 55% of women in the state of Karnataka said that they have become more involved. Women gave several reasons for their increased involvement, including that they have become comfortable talking to others, gained confidence, and become aware of social issues as well as learning how to speak in public. Additionally, 87% of all the women interviewed say that they are satisfied with being on the committee.[398]

3.9.2 Women's Participation as A Domestic User in The Water Sector:

Another role women play in drinking water supply schemes is that of domestic users. As a member of the household/ community, they are required to participate in a wide range of meetings at various stages of the project (discussed in detail in section 3.3.1). However, according to the above-mentioned study conducted in the state of Karnataka and the state of Uttar Pradesh (see section 3.7.1), only 22% of households in the State of Karnataka were reported to send someone to a community meeting about the water projects. Only 11% of these households were represented by a woman. Overall, in Uttar Pradesh, 80% of households sent someone to a meeting, and almost half of these households were represented by women. Looking just at the plains of Uttar Pradesh, 68% of households went to a meeting and almost 30% of these households were represented by a woman. This is different from the findings for committee members, but it still cannot be considered full participation in the real meaning of the word "participation." Women participants face several challenges related to culture, patriarchal

[396] Linda Stalker Prokopy, Women's participation in rural water supply projects in India: is it moving beyond tokenism, and does it matter? Department of Forestry and Natural Resources, Water Policy 6 (2004) 103–116
[397] Ibid
[398] Ibid

norms, lack of confidence, fear, lack of interest and knowledge, etc. as mentioned above. These factors have restricted their participation, as noticed in the state of Karnataka. Women in Karnataka stated that during the planning and implementation stage of the project, they were not consulted about the facilities and their locations. This indicates how their opinion is not considered as valuable as men's.[399] To increase women's participation in rural water supply programs, not only do these factors need to be addressed, but some challenges at the policy level require attention too. Women's role as domestic users in the drinking water supply reform can be dated back to 1986 when the ARWSP Guidelines 1986 emphasised the involvement of women at all stages in rural water supply schemes. Besides this, they were given reservations to secure their participation in the TRYSEM, and other training schemes.[400] With the introduction of a sector-wide approach, the focus was shifted to strengthening women's participation in the project activities by the formation of user groups comprising exclusively of women in each village. These groups were required to function in close coordination with the VWSCs. The overall objective was to incentivise women to take an active role in the process of maintenance of water supply and sanitation systems; to create a sense of empowerment and ownership responsibilities among the users. [401] However, the requirements and preferences of women as domestic users have not been given much attention during the formulation of recent Water supply policies. For instance, the NRDWP Guidelines 2013 has given due consideration to ensuring women's participation as a member of GPs/ VWSCs by securing 50% reservations, especially those belonging to SCs, STs, and OBCs, but failed to recognise their role as domestic users. These guidelines have been very vague when it comes to defining women's role as domestic users and have instead used the word "community participation".[402] The problem with this expression is that it leaves room for those in charge to interpret how they want.

The National Water Policy is another document that also needs revisiting. The National Water Policy 2002 mentions women while emphasising appropriate roles for them in designing participatory water institutions but failed to elaborate more on their role. The National Water Policy of 2012 does go a step further to consider the unique needs and aspirations of women along with SCs, STs, and other weaker sections of society, but again failed to give due consideration to their role in the planning process in water management. Consequently, this is something that needs to be addressed to provide concrete guidelines or recommendations to make the policies more gender-neutral at the state level. [403]

3.10 Conclusion:

The above discussion provides insight into the dichotomy between the two understandings of participation. The first one is introduced under the Indian Constitution, which confirms that participation is not limited to central/state government and cannot be dissociated from decentralisation and

[399] Ibid
[400] Accelerated Rural Water Supply Programme Guidelines, 1999 available at http://www.ielrc.org/content/e9914.pdf (assessed on 31-10-2018)
[401] Ibid
[402] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013
[403] Khandker V, Gandhi VP, Johnson N. Gender Perspective in Water Management: The Involvement of Women in Participatory Water Institutions of Eastern India. *Water*. 2020; vol.12(1):196

democratisation by putting democratically elected institutions at the centre of the participation framework. The second one is based on the current international water policy consensus that sees water as an economic good and that promotes demand-led water management. An interesting factor about these two separate frameworks is that they both promote greater involvement of local government and water users simultaneously. However, at the same time, some challenges arise from the frameworks themselves, which has hindered the participation of both gram panchayats and local water users.

Firstly, the Indian constitution has failed to identify the overbearing power of the centre/ state governments as a problem that needs to be addressed. Since this has led to the situation where gram panchayats despite having constitutional status are still subject to bureaucratic control due to the discretionary power of the state governments. In this case, the ideal solution could be a revision of powers given to the state governments under the seventh schedule of the Indian constitution and bringing in local governance as another layer of government particularly to deal with water-related matters. This would make the state government legally bound to share the power with the local government regarding water-related matters. Revision should also be done to ensure the number of Gram Sabha meetings should be conducted as required under the drinking water supply programs. In addition, the national water policy and national framework bill both need revision to explain the role of gram panchayats and water users, as well as women in all activities related to water management such as from planning to implementation and management. This chapter has also highlighted the lack of competent staff and institutional setup in the regulatory framework that is established to ensure capacity-building programs as an issue. It is also important that these issues are addressed as without the correct support and an effective informative system in place, local governance or water users can't get involved.

Moreover, it has also been highlighted that water quality monitoring is subject to bureaucratic control and the role of gram panchayat is zero due to a lack of policy support. This does indicate the violation of policy guidelines promoted under the NRDWP requiring gram panchayats to take up this task. This, therefore, requires a strict policy framework in line with the non-binding policy framework introduced in the form of a drinking water supply policy. In addition, attention and financial investment are required to improve the laboratory infrastructure. Further, the bureaucratic control over financial powers as well as the complexity of issuing funds to the gram panchayats needs to be re-examined. State governments implementing the Panchayat Raj Acts will ensure that local bodies and Gram panchayats get functional and financial autonomy. In addition, issues faced by the SFCs also need to be addressed to resolve the issues of finical autonomy of the panchayats.

Regarding the role of women, it indicates that reservation provisions are helping women become more confident, which would eventually lead to a breakthrough to demolish restrictions arising from a cultural, religious, and patriarchal society. However, there is a long way to go. Mere Quota reservation is not enough, the challenges behind having a capacity-building requirements program and infrastructure need to be addressed. Moreover, the drinking water policy framework also needs to reconsider its approach when it comes to women's role and recognise their role as domes users along with a member of local governance.

Chapter 4

Farmers' participation in Irrigation Water Management

4.1 Introduction:

In India, the agriculture sector is the major water consumer and accounts for 90% of water use in the country. This makes farmers essential stakeholders in water management.[404] Their role in water management has been developed under an irrigation management system introduced in the form of Participatory Irrigation Management (PIM) as a result of water sector reform. According to the report by the Central Water Commission of India, the irrigation sector in India was constrained by several challenges including low performance due to poor maintenance of the irrigation system, lack of funds, inequitable distribution of water between the head-reach and tail-reach farmers, and underutilisation of created potential, etc. This led to a realisation that the existing government-centric institutional setup, particularly in canal systems for irrigation water management, requires a paradigm shift. the National Water Policy, the 12th five-year plan document, and Central Water Commission's comprehensive mission document stressed community involvement in the irrigation management system. [405] As a result, PIM was introduced under which farmers have been given a role to participate in governance, policy, planning, design, construction, operation, maintenance, financing, equitable water distribution, efficient water use, monitoring, and evaluation of the irrigation system at primary, secondary and tertiary levels, through the establishment of Water Users Associations (WUAs). [406] Currently out of 28 states, 23 states and 1 union territory of India have adopted the PIM approach[407] partly or fully by forming WUAs either through policy legislation or through government institutions.[408] However, despite these efforts, the role of farmers in irrigation water management is limited and faced a number of constraints, arising from the legislative framework adopted at the national level as well as at the state level in the form of PIM Acts. Besides that, the constitutional provisions have also sometimes caused a conflict of interest and authority between WUAs and Panchayat Raj Institutions (PRIs). Since the constitution of India under the 73rd amendment Act 1992 has provided an equal role to PRIs in minor irrigation management. In addition, a challenge to their democratic integrity by the Water Regulatory Authority, the lack of financial aid, and capacity-building challenges are contributing factors to the lack of farmers' participation and the effective functioning of WUAs.

To find the reasons for these challenges and to suggest measures accordingly, this chapter starts with examining the framework developed at the national level to establish WUAs and then look at its application at the state level how it has been developed, and what policy measures have been taken

[404] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p.9

[405] Devi, C. V. (2018). Participatory Management of Irrigation System in North-eastern Region of India. International Journal of Rural Management, 14(1), 69–79

[406] Resource Centre for Water User Associations Participatory Irrigation Management and WUAs available at http://wua.aquiferindia.org/participatory-irrigation-management-and-wuas.aspx (assessed on 5-6-2019)

[407] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) p. 138-39

[408] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) p. 137

and the gaps in the policy framework. It further examines the constitutional provisions and role of PRIs in minor irrigation management to see what fair criteria are adopted and whether it is more suitable for WUAs to perform these functions and if so, then what steps need to be taken in this regard. Moreover, the role of the Water Regulatory Authority (WRAs) has also been analysed to see how the introduction of such an institutional body has impacted the independence and integrity of the WUAs. It is essential to note that the introduction of WRAs was the result of water sector reform for sustainable water management. However, it is suggested that the introduction of such reform has dominated the integrity of WUAs. Furthermore, proposed financial mechanisms under the PIM Acts to support WUAs have been analysed to see whether they have been applied in practice and if not, then what actions need to be taken to implement them in the future. Moreover, the capacity-building network has been examined to identify any gaps. The effectiveness of the capacity-building network has been tested against the data collected from the state of Punjab from villages under three districts namely the district of Amritsar, Jalandhar, and Ludhiana and suggestions have been made to improve this in the future.

The last section of this chapter focuses on women's participation in irrigation management. According to the World Bank, women are the second most important water users after men in the irrigation sector and contribute nearly 80% of food and 90 % of dairy products[409], with 75% of the agriculture labour force being women in rural India.[410] This makes them a significant stakeholder in irrigation water management. However, when it comes to the legal framework, they have not been given an equal say in water management and decision-making in the irrigation sector.[411] Therefore, policy gaps and other contributing factors have been analysed, to suggest measures to improve their participation in the future.

This chapter has been concluded with the findings of the analysis to see whether the participatory approach promoted under the Participatory Irrigation Management (PIM) fits well within the concept of participation promoted under IWRM (integrated water management), if not then what changes need to be made to make this happen?

[409] Desai. G, Siddiqui. A, Radhakrishnan. A, Gupte. K, Patankar. M. K, Rochi. R, Sukhman. (2019). Gender and Water in Agriculture and Allied Sectors. Joint publication by 2030 Water Resources Group (World Bank) and UNDP unveils innovative and sustainable partnership and financing models towards Gender and Water in agriculture and allied sectors in Maharashtra, p. 3

[410] National Sample Survey Office, Ministry of Statistics & Programme Implementation, Government of India. (2014). Employment and Unemployment Situation in India. NSS 68th Round (July 2011 - June 2012)

[411] National Institue of Rural Development, India Panchayati Raj Report 2001: Four Decades of Centralised Governance in Rural Indi, Volume 1 (Hyderabad: National institute of Rural Development 2002)

4.2 Development of Farmers' Participation in The Irrigation Sector:

When it comes to farmer participation, irrigation law is noteworthy because it is one of the oldest branches of modern statutory water law in India and significant since it is the only form of participation developed for farmers within a legal framework relating to irrigation management.[412] The historical development of irrigational law can be traced back to the old irrigation acts, adopted in the nineteenth century. The focus of the colonial power, however, was on the economic development of the country through the irrigation sector.[413] To achieve this purpose, the state governments were given control and ownership over surface water to use the water resources for fostering higher crop yields. These enactments thus did not recognise farmers' or other users' rights over the water. [414] After India's independence in 1947, the framework for irrigation legislation did not change much, and most of the states carried on following the old established rule under their respective irrigation law, under which state governments had ultimate control over water.[415] The strategy behind this was to stabilize and increase food production, generate hydroelectric power, and ensure flood control for the major rivers prone to flooding, etc. For this purpose, irrigation was mainly considered a technical enterprise focused on the construction of dams, reservoirs, weirs, barrages, and canals to achieve the maximum potential of irrigation projects. However, the major drawback of this system started surfacing when after decades of massive investment in surface irrigation, the irrigation system failed to foster the benefits expected in terms of physical and financial performance and yield increasing potential.[416] To bring this awareness to a country level, the Central Water Commission of India analysed the performance of 24 irrigation projects between 1975 and 1980 and gradually recognised that the management part of the system was grossly neglected. A number of reasons for the failure of the irrigation system were identified in the reports, including poor maintenance of structures; lack of funds for operation and maintenance; inequitable distribution of water between the head-reach farmers and tail-reach farmers due to lack of water. This led to a paradigm shift in the irrigation sector from construction to the management of irrigation systems. [417] This new framework was significantly influenced by the international participatory model known as Participatory Irrigation Management (PIM).[418] Participatory Irrigation Management requires the involvement of irrigation water users in the irrigation management system based on surface water as well as groundwater. [419] Such involvement includes their role in planning, design, construction, operation, maintenance, financing, governance, monitoring, and evaluation of the irrigation system at primary, secondary, and tertiary levels, through the establishment of Water Users Associations (WUAs).[420] Their role is of significant importance in the management of water since they have been

[412] Philippe Cullet, Water Regulation and Public Participation in The Indian Context, Public Participation and Water Resources Management: Where Do We Stand in International Law? 2013, P. 23
[413] ibid
[414] ibid
[415] ibid
[416] Mamata Swain, Deepak Kumar Das, Participatory Irrigation Management in India: Implementations and Gaps, Journal of Developments in Sustainable Agriculture :3, 28-39 (2008)
[417] Devi, C. V. (2018). Participatory Management of Irrigation System in North-eastern Region of India. International Journal of Rural Management, 14(1), 69–79
[418] S. Hodgson, Legislation on Water User, Organisations—A Comparative Analysis, FAO Legislative Study 79, Rome, 2003
[419] Resource Centre for Water User Associations Participatory Irrigation Management and WUAs available at http://wua.aquiferindia.org/participatory-irrigation-management-and-wuas.aspx assessed on 5-6-2019)
[420] ibid

entrusted with the responsibility of ensuring efficient and economical utilisation of water, equitable distribution, and regulating the use of water.[421]

In India, the PIM model was promoted for the first time through the program of command area development (CAD)[422] in several states in 1985. Later, the National Planning Commission (now known as NITI Ayog) set up a special working group to review the implementation of PIM and suggest the strategies for the 9th five-year plan (1997-2002). [423] Since then, this model has been actively promoted and established with the joint effort of internationally funded agencies (including the World Bank, European commission aid for minor irrigation projects, the agricultural intensification program with assistance from the Japan bank for international cooperation), and state government initiatives[424] as well as some non-governmental organisations (NGOs). Currently, nationwide around 93,668 WUAs covering an area of 17,842,200 hectares across 23 states of India, including one union territory have been formed (Table 1) and is functioning with various degrees of success and impediments.[425]

Besides these practical initiatives, a policy push has also been very instrumental not only in bringing in reform but also to make this reform stronger by bringing in the element of financial independence and a capacity-building component.[426] For instance, the National Water Policy 1987 for the first time introduced the concept of farmers' participation in irrigation management[427] , and the guidelines for the formation of the WUAs were issued accordingly.[428] The role of the framers was further widened in the second policy of 2002 by ensuring their participation in the management of water infrastructures/facilities and transferring management of such facilities to them. [429] The present policy of 2012 has gone even further by proposing participation should be part of good governance and emphasising the financial strengthening of Water Users Associations (WUAs), and capacity building of them. [430] These national water policies thus directly refer to water users' participation, something that water law fails to do. [431] Moreover, the most recent National Framework bill 2016 also recognises the appropriate government shall undertake and encourage a participatory approach to irrigation management at all levels through appropriate laws, regulations, and administrative measures including the establishment of Water Users Associations.[432] There is no doubt that these developments confirm a positive picture when it comes to the effort made to ensure farmers' involvement in irrigation

[421] Section of 16 and 17 of the Assam Irrigation Water Users Act 2004

[422] The Command Area Development Programme was launched in 1974-75 to improve the utilization of created irrigation potential and optimizing agriculture production and productivity through a multidisciplinary team under an Area Development Authority. It is about the command areas of the major and medium irrigation projects in the country. The programme was restructured and termed as “Command Area Development and Water Management (CADWM) Programme” from 1 April 2004.

[423] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds), Water governance challenges and prospects (1st edn. Spring Water 2019) p. 137

[424] Mamata Swain, Deepak Kumar Das, Participatory Irrigation Management in India: Implementations and Gaps, Journal of Developments in Sustainable Agriculture :3, 28-39 (2008)

[425] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) pp. 137-139

[426] Sec 7(5) National Water Policy 2012

[427] Sec 12 National Water Policy 1987

[428] Philippe cullet, Alix Gowlland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010) p. 218

[429] Sec 12 National Water Policy 2002

[430] Sec 7(5) National Water Policy 2012

[431] Devi, C. V. (2018). Participatory Management of Irrigation System in North-eastern Region of India. International Journal of Rural Management, 14(1), 69–79

[432] Section 24 Draft National Water Framework Bill, 2016 Draft of 18 July2016

management. However, it is imperative to note that despite these efforts, five Indian states are yet to establish WUAs as per the evidence shown in table 4. Moreover, the existing WUAs face a number of legal challenges that have a direct impact on the role of farmers and need to be addressed to improve and encourage the role of farmers in irrigation management. This is discussed further below.

Table 3 Numbers of Water Users Associations (WUAs) And Irrigated Areas Covered by Them in The States of India.

	States	Number of WUAs.	Area covered (000 hectares)
1.	Andhra Pradesh	10,884	4179.25
2.	Arunachal Pradesh	43	10.97
3.	Assam	847	95.02
4.	Bihar	80	209.47
5.	Chhattisgarh	1, 324	1,244.56
6.	Goa	84	9.54
7.	Gujarat	8278	662.99
8.	Haryana	8490	1616.27
9.	Himachal Pradesh	1173	140.56
10.	Jammu Kashmir (UT)	383	32.79
11.	Jharkhand	NA	NA
12.	Karnataka	2787	1418.66
13.	Kerala	4398	191.22
14.	Madhya Pradesh	2062	1999.64
15.	Maharashtra	2959	1156.22
16.	Manipur	69	29.40
17.	Meghalaya	159	20.17
18.	Mizoram	390	18.23
19.	Nagaland	24	3.44
20.	Orrisa	20794	1757.71
21.	Punjab	4845	610.29
22.	Rajasthan	1994	1144.45
23.	Sikkim	0	0.00
24.	Tamil Nadu	1910	935.66
25.	Telangana	**0**	**0**
26.	Tripura	0	0
27.	Uttarakhand	0	0
28.	Utter Pradesh	9,691	318.69
29.	West Bengal	10000	37.00
	Total	**93,668**	**17, 842.20**

4.3 Lack of Legislative Framework and Bureaucratic Control:

To implement the PIM, states have adopted different approaches, 15 states introduced legislation providing for the setting up of WUAs, while the Government of Bihar issued a notification "The Bihar Irrigation, Flood Management, and Drainage Rules, 2003", in the exercise of the powers conferred by the Bihar Irrigation Act, 1997, to establish WUAs in the state (table 5). Similarly, the state of Jharkhand also issued Participatory Irrigation Management Rules (2014) under the Bihar irrigation Act 1997, but there is no reference to WUAs in the state.[433] On the other hand, in some of the states including northeast region states such as Manipur and Mizoram, and the northern states of Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, Uttarakhand, and West Bengal[434] such reform has been introduced by different governments departments including the Irrigation Department, Command Area Development (CAD), Minor Irrigation Department and Ministry of Water Resources for maintenance and management of the irrigation system at field or watercourse level.[435] the adoption of the framework of PIM in the states to introduce WUAs either through legislation in states or through debarments recognise a significant change in the attitude of the government to share power and responsibilities with the farmers in irrigation water management. However, there are some concerns WUAs legislation faces which need to be addressed.

Table 4 States with Their Own Independent PIM Acts:

1.	**Andhra Pradesh**	**The Andhra Pradesh Farmers Management of Irrigation System Acts March 1997**
2.	Assam	The Assam Irrigation Water Users Act 2004
3.	Bihar	The Bihar Irrigation, Flood Management, and Drainage Rules 2003 Under the Bihar Irrigation Act 1997
4.	Chhattisgarh	The Chhattisgarh Sinchai Prabandhan Me Krishkon Ki Bhagidari Adhiniyam,2006
5.	Goa	The Goa Command Area Development Act 1997 (Goa Act 27 Of 1997)
6.	Gujarat	The Gujarat Water Users' Participatory Irrigation Management Act, 2007
7.	Jharkhand	Jharkhand Participatory Irrigation Management Rules' (2014)
8.	Karnataka	Promulgated an Ordinance On 7th June 2000 for Amendment of The Existing Karateka Irrigation Act 1957
9.	Kerala	The Kerala Irrigation and Water Conservation Act 2003 (As Amended in 2018)

[433] Government of Jharkhand, department of water resources available at http://wrdjharkhand.nic.in/pdf/PIM%20English.pdf at (assessed on 28-6-2019)
[434] Participatory Governance - PIM Framework in India available at http://nwm.tiss.edu/wp-content/uploads/2017/11/Doc-2-Participatory-Governance-PIM.pdf at (assessed on 28-6-2019)
[435] Devi, C. V. (2018). Participatory Management of Irrigation System in North-eastern Region of India. International Journal of Rural Management, 14(1), 69–79

10.	Madhya Pradesh	The Madhya Pradesh Sinchai Prabandhan Me Krishakon Ki Bhagidari Adhiniyam, 1999
11.	Maharashtra	The Maharashtra Management of Irrigation Systems by Farmers Act 2005
12.	Nagaland	The Nagaland Farmers Participation in Management of Irrigation System Act 2013
13.	Orrisa	The Orissa Pani Panchayat Act, 2002
14.	Rajasthan	The Rajasthan Farmers' Participation in Management of Irrigation Systems Act, 2000
15.	Sikkim	The Sikkim Irrigation Water Tax 2002, Sikkim Irrigation Water Tax (Amendment) Act 2008
16.	Tamil Nadu	The Tamil Nadu Farmers Management of Irrigation Systems Act, 2000
17.	Utter Pradesh	The Uttar Pradesh Participatory Irrigation Management Act, 2009

The main issue faced by the WUAs legislation is the disinclination of the bureaucracy to give up its authority and function to farmers. To keep their power most states have kept the ownership of the irrigation management system with them. For instance, the state of Maharashtra has specifically mentioned that ownership of a canal system whose management is being given to the WUA remains with the government.[436] This notion was justified on the ground that the government has the authority to take such control in the larger public interest.[437] While some state acts recognise the need to include farmers with a sense of ownership of the irrigation system[438] but this has largely remained on paper.[439] This attitude has resulted in imposing more obligations on farmers than rights. the situation is more challenging in those states who introduced WUAs though departments and later amended their existing irrigation acts such as the state of Punjab. in the state of Punjab so far 4,845 WUAs have been established covering an area of 610,290 hectares but irrigation management is still the monopoly of the state government.[440] A central irrigation agency (canal department) manages the primary main canal system, and its secondary-level distributary body delivers a quantity of water proportional to the Culturable Command Area (CCA)[441] of the watercourse. Field staff of the irrigation wing regulate the water supply, fix the turn of each farmer for water, and the duration and quantity of water for farmers.[442] This bureaucratic control arises from the current application of the old Northern India Canal and

[436] Sec 69 Maharashtra Management of Irrigation System by the Farmers Act 2005

[437] Ibid

[438] Sec 16 Orrisa Pani Panchayat Act 2002, sec 16 Madhya Pradesh Chinachai Pradhandan me Krishakin Ki bhagidaari Adhiniyam 1992, sec 24 Chhattisgarh Sinchai Pradhan me Krishkon Ki bhagidahri adhiniyam, and sec 4(1)(v) Maharashtra Management of Irrigation System by the Farmers Act 2005

[439] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) P. 114

[440] Inderjeet Singh and Kesar Singh Bhangoo (September 2013), Irrigation System in Indian Punjab, Munich Personal RePEc Archive, Economics Department, Punjabi University, Patiala (Punjab), India, Center for Research in Economic Change, Punjabi University, Patiala (Punjab), India P. 11

[441] Culturable Command Area (CCA) is the area which can be physically irrigated from a scheme and is fit for cultivation.

[442] Argha Bagchi, (2014) Development of A Water Distribution Model for Warabandi System p.1

Drainage Act of 1873. [443] This act was enacted under British governance and does not recognise the role of farmers in irrigation management. After the independence, the Act has been amended from time to time, as a consequence of which the management domain of the Irrigation Department and water users have been defined. Nevertheless, all these modifications seem to be made to strengthen the control of the government over canal irrigation.[444] As per the amended version of this act, farmers are required to take up financial responsibility for infrastructure as well as ensure the maintenance of the watercourse, without providing them any role in other activities related to irrigation management systems.[445]

4.4 No Participation in Project and Scheme Design:

The underlying principle in the existing Participatory Irrigation Management (PIM) enactments is to involve farmers in irrigation management through WUAs. In principle, the term PIM refers to participation that covers the participation of users in the planning implementation, and management of water infrastructure. [446] However, in the case of irrigation management in India, this should not be confused with participation in decision-making or project design since the focus is on participation at the tail end of the process. This implies transferring part or full control of irrigation systems to users by both allowing them and obliging them to take responsibility for the upkeep of irrigation systems, bear the financial costs involved to maintain the operation and maintenance, as well as regulating, monitoring, and supply of water equitably to members, etc. [447] The word participation is misleading here. On the one hand, what is envisaged is not so much the possibility for farmers and users to participate in taking decisions affecting them, but the imposition of a number of responsibilities.[448] The reasons for states not giving any statuary rights to farmers to participate in decision-making processes arise from the national water policies themselves. The National Water Policy 2002, for instance, emphasised involving WUAs to transfer the management of facilities to farmers but there was no mention of the transfer of ownership of water facilities to them or their right to participate in the decision-making process in irrigation management.[449] It further states that the participation of beneficiaries and other stakeholders should be encouraged right from the project planning stage, but the nature of participation and how and by whom beneficiaries and stakeholders should be defined is unclear.[450] Moreover, the National Water Policy 2012 also failed to define any statutory rights to WUAs to participate in the

[443] Department of Water Resources, Punjab India, Canal Administration)
available at https://irrigation.punjab.gov.in/Canal.aspx (assessed on 30-6- 2019)

[444] Sec 14,15,20,31, and 32 The Northern India Canal and Drainage Act, 1873 (Act No. 8 of 1873)

[445] Sections 18, 30E, 30F, 30FF of the Northern India Canal and Drainage Act, 1873 Act No. 8 of 1873

[446] Resource Centre for Water User Associations Participatory Irrigation Management and WUAs available at http://wua.aquiferindia.org/participatory-irrigation-management-and-wuas.aspx (assessed on 30-6-2019)

[447] Section 20 of the Tamil Nadu Farmers Management of irrigation Systems Act 2000 (Tamil Nadu Act 7 of 2001), section 17, The Orissa Pani Panchayat Act, 2002, section 19 of the Gujarat Water Users' Participatory Irrigation Management Act, 2007 Act 18 of 2007

[448] Philippe Cullet, Water Law In India Overview Of Existing Framework And Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre

[449] Philippe cullet, Alix Gowland gualatieri, Roopa Madhav, Usha Ramanathan (eds), Water Law for The Twenty -First Century national and international aspects of water l- law reforms in India (Routledge 2010 p. 151

[450] ibid

planning process of the projects[451] by giving state governments the option to involve WUAs in the planning of the projects wherever applicable.[452] This indicates that the central government was keener on involving farmers in the management part to ensure the efficiency of the irrigation management system than looking after farmers' interests as water users. Nonetheless, the focus has been shifted as can be seen in the National Framework Bill 2016, under which users are required to participate in the planning and implementation of water projects but this Bill has yet to be passed. [453]

4.5 Constitutional Division of Powers in Irrigation Matter and Its Impact on WUAs:

The 73rd Constitutional Amendment Act 1992 has been a challenge to the integrity and validity of the WUAs. The 73rd amendment provides a legal mandate to the Panchayati Raj Institutions (PRIs) to perform a number of functions under its eleventh schedule, one of which is minor irrigation work.[454] On the other hand, minor irrigation has also been assigned to the WUAs under the PIM reform. The overlapping of functions between WUAs and PRIs has sometimes become a matter of concern in India for several reasons.[455] The integrity of the WUAs has been questioned on the ground that panchayats are constitutionally sanctioned democratic institutions for local governance that have been envisaged as the proper forum for overseeing issues of minor irrigation, while the WUAs in a number of states do not have policy backup and are the result of irrigation funded schemes.[456] Therefore, minor irrigation work is argued to be performed by the Panchayats only and not by any parallel body. In this context, some recommendations were made by the State Ministers of Panchayati Raj and their representatives for joint acceptance by the centre and the state governments stating that parallel bodies should be established only where indispensable, and invariably in consultation with and collaboration of PRIs at an appropriate level. if for any valid reason, parallel bodies have been set up or are to be set up, these must be mingled into a cooperative relationship with the PRIs, at the appropriate level so that PRIs are fully involved with the work of parallel bodies. Moreover, by law, parallel bodies should be required to report periodically to the Gram Sabha(s) so that the community as a whole is kept informed of the activities of parallel bodies.[457] Nevertheless, the mode of executing this idea into practice is proving problematic. This generally worded proposition may be easy to formulate but is difficult to execute on the ground. Observers point out that users' organisations may not fit well within the system of local governance and linking them to Panchayats may undermine their independence and effectiveness.[458] On the other hand, this issue could be addressed by reviewing and modifying the existing PRIs acts.

[451] Sec 7(5) National Water Policy, 2012
[452] Section 9.6 of the National Water Policy 2012
[453] Section 24 of the Draft National Water Framework Bill, 2016 Draft Of 18 July2016
[454] The Constitution (Seventy-Third Amendment) Act, 1992, ELEVENTH SCHEDULE (Article 243G)
[455] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi, pp. 2-3
[456] Philippe Cullet, Water Law In India Overview Of Existing Framework And Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre
[457] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi, pp. 2-3
[458] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi, p.3

The subjects listed in the eleventh schedule of the Indian constitution for PRIs have been very broadly and generally worded and the state laws have continued to put them in similar words. When an activity mapping of what these functions could mean is done, it overlaps with the activities presently being carried out by the user groups (WUAs).[459] This is also justified on the ground that panchayats are already overburdened, lack the expertise to manage water, and are caught up with party politics and factionalism.[460] A clear division of functions between PRIs and WUAs would also help to stop Inter-institutional conflict from happening in near future. Since the tendency of one institution to acquire dominance over the other, leaders of these institutions to achieve power positions, competition over management and control, and disputes over benefit sharing are the factors behind such conflicts. It is also argued that giving PRIs control over minor irrigation is not an innovative idea because sometimes PRIs chose financial profit over reasonability, and this can hinder them from performing their function with integrity and impartiality. An example can be seen in the state of Rajasthan Kharad irrigation project under which all the minor Irrigation works with Culturable Command Area (up to 90) were transferred to the Gram Panchayat/Panchayat Samiti. When an area irrigated by a water tank covers two or more Gram Panchayat, such tanks are to be handed over to the Panchayat Samiti.[461] such transfer becomes effective only when the concerned Gram Panchayat passes a resolution for taking over the control of these tanks. Under this project out of five water tanks, there was only one tank in respect of which the Gram Panchayat passed a resolution. This was the only tank issued for fishing purposes gram panchayats believes that it can bring them immediate financial returns.[462]

Last, but not least, WUAs provide the farmers with a platform to come together and work as a group with the concerned irrigation authorities so that, as a group, they can serve farmers' interests better.[463] This is not possible with the Gram Panchayat, since the Gram Panchayats in every village consist of persons chosen by direct election from territorial constituencies in the Panchayat area.[464] This results in giving no independent platform to framers to participate in irrigation management, raise their concerns or look after their interest in the irrigation sector.

4.6. Water Regulatory Authority and Their Control Over WUAs:

Water sector reform includes several proposals that affect the role of the government in the water sector. The setting up of a water regulatory authority is another part of this reform besides the WUAs, which are meant to take over part of the functions of existing government departments. A number of

[459] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi P.4

[460] Philippe Cullet, Water Law In India Overview Of Existing Framework And Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre

[461] Panchayat Samiti is an **intermediary level** in panchayat Raj institution. It is elected statutory body endowed with comprehensive functions under the 11th schedule. It is bestowed with requisite authority and resources.

[462] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi, pp. 38-41

[463] Videh Upadhyay (2012) Beyond the Buzz: Panchayats, Water User Groups and Law in India, With Specific Studies on Participatory Irrigation Management, Rural Water Supply, And Watershed Development, Jawahar Law Nehru University New Delhi, p. 22

[464] Article 243-C of the constitution of India 1949

states have enacted water regulatory authority enactments, but it is in operational mode only in the state of Maharashtra (see chapter 5). Water regulatory authorities are state-level legally defined bodies. One of the areas that they cover is irrigation management. they have significant tasks ranging from distributing water to WUAs to fixing water rates for irrigation water use, etc.[465] this indicates the clash of jurisdiction between WRAs and WUAs. Since both organisations have similar tasks. Moreover, another concern is the ultimate control of the WRAs over the existence of WUAs. In the case of the states of Maharashtra and Rajasthan legislation, authorities are given the power to dismember WUAs. In other words, WUAs have no democratic legitimacy and can be made and broken anytime. This indicates that water sector reform concentrated on setting up this new decentralisation institution by focusing on reducing the burden of the government, but without paying attention to the legitimacy of the WUAs. The lack of institutional stability seriously hampers local people's effective control over water and requires the governments to provide statutory status to the WUAs under their respective PIM Acts. Moreover, review the existing water regulatory authority enactments to define the jurisdiction of WRAs over the existence of WUAs.[466]

4.7. Participation In Irrigation Water Management and Landowners:

The rationale for promoting farmers' participation through WUAs is to promote a sense of ownership among the farmers for the irrigation system. This is assumed to lead to sustainable water governance and water management since users are more likely to abide by the rules and regulations set out under the PIM acts, governments, and irrigation departments for management of the system if they are part of the management entity themselves.[467] Moreover, the livelihood of water users depends on the canal system, hence their stakes and motivation in maintaining the canal system are higher than government agencies and they are more likely to have better access and information about local resources.[468] However, the participation recognised in most PIM acts cannot be considered participation based on the principle of equity and equality since the focus has been limited to landowners only as a basis for governing the use and control of irrigation water and other related management functions.[469] This is more visible in the Rajasthan Farmers' Participation in Management of Irrigation Systems Act 2000,[470] and the Nagaland Farmer's Participation in Management of Irrigation System Act 2013.[471] This makes it difficult for those farmers who do not own the land they work on.[472] The reasons for such division lie in the old common law principle which still regulates the irrigation sector in India. The old common law

[465] Philippe Cullet, Water Law In India Overview Of Existing Framework And Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre
[466] Philippe Cullet, Water Law In India Overview Of Existing Framework And Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre
[467] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) p.134
[468] Ibid
[469] Philippe Cullet, Water Law in India Overview of Existing Framework and Proposed Reforms, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre
[470] Section 4 Rajasthan Farmers' Participation in Management of Irrigation Systems Act 2000
[471] Section 4 Nagaland Fanners Participation in Management of Irrigation System Act 2013
[472] Dhananjay Vaidyanathan Rohini, The times of India, (May 4, 2020), Finding the unseen: The curious case of India's missing farmers available at https://timesofindia.indiatimes.com/blogs/matters-of-impact/finding-the-unseen-the-curious-case-of-indias-missing-farmers/(assessed on 8-7-2019)

principles give landowners significant control over the water flowing through their land and over groundwater.[473] This indicates that WUAs in these states cannot be expected to make a major contribution to irrigation water management because of their restricted membership. Some states on the other hand, for instance, Andhra Pradesh[474], Assam[475] Chhattisgarh[476], Madhya Pradesh[477], and Maharashtra[478] have taken a step to further widen the membership of WUAs by including tenants as well as landowners/ landholders and where both the owner and the tenant are landholders in respect of the same land, the tenant. However, the fundamental problem here is agricultural land tenancy is illegal in most parts of India.[479] Most state governments have either legally banned or imposed restrictions on agricultural land leasing under their land leasing enactments. Such bans and restrictive land leasing laws have led to concealed tenancy in almost all parts of the country. For example, in the state of Kerala and the Union territory of Jammu & Kashmir, there is a complete ban on land leasing. Other states with highly restrictive land leasing laws are the states of Gujarat, Maharashtra, and Tripura. Some states such as Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Uttarakhand allow tenancy but do not provide any protection against eviction.[480] These reasons have forced tenancies to be informal, insecure, and inefficient. Informal tenants are most insecure, and with a lack of legal sanctity, it gets difficult for tenants to even think about becoming members of WUAs. More recently, the Model Agricultural Land Leasing Act, 2016 was introduced to permit and facilitate the leasing of agricultural land, to permit access to land by the landless and semi-landless poor farmers, and to provide recognition to farmers cultivating agricultural land on lease, along with other purposes such as to improve agricultural efficiency and equity, and occupational diversity.[481] However, the land is a state subject, the centre cannot do much more than provide a template. Very few states, notably Madhya Pradesh and Maharashtra, have taken the lead and enacted laws to unshackle tenancy.[482] Nevertheless to bring a change and to address this issue without any further complications, states should follow the same criteria followed by the state of Tamil Naidu where all the water users have equal rights to be a member of WUAs.[483]

4.8 Legal Provisions to Support Financial Sustainability of WUAs And Its Application:

WUAs are not commercial entities, but they need to be financially independent to carry out the functions assigned to them and therefore need to receive an income that is sufficient to allow them to perform

[473] Philippe Cullet (2014) Groundwater Law in India: Towards a Framework Ensuring Equitable Access and Aquifer Protection, Journal of Environmental Law, Vol 26(1) p.55
[474] Section 3 Andhra Pradesh Farmers' Management of Irrigation Systems Act, 1997
[475] Section 3 Assam irrigation water users Act 2004
[476] Section 5 Gujarat Water Users' Participatory Irrigation Management Act, 2007
[477] The Madhya Pradesh Sinchai Prabandhan Me Krishakon Ki Bhagidari Adhiniyam, 1999
[478] Section 8 MAHARSHTRA ACT No. XXIII OF 2005
[479] NITI AAYOG Govt. of India New Delhi, Report of The Expert Committee on Land Leasing 31st March 2016
[480] NITI AAYOG Govt. of India New Delhi, Report of The Expert Committee on Land Leasing 31st March 2016 PP. 40-47
[481] NITI AAYOG Govt. of India New Delhi, Report of The Expert Committee on Land Leasing 31st March 2016, P. 18
[482] Dhananjay Vaidyanathan Rohini, The times of India, (May 4, 2020), Finding the unseen: The curious case of India's missing farmers available at https://timesofindia.indiatimes.com/blogs/matters-of-impact/finding-the-unseen-the-curious-case-of-indias-missing-farmers/ assessed on 8-7-2019)
[483] Section 4 Tamil Nadu Farmers' Management of Irrigation Systems Act, 2000

these functions efficiently. [484] For this purpose, the PIM acts allow WUAs to resort to multiple financial sources including grants, donations, borrowing, and water charges, to ensure that WUAs are financially independent and financially viable.[485] Among all these sources, water charges are something that WUAs can have direct control over since they are allowed to collect the water rates and retain the prescribed fraction of the charge for the operation and maintenance of the system and administration expenses as advocated under the National Water Policy 2012.[486] To have control over water rates share, water rate collection is required to be performed by the WUAs directly. Nevertheless, this is not the case in all states. Some states, for instance, Maharashtra, Gujarat, and Rajasthan have not only given authority to WUAs to collect water rates under their respective PIM legislations, but crucially, they have also implemented these provisions into practice. On the other hand, states such as Andhra Pradesh and Uttar Pradesh have failed to do so. In these states, the collection of water rates is still managed by the revenue department of the state governments but the prescribed % of collected revenue is paid back to the WUAs by the state governments.[487] However, the mechanism adopted to allot water rate share to the WUAs is not very effective, which makes financial independence more challenging for WUAs. The current system of reallocation of money through government channels is time-consuming and disrupts the financial viability of WUAs as it can take from a few months to a few years for the funds to reach them.[488] Such delay cripples the WUAs in the absence of any other generated sources of income. Instead of the ploughing back of funds and causing inevitable delays, state governments should adopt the system implemented in the state of Gujrat, where WUAs can retain 30% of revenue collected for ordinary repairs and maintenance of canals and can retain an additional 20% if 100% of the tax is collected in time.[489] Another difficulty is the low price of water rates. As discussed in detail in chapter 7, water rates are not set at a level that is even able to meet the cost recovery principle, and in this situation, it becomes more difficult for the WUAs to survive and execute their functions. Moreover, a lack of awareness regarding the available financial avenues is another contributing factor to the failure of WUAs. This was recorded in the state of Rajasthan, where a fixed deposit against a one-time management subsidy was renewed every year with interest and the WUA office bearers did not know that they could utilise its interest portion.[490] As far as the grants are concerned, WUAs can also avail themselves of a one-time grant of Rs 1200/ha under the command area development and water management program. Nevertheless, WUAs in all states have a common concern that the funds given by the government are too meagre to provide salaries to staff and carry out repair and maintenance of the irrigation system simultaneously.[491]

[484] Stephen Hodgson, Legislation on Water Users, Organizations – A Comparative Analysis (Rome: FAO, FAO Legislative Study 79, 2003)
[485] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) p.151
[486] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) P. 155
[487] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) P. 151
[488] Ibid
[489] Ibid
[490] Ibid
[491] Ibid

4.9 Capacity Building Challenges to WUAs:

Participatory irrigation management encourages farmers' involvement in several functions ranging from irrigation management systems to water distribution, delivery, utilization, dispute settlements, economic efficiency, maintaining records, budget preparation, etc. The effective implementation of these functions requires specific skills for farmers to perform their roles and responsibilities more efficiently. The involvement of institutional organisations such as WALMIs, Krishi Vigyan Kendra, NGOs, and agriculture universities play an important role in the capacity-building process of the WUAs.[492] However, despite these efforts, some instances were recorded where farmers were found to be unaware of any such organisations (WUAs), or PIM Acts, and also reported to be disinclined to participate in the meetings where all collective decisions are taken. For instance, in the states of Nagaland and Sikkim, farmers are reported to be unaware of PIM Acts, which means they do not know any functions assigned to them under the Acts, and this consequently has an impact on their participation.[493] A similar situation was noticed in the survey conducted for this study in the state of Punjab. Despite having 4,845 WUAs in the state, out of 300 respondents, 221 participants said that they are not aware of WUAs (data in the percentage from each district is provided in figure 5).

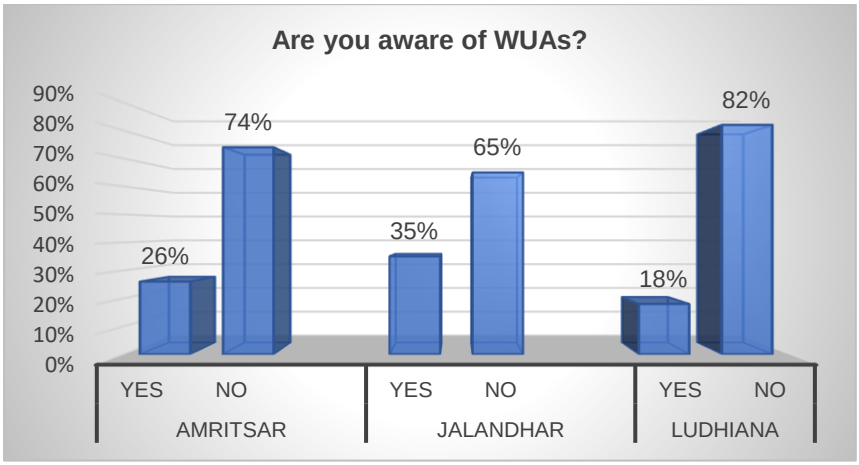

Figure 5 Awareness Level of Farmers Regarding the Establishment of WUAs In the State of Punjab

Moreover, in the state of Gujrat, farmers were reported to be unwilling to participate in WUAs meetings. A survey conducted by an independent researcher to assess the performance of eight WUAs located on two branch canals of the Dharoi irrigation project releveled that the proportion of members taking active participation in WUAs activities was low. In most of the surveyed WUAs on Branch 1, only 35% of farmers reported participating in the proceedings of general body meetings. [494] While on the surveyed

[492] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) pp. 152-53
[493] Devi, C. V. (2018). Participatory Management of Irrigation System in North-eastern Region of India. International Journal of Rural Management, 14(1), 69–79
[494] Nitin Bassi, Parul Rishi & Nirmalya Choudhury (2010) Institutional organizers and collective action: the case of water users' associations in Gujarat, India, Water International, 35:1, 18-33

WUAs on Branch 2, only 12% of the members were found to be attending the general body meetings against the required proportion of 40%, which is mandatory for arriving at any decisions. Members were also found entirely dependent on executive committee members for any action to be taken in respect of the operation and maintenance of minor canals. [495] As a result, many members were unaware of the various events and decisions that were taken during such meetings. This is due to the member's interest in getting assured irrigation water rather than attending meetings. This situation, which is prevailing at present, shows that farmers do not see their contribution to resource management as critically important. [496] In light of these facts, the above-mentioned involved institutions need to make the WUAs members understand the value of sharing the responsibility as a group. [497] This data revelation also raises doubts about the effective functioning of capacity-building programs in the irrigation sector. Based on the literature review, the institutes involved in capacity-building programs are suffering from a lack of training resources and training methods as well as a lack of a network to generate training resources through the training of trainers which consequently has impacted the WUAs. Moreover, the training of farmers is mostly conducted in classrooms by these involved institutes, which has an extremely limited effect on the participants. This does recognise the need to change its approach to enhance the capacity building of farmers. [498] This could easily be addressed by adopting practical methods such as Farmer Field Schools (FFS) as promoted under the Chhattisgarh Irrigation Development Project (CIDP). The method of FFS is based on the concept of "learning by doing" under which training is conducted at the farmers' fields. This method so far has been reported to be found more effective in the strengthening of WUAs and the achievement of project objectives.[499] Moreover, in this context, street plays, and video shows could be used to make the water users understand the concepts and practices of PIM. To bring the impact to a bigger level, activities undertaken by the institutions need to be more intensive and cover a larger section of the farmers.[500]

4.10 No Provisions for Women's Participation In PIM:

Women are the second most important water users in the irrigation sector with 43% of the agriculture labour force being women in the world.[501] The share of women in the agriculture sector in India is of paramount importance as nearly 75% of rural women are farmers[502] and up to 80% of food and 90% of dairy products in India are produced by women. Women carry out most of the tasks including preparing the land, selecting seeds, sowing to transplanting the seedlings, applying manure, fertilizers, and

[495] Ibid
[496] Ibid
[497] Ibid
[498] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) Pp. 152-153
[499] Ibid
[500] Nitin Bassi, Parul Rishi & Nirmalya Choudhury (2010) Institutional organizers and collective action: the case of water users' associations in Gujarat, India, Water International, 35:1, 18-33
[501] The state of food and agriculture 2010–2011: women in agriculture: closing the gender gap for development, Food and Agriculture Organization of The United Nations Rome 2011. Pp. 7-8
[502] National Sample Survey Office Ministry of Statistics & Programme Implementation, Government of India. (2014). Employment and Unemployment Situation in India. NSS 68th Round (July 2011 - June 2012)

pesticides, and then harvesting, winnowing, and threshing.[503] Given their substantial role in the agricultural economy, it becomes essential to focus on gender equality while framing agriculture policies.[504] However, this has not happened to its full extent in the case of the irrigation sector in India. The PIM Acts mandate decentralised institutions (WUAs) for a range of functions but failed to promote gender equality in the management of the irrigation systems in the country.[505] Except for the six states including the state of Bihar, Chhattisgarh, Rajasthan, Madhya Pradesh, Maharashtra, and Uttar Pradesh[506] , the PIM Acts in other states such as Andhra Pradesh, Tami Nadu, Orissa, and Assam have not even recognised women as water user in the irrigation sector.[507] These limitations stem from the National Water Policies of 1987, 2002, and 2012, which do not give significant importance to the concerns related to gender.[508] The National Water Policy of 1987 mentioned the need for equity and social justice in water distribution and allocation but failed to recognise the role of women in the management of the irrigation systems and covered only the economically disadvantaged sections, and smaller farmers.[509] The National Water Policy of 2002 mentioned women's roles in designing participatory water institutions but failed to give any recommendations on general equality in detail.[510] Further, the National Water Policy of 2012 considers the unique needs and aspirations of women along with Scheduled Castes (SCs), Scheduled Tribes (STs), and other weaker sections. [511] However, it again failed to give concrete guidelines to make the policy more gender-neutral.[512] The irrigation field is typically perceived to be male-dominated and therefore they are considered the primary participants of programs. Hence, National Water Policies and Agricultural Policies continue to be dominated by the impression that "farmers are men", and the role of women is restricted to being homemakers and helpers.[513] Though an effort was made by the central government in the form of the National Policy for Women 2016, which recommends that the design of programs and projects must be done keeping in view women as significant water users. It also suggests the need for the involvement and training of women in initiatives on the conservation and utilization of water. Unlike the Water Policy, the National Policy for Women pitches for a gender perspective in water resource management strategies but has

[503] Pande, Mrinal. (2017). The invisible women farmers. [Online] The Indian Express available at https://indianexpress.com/article/opinion/columns/the-invisible-women-farmers-agriculture-labourer-4714072/ (assessed on 8-8-2019)

[504] V Wahaj, R.; Hartl, M. Gender and Water. Securing Water for Improved Rural Livelihoods. the Multiple-Users System Approach; International Fund for Agricultural Development (IFAD): Rome, Italy, 2007available at https://reliefweb.int/report/world/gender-and-water-securing-water-improved-rural-livelihoodsmultiple-uses-system (assessed on 10-8-2019)

[505] Philippe Cullet, Sujith Koonan (eds), Water Law in India an Introduction to Legal Instruments (2nd edn. Oxford University Press,2017) p.16

[506] The Bihar Irrigation, Flood Management, and Drainage Rules, 2003, Chhattisgarh Sinchai Prabandhan Me Krishkon Ki Bhagidari Adhiniyam, 2006, Rajasthan Farmers' Participation in Management of Irrigation System Act, 2000, Madhya Pradesh Sinchai Prabandhan Me Krishakon Ki Bhagidari Adhiniyam, 1999, MAHARSHTRA ACT No. XXIII OF 2005, Uttar Pradesh Participatory Irrigation Management Act, 2009

[507] Andhra Pradesh Farmers Management of Irrigation System Act 1997, The Tamil Nadu Farmers Management of Irrigation System Act 2000, The Orissa Pani Panchayat Act 2002

[508] Paul, Tanusree. (2017). Viewing National Water Policies Through a Gendered Lens. Economic and political weekly 52

[509] Sections 10(3), and 12 of the National Water Policy 1987

[510] Varsha Khandker, Vasant P. Gandhi, and Nicky Johnson, (10 January 2020) Gender Perspective in Water Management: The Involvement of Women in Participatory Water Institutions of Eastern India, online

[511] Section 9.6 of the Nation water Policy 2012

[512]Khandker V, Gandhi VP, Johnson N (2020) Gender Perspective in Water Management: The Involvement of Women in Participatory Water Institutions of Eastern India. *Water* vol.12(1):196

[513] Ibid

yet to be approved. [514] Besides the need to enact gender-neutral policies at the centre level, which can direct the states to provide legal backup to women as stakeholders in irrigation water management, much more is required to overcome the constraints faced by women. These challenges arise due to cultural traditions as well as a lack of an informative mechanism to address their role. For instance, Indian society is male dominated to large extent due to family tradition and culture where only men participate/address meetings and make all the decisions related to farm and water management.[515] This has a direct impact on the low participation of women, as reported in the case of the state of Bihar. According to a survey investigating the inclusion of women as members of the WUAs General Body, and as members of the Executive Committees of the WUAs, the inclusion of women was exceptionally low as only 7.0% and 5.3% respectively.

Besides the cultural restrictions, other contributing factors to low participation are a lack of confidence and lack of knowledge about water management issues[516], as well as a lack of information about their right to participate. Women are often under-represented in rural organisations and institutions and are poorly informed regarding their rights. This prevents them from having an equal say in decision-making processes and reduces their ability to drive collective action, such as membership in WUAs. As a result, ensuring women's participation in a real and meaningful way under WUAs requires gender-responsive solutions such as capacity-building programs that enable more women to access finance, technology, information, and market opportunities.[517]

4.11 Conclusion:

The concept of Participation in the irrigation management system serves two aims simultaneously. On one side it ensures the efficient management of the irrigation system by involving farmers in the construction, operation, maintenance, monitoring, and evaluation of the irrigation system at primary, secondary, and tertiary levels. On the other, it gives farmers a major responsibility to ensure that water is used more efficiently, productively, and distributed equally. However, its scope is limited since several states are yet to introduce PIM Acts, which has led to continuous Bureaucratic control. Comprehensive rethinking of the participatory approach is necessary to ensure that irrigation management and water management are done effectively. Moreover, the participation promoted under PIM should not be misunderstood as participation in decision making which is one of the essential components of the participatory approach promoted under IWRM. Here farmers have neither been allowed to take part in policy planning nor have any right to share their opinion on matters related to them. The PIM Acts need significant updating to bring this change as well as the effective implementation of the National Framework Bill 2016. Moreover, the PIM Acts need reconsideration to involve all farmers in irrigation water management irrespective of their status since the current policy framework tends to establish WUAs as institutions based on old common law principles that give landowners significant control over

[514] National Policy for Women 2016 (draft)
[515] Khandker V, Gandhi VP, Johnson N (2020) Gender Perspective in Water Management: The Involvement of Women in Participatory Water Institutions of Eastern India. *Water* vol.12(1):196
[516] Ibid
[517] Prakash, Daman (2003) Rural Women, Food Security and Agricultural Cooperatives, New Delhi: Rural Development and Management Centre

the water flowing through their land and over groundwater. This shows that WUAs in these states cannot be expected to make a major contribution to irrigation water management because of their restricted membership. This is also against the concept of participation promoted under IWRM, which requires the participation of all relevant stakeholders irrespective of their status.

There is also a need for a clear division of powers and authority between gram panchayats and WUAs. There is no doubt that the 73rd constitutional amendment was introduced to supply legal status to the PRIs and to ensure their involvement in water management. However, with the introduction of PIM, it has become important to revisit this amendment to withdraw minor irrigation matters from their authority since WUAs as organisations of farmers can serve their interests better and have knowledge about their interests than Gram Panchayats does. For financial sustainability, it is also important for the states to have PIM Acts with clear provisions to ensure the legitimacy of the right of WUAs to collect water rates. They should be allowed to keep prescribed water charges directly rather than getting reallocation of the money through government departments which is time-consuming and restrain the financial viability of WUAs. Furthermore, the prescribed share should be fixed after considering all the relevant expenditures that occurred including the costs of O&M, administrative costs, the salary of the staff, etc. Moreover, when it comes to capacity-building programs, the involved institutions need to be more proactive and be able to understand the requirement and the best way to enhance the knowledge of farmers which would consequently increase their participation.

Last but not least is the issue of women's participation in irrigation management which needs to be addressed. Though some states have taken policy initiatives to recognise women’s role as water users in the irrigation sector but a gender-neutral policy at the national level is required. For this, national water policy needs to recognise women as significant stakeholders in water management and provide concurrent guidelines to guide the states to ensure their participation in all aspects of water-related activities from planning to management, supervision, etc. Moreover, a regulatory framework is also needed to address capacity-building-related issues such as creating awareness and knowledge amongst women about their roles and rights as well as helping them to gain confidence to break the cultural obstacles.

Chapter 5

Analysis of Rural Water Pricing in India

5.1 Introduction:

In the past, water has been treated more as a social good than as an economic good, leading to the misuse of resources. This problem was further coupled with rising water demand due to population growth and deteriorated water quality, which raised debate on the economic value of water at the international level. As a result, the UN-Water Conference in Mar del Plata (Argentina) in 1977 for the first time addressed water as an economic good but failed to introduce any change in practice. This gap was later filled in 1992 when the Dublin statement and Agenda 21 not only introduced water as a socio-economic good but also introduced the four basic pillars of water pricing mechanisms, which are: revenue sufficiency, economic efficiency, environmental sustainability, and social equity (see figure 6). This pricing model has since been the basis for most of the reforms that have been adopted by the countries over the past few decades.[518] What interests here the most is that water pricing may strive to meet different combinations of objectives, depending on the region's development goals and needs, with the only requirement to achieve an appropriate balance between the four objectives. However, since these four pillars/ goals of water policy are interrelated, setting a balance between these four objectives is not an easy task.[519] Consequently, reform has rarely been able to achieve its full potential.[520] It is important to note that India has also recognised water as socio-economic good by introducing policy reform in the water sector. Therefore, the aim of this chapter is set to analyse the legislative framework within which the water pricing model has been developed and the implementation of the water pricing mechanism to see to what extent it has been able to achieve the balance between the four pillars, and highlight the policy gaps if there are any, and suggest changes accordingly to improve the water pricing system in India.

With this aim in mind, the water pricing system adopted in India, particularly in the domestic and irrigation sectors, has been investigated. This chapter starts with a discussion on the evolution of water pricing policy at the international level to understand the water pricing mechanism proposed to achieve the aim of water as socio-economic good. Subsequently, discourse leads to critically analysing the water pricing model introduced under rural water supply-funded schemes by the central and internationally funded agencies in the rural water supply sector in India. Further, the National water policy and National framework bill 2016 have also been analysed to see how the concept of water as a socio-economic good was introduced and to establish if it complies with the water pricing model introduced at the international level. These are both significant policy documents to analyse since the national water policy guides the state governments when formulating any policy framework and the

[518] United Nations Department of Economic and Social Affairs, International Decade for Action' Water for Life' 2005-2015 available at http://www.un.org/waterforlifedecade/iwrm.shtml (assessed on 5-6-2021)

[519] Georg Meran, Markus Siehlow, Christian von Hirschhausen, The Economics of Water: Rules and Institutions (1st edn, Spring Water 2021) pp. 124-128

[520] Ariel Dinar Ashok, Water Pricing Experiences: An International Perspective: No.386. (World Bank Technical Paper) 1997, p. VII available at https://documents1.worldbank.org/curated/en/580151468768597034/pdf/multi-page.pdf (assessed on 5-6-2021)

national framework law was introduced as an umbrella document to regulate water resources in the country. Later, the State of Punjab has been used as a case study to analyse the actual application of the water pricing mechanism proposed under both the centrally funded policy guidelines as well as under the national water policy and national framework bill, to see the gaps and suggest modifications for both the national water policy and national framework law. In addition, it proposes some measures for the central government or any internationally funded agencies to consider while issuing any policy guidelines to achieve the balance between the four policy objectives. Policy analysis has been conducted against the data collected from villages in three districts, namely Jalandhar, Ludhiana, and Amritsar to make suggestions.

5.2 Evolution of Water Pricing Policy at International and National Levels:

Water has an economic value in all its competing uses and should be recognised as an economic good. In the past water has always been considered a social good, which has led to a situation where consumers often paid less for the water and related services, they received than the cost of provision and were not aware of the actual costs. [521] It is opined that this attitude has led to the misuse of the resource.[522] In addition, rising water demand due to population growth and deteriorated water quality also merged as a challenge to the sustainable management of water resources.[523] These concerns started a debate that led to the recognition of water needed to be treated as an economic good to regulate the sustainable management of this finite resource. As a result, the UN-Water Conference in Mar del Plata (Argentina) in 1977, emphasised the need to reflect the economic costs of water through appropriate water pricing to ensure efficient and balanced use of water. However, there were no explicit recommendations for the use of concrete instruments until 1992. The International Conference on Water and Environment in Dublin in 1992 declared water as an economic good and emphasised recovering some form of cost coverage for water supply. Later, the cost recovery principle was anchored in Agenda 21 (adopted at the 1992 UN Conference on Environment and Development in Rio de Janeiro), as a component of sustainable water resources management by considering affordability and equity criteria. Thus, both the Dublin statement and Agenda 21 have been instrumental in an institutional reorientation of global water pricing policy by introducing water as a socio-economic good.[524] Based on this simple statement, four objectives such as revenue sufficiency, economic efficiency, environmental sustainability, and social equity, were introduced as the basic pillars of the water pricing policy (Figure 6). This pricing model since then has been the basis for most of the reforms that have been adopted by the countries over the past few decades.[525] Integrated Water Resources Management (IWRM) framework has also adopted a water pricing mechanism based on these four pillars.[526] IWRM promotes this water pricing mechanism to conserve water resources for the present and future generations. Under IWRM, the recovery of costs with a reflection of the economic value is the requirement for ensuring economic efficiency in the pricing system. Thus, the total cost recovery should not only encompass the infrastructure construction, maintenance, and management costs but also include the environmental costs. Since the extensive and wasteful use of resources has severe negative impacts on the environment and leads to a declining resource. Therefore, consideration of environmental externalities in water pricing is required. That consideration can assist in full cost recovery on one hand and provide water conservation incentives. In addition to efficient resource use and environmental integrity, the IWRM framework conveys comprehensive significance in ensuring equitable access for the poor marginal social groups.

[521] TAC BACKGROUND PAPERS NO. 4 Integrated Water Resources Management, 2000, Global Water Partnership, p.18
[522] ibid
[523] Ibid
[524] Georg Meran, Markus Siehlow, Christian von Hirschhausen, The Economics of Water: Rules and Institutions (1st edn, Spring Water 2021, pp. 123-124
[525] United Nations Department of Economic and Social Affairs, International Decade for Action' Water for Life' 2005-2015) available at http://www.un.org/waterforlifedecade/iwrm.shtml (assessed on 5-6-2021
[526] Ibid

However, the implementation of an IWRM-based water-pricing system is not an easy task. Since some goals work against each other and others complement each other (Figure 1). For instance, equity contradicts the other two principles. The provision of a subsidized low price does not satisfy the criterion of cost recovery on the one hand, and it reinforces the misuse of the valuable environmental resource and leads to its degradation on the other. [527] On the other hand, an increase in the volumetric price may not only lead to higher revenues for the water supplier, which supports the revenue sufficiency goal, but it might also result in less exploited water resources due to reduced water demand, which facilitates achieving the environmental sustainability goal.[528] This shows that implementing a water pricing mechanism that would set a balance between these four pillars is very complex. Therefore, there is often disagreement over the objectives of water pricing and tariff design. As a result, countries have often adopted a water pricing system by focusing on only one or two objectives depending on their preferences. Some countries for instance have adopted systems to recover costs, while others use charges to improve water allocation.[529] This, therefore, directs a use-specific water-pricing system to successfully integrate IWRM principles. In other words, to set up a system to find a balance between these four pillars to their best effect.[530]

[527] R Quentin Grafton, Long Chu, Paul Wyrwoll (2020) The paradox of water pricing: dichotomies, dilemmas, and decisions, Oxford Review of Economic Policy Vol 36 (1) 86–107

[528] Georg Meran, Markus Siehlow, Christian von Hirschhausen, The Economics of Water: Rules and Institutions (1st edn, Spring Water 2021, pp. 124-128

[529] Ariel Dinar Ashok, Water Pricing Experiences: An International Perspective: No.386. (World Bank Technical Paper) 1997, p. VII, available at https://documents1.worldbank.org/curated/en/580151468768597034/pdf/multi-page.pdf(assessed on 5-6-2021

[530] Kashem S, Mondal MS (2022) Development of a Water-Pricing Model for Domestic Water Uses in Dhaka City Using an IWRM Framework. *Water* 14(9):1328

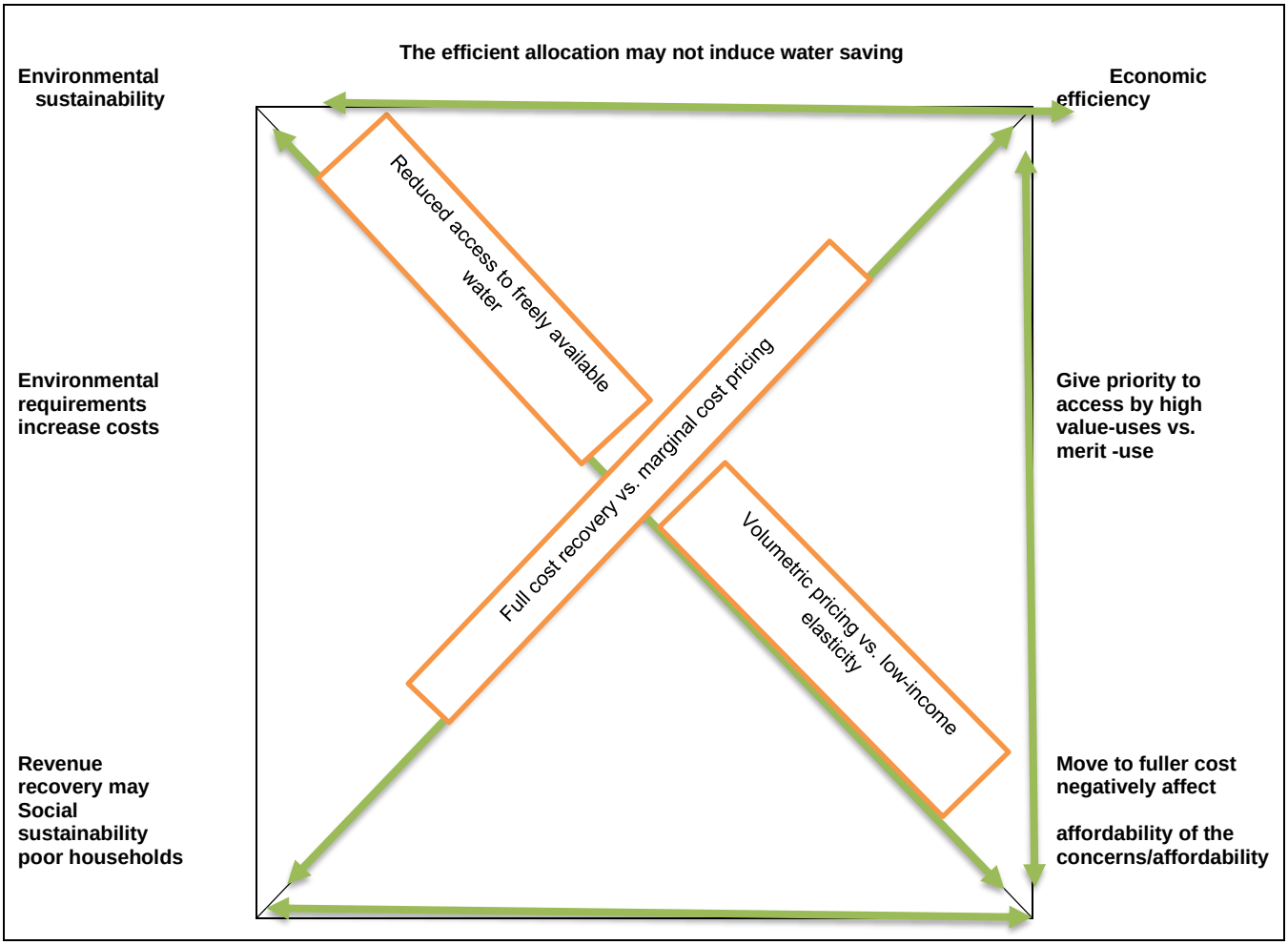

Figure 6 A Brief Overview of The Four Main Objectives, Which Are Categorized as The Sustainability Dimensions of The Water Pricing Policy

5.2.1 Development of Water Pricing Policy in the Rural Water Supply Sector in India:

Rural water supply sector reform was introduced in the context of the centrally sponsored Accelerated Rural Water Supply Programme (ARWSP) 1972-73 in India.[531] However, it was not until the 1990s, when for the first time, water was recognised as an economic good through the World Bank-funded project called "Swajal" launched in Uttar Pradesh and Bundelkhand.[532] Nevertheless, the water pricing mechanism introduced under the Swajal project was not in line with a water pricing policy/ model introduced at the international level (Figure 1). Firstly, the principle of revenue sustainability was not applied to its full extent. Revenue sustainability is measured in terms of covering all the incurred costs including capital costs, operation and maintenance costs, supply costs, opportunity costs that reflect

[531] Accelerated Rural Water Supply Programme Guidelines, 1999 available at http://www.ielrc.org/content/e9914.pdf (assessed on 27-6-2021)

[532] Vibhu Nayar, A. J. James (2010) Policy Insights on User Charges from a Rural Water Supply Project: A Counter-intuitive View from South India, International Journal of Water Resources Development, 26 (3), 403-421

the scarcity value of the water resources, and water extraction costs.[533] This project only proposed the full cost recovery of operation and maintenance costs. Concerning capital costs, a 10 % contribution as an arbitrary figure was chosen as a way to introduce the principle of cost recovery rather than as a goal in itself.[534] The recovery of the 10% capital cost contribution was further divided into two parts: 2% was offered to be paid in cash and the rest of the contribution could be in the form of labour, cash, or a combination of the two. [535] Secondly, this project failed to mention the principles of environmental sustainability, economic efficiency, and affordability while applying the cost mechanism.[536] Later, the government of India introduced the Sector Reform Project (SRP) in selected districts in 1999 to extend the water supply system. The SRP followed similar principles to the ones introduced under the Swajal project, including financial responsibility, but also failed to recognise the other three objectives of the water pricing policy.[537] The positive assessment of these two projects led to the formulation of the Swajaldhara program in 2002, which extended to the whole country.[538] The conceptual background of the program was directly derived from the Swajal project and thus followed a similar water pricing mechanism to charge for water, as proposed under the previous projects.[539] Nevertheless, it took one step ahead by recognising water as socio-economic good, and as a result, the principle of affordability was introduced. The affordability criteria were, however, limited to only scheduled castes (SCs) and scheduled tribes (STs), which cover more than half of all habitations.[540] In 2009, the Swajaldhara program was modified as the National Rural Drinking Water Programme (NRDWP), which had a major emphasis on ensuring the sustainability of water availability in terms of potability, adequacy, and convenience, extending the norm of 40 lpcd to 55 lpcd. The water pricing policy was also modified accordingly, increasing the capital cost-share to 20%, with 100% operation and maintenance cost recovery. This project further extended the principle of affordability by bringing the notion of equity. As a result, the ethic was adopted that the fulfilment of drinking water needs to all should not be commercialized and denied to those who cannot afford to pay for such service.[541] The addition of supply cost was another significant step introduced under this program, but with an exceptional case where water is supplied beyond the basic minimum need. Therefore, it has paved the way for water supply as a part of the cost recovery principle in the future, but to apply this to the full extent, there is still a long way to go.[542]

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[533] OECD. (2010). Pricing water resources and water and sanitation services. Paris: OECD Publishing. Olmstead, S. M., & Stavins, R. N. (2009a). Comparing price and nonprice approaches to urban water conservation. Water Resources Research, 45, 1–10

[534] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.153

[535] World Bank, Staff Appraisal Report--- Uttar Pradesh Rural Water Supply and Environmental Sanitation Project (Report No 15516-IN, 1996) 142

[536] World Bank, Staff Appraisal Report--- Uttar Pradesh Rural Water Supply and Environmental Sanitation Project (Report No 15516-IN, 1996)

[537] Department of Water Supply & Sanitation, Final Report - Updated Environment Management Framework, (January 2015), Environment & Social Assessment Studies for PRWSS II Program, available at http://documents.worldbank.org/curated/en/165181468035464831/pdf/E47250V20Punja00Box385422B00PUBLIC0.pdf (assessed on 30-6-2021)

[538] Ministry of Rural Development, Guidelines on Swajaldhara 2003, s 15(1)

[539] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p. 160

[540]Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.162

[541] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, pp. 1-5

[542] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013, p. 3

Besides the drinking water supply policy framework, the National water policy is another important document, which acts as a guiding document for the states to bring reform in their respective water sectors and has been instrumental in filling the gaps left in drinking water supply policy guidelines. The National water policy in 1987 for the first time introduced the concept of water rates, to convey the scarcity value of the resource to encourage the economy in water use, and to cover the annual maintenance and operation charges.[543] Later in 2002, the policy was again updated, and the principle of cost recovery was modified to recover the full costs of operation and maintenance, along with part of the capital costs, while the economic efficiency was ignored completely. This policy remained loose on water pricing like the Swajal project. [544] This gap was later filled by the National Water Policy 2012, which for the first time introduced water as an economic good by suggesting that water should be charged based on a volumetric basis to meet the objectives of equity, and efficiency, whilst guided by economic principles. It also emphasised the need to set up an independent statutory water regulatory authority to regulate the water pricing mechanism.[545] Besides the National water policy, the National framework bill 2016 also leads the way for essential legislation on water governance including the water pricing policy in Indian states.[546] However, data released by the World Bank and collected during an independent survey for the present study has raised questions on the effective implementation of this water pricing mechanism. According to a study conducted by the World Bank, the extent of cost recovery varies across schemes, but none of them claim to recover even close to 100%, leaving revenue sustainability a challenge for the government. The overall O&M cost recovery in piped water schemes was reported to be about 46%, while in handpump schemes there is hardly any cost recovery. The recovery of O&M cost was relatively higher in community-managed schemes at an average of 71% and lower in government/public utility-managed schemes, at about 21%.[547] Owing to the low recovery of costs, there is a huge subsidy to the rural water supply, estimated to be between 20-30 billion of the totals of Rs. 40 billion. [548] Moreover, according to the independent survey data conducted for the present study in three districts of the state of Punjab, wastage of water is another issue that is causing a threat to water resources. according to the data 77.2% of respondents in Amritsar against 22.8% respondents, 78.8% in Jalandhar against 21.2% respondents, and 73.5% in Ludhiana against 26.5% said people do wastewater (see figure 8). To find answers to what led to the failure of the current water pricing system, the state of Punjab has been used as a case study, and a detailed analysis is provided below:

[543] Section 11 National Water Policy 1987
[544] Section 11 National Water Policy 2002
[545] Section 7 National Water Policy 2012
[546]Section 22 Draft National Water Framework Bill, 2016 DRAFT OF 16 MAY2016
[547] The World Bank (2008), Sustainable Development Unit South Asia Region. Sustainable Development Unit South Asia Region, Review of Effectiveness of Rural Water Supply Schemes in India p.27 available at http://re.indiaenvironmentportal.org.in/files/rws-india.pdf (assessed on 8-7-2021)
[548] UNDP, World Bank, Water and Sanction Programme, Water for India's Poor Who Pays the Price for Broken Promises? Available at https://www.wsp.org/sites/wsp/files/publications/2122007110846_whopaystheprice.pdf (Assessed on 8-7-2021)

5.2.2 Water Pricing Policy in Rural Water Supply Sector in Punjab State:

The concept of water pricing was introduced in the state of Punjab for the first time in 2007. This was a result of the world bank funded Punjab Rural Water Supply and Sanitation Project (PRWSSP), which adopted a sector-wide approach (SWAp) during the period 2007-14. Within the framework of SWAp, community-driven development (CDD) was promoted under which the community was given the responsibility to bear the full cost for construction and management of their water supply systems and to make the systems financially sustainable, with consumers paying for operations and maintenance on an ongoing basis. Since then, the government of Punjab has been following this norm in all its water supply schemes funded both by the PRWSSP and by the GOI's National Rural Drinking-Water Program (NRDWP). [549] Subsequently, the state rural water supply and sanitation policy 2014, was introduced to provide legal support to implement this cost recovery mechanism.[550] Despite introducing the norm of cost recovery, a large number of water supply schemes covered under the SWAp program are suffering due to a lack of revenue sustainability. For example, Of the 1,457 IDA (International Development Association) funded schemes, only 1024 are recovering fully O&M costs, leaving a gap of 433 schemes (30% of the total). [551] Similarly, the data collected from villages for the present study also demonstrated that the cost-recovery of the schemes is low as only 13 villages out of 30 are said to be recovering O &M costs, while the remaining 17 village Gram panchayats claimed to be struggling to recover the costs (table 5).

Table 5 Water Charges, Recovery Rate, And Coverage Of O&M In The Districts Of Amritsar, Jalandhar, And Ludhiana:

Amritsar

	Village Name	water charges (monthly)	Recovery rate by payment received from users	Cover O &M	Do people pay
1.	Baba Bakkala	Rs. 100	20%	No	No
2.	Buter sidiya	Rs. 140	45%	No	No
3.	Cheema batth	Rs. 100	50%	No	No
4.	Kaler Ghuman	Rs.75	Nil	No	No
5.	Kutbewal Arhia	Rs. 70	50%	No	No
6.	Nangli	Rs. 100	92%	Yes	No
7.	Pheruman	Rs. 140	50%	No	No
8.	Rayya	Rs. 100	100%	Yes	Yes
9.	Tathiyan	Rs. 130	35%	No	No
10.	Tong	Rs. 125	100%	Yes	Yes

Jalandhar

[549] Document of The World Bank (Report No: PAD 1174) International Bank for Reconstruction and Development Project Appraisal Document on A Proposed Loan in The Amount of Us$248 million To India for A Punjab Rural Water and Sanitation Sector Improvement Project 2015

[550] Section 3a of the State Punjab Rural Water Supply and Sanitation Policy 2014

[551] Document of The World Bank (Report No: PAD 1174) International Bank for Reconstruction and Development Project Appraisal Document on A Proposed Loan in The Amount of Us$248 million To India for A Punjab Rural Water and Sanitation Sector Improvement Project 2015, p.19

	Village Name	water charges (monthly)	Recovery rate by payment received from users	Cover O &M	Do people pay
1.	Arjanwal	Rs. 100	100%	yes	Yes
2.	Chumo	Rs. 100	100%	Yes	Yes
3.	Chudwali	Meter supply	70%	Hardly	No
4.	Fatehpur	Rs. 100	60-70%	No	No
5.	Gazipur	Rs.105	90%	Yes	No
6.	Jaitewali	Rs. 80	95%	Yes	No
7.	Jandu Singha	Rs. 100	56%	No	No
8.	Kangniwal	Rs. 100	70%	No	No
9.	Maddar	Rs. 125	70- 75%	No	No
10.	Mander	Rs. 100	70%	No	No

Ludhiana

	Village Names	water charges (monthly)	Recovery rate by payment received from users	Cover O & M	Do people pay
1.	Bagga Kalan	Rs. 100	50%	No	No
2.	Bagga Khurd	Rs. 125	90%	Yes	No
3.	Bhatia wait	Rs. 100	40%	No	No
4.	Kapoor Singowal	Rs. 140	90%	Yes	No
5.	Kherawaat	Rs. 90	98%	Yes	No
6.	Maj Phaguwala	Rs. 100	60%	Yes	No
7.	Qadian	Rs. 100	80%	Yes	No
8.	Rajowal	Rs. 120	99%	Yes	No
9.	Rajpura and Hussain Pura	Rs. 100	100%	Yes	Yes
10.	Walipur Kalan	Rs. 80	92%	Yes	No

For any water supply scheme to succeed, revenue sustainability is essential and for this water, rates should be sufficient to cover all the costs incurred since they determine the level of revenues that service providers receive from users. At present, a flat rate is applied in the rural water supply sector to charge for water, [552] except for very few villages that have a metered water supply. Such charges are fixed by both the Gram Panchayats and the Junior Engineer (JE) (as per data provided by the gram panchayats). The Junior Engineer is a part of the government department that works under the control of DWSS, to assist GPs. [553] The reason for their involvement is that the process of transferring water supply schemes to the gram panchayats is still ongoing and therefore some of them are still under the control of DWSS. Generally, the state government issues guidelines for the lower bodies to follow while fixing water rates,[554] but current recovery rates indicate that such rates are fixed without giving any consideration to the costs incurred during water supply. Rates also vary between villages, which indicates the use of discretionary powers by the Gram panchayats as well as by the JE (table 1). To improve the situation in the future, the state government has proposed some measures such as metered water supply and the involvement of water regulatory authorities but applying these measures in

[552] Dajun Shen, V. Ratna Reddy (2016) Water pricing in China and India: a comparative analysis. Water Policy vol 18 (S1) 103–121

[553] State Program Management Cell, Department of Water Supply & Sanitation, Government of Punjab, Revised Final Report - Social Assessment Component Environment & Social Assessment for PRWSS- II Program January 2015, Pp. 64-69

[554] Dajun Shen, V. Ratna Reddy (2016) Water pricing in China and India: a comparative analysis. *Water Policy* vol 18 (S1) 103–121

practice is not an easy task and there is a need to address some challenges to make the system work. These are discussed below:

1. **Water Metred Supply**:

Metering of the water supply has been a topic of discourse for a very long time and the National water policy of 2012 introduced volumetric water charging at the national level.[555] This was later promoted under the National framework bill 2016 [556] At the state level, metered water supply was introduced under the world bank funded project (2007-14), even before the national water policy.[557] Subsequently, the State of Punjab rural water supply policy 2014 was introduced to make the application of metered water supply uniform throughout the state. For this, the state government was required to convert all existing unmetered water connections to metered connections within the next five years from its enactment.[558] However, meter installation in the state has been very slow. According to World Bank data, only 200 out of 840 villages were reported to be covered under the World Bank project by its completion date.[559] independent survey data conducted for the present study has also revealed the slow progress as only 2 villages out of 30 reported they had metered connections and even with the 2 villages with metered connections, only 1 had a metered water supply. For the second village, meters had been installed but had not started working yet. From a policy perspective, the challenge is a lack of penalty provisions in the case of non-compliance. For instance, the State policy 2014 stated the time limit of five years without applying any legal penalty provisions.[560] Consequently, the state has not made the completion of the target a priority and has also failed to ensure that future schemes are implemented with a metered water supply.

2. **Water Regulatory Authority and Water Tariffs:**

A metered water supply is not enough in itself to achieve revenue sustainability or economic efficiency. It also requires a correct setting of water rates, which should reflect the scarcity value of water to ensure water conservation as well as to cover all the costs incurred to ensure an effective and efficient operation and management of the water supply system. If the costs are not covered, the incoming cash flow cannot ensure effective management of the water supply system. The failure of the water supply system will then lead to disruption of water supply[561], as reported by the head of the gram panchayat of the village of Pheruman (Amritsar district), who stated that people had not received water supply for two months before the survey due to the failure of the motor pump (motor pump is used to extract

[555] Section 7 Nation Water Policy 2012
[556] Section 22 Draft National Water Framework Bill, 2016 Draft Of 18 July2016
[557] Ministry of Finance Department of Economic Affairs, The World Bank in India (Document No. 76535) 2013, Metering and Billing Water Use in Rural Punjab, Punjab Rural Water Supply and Sanitation Project
[558] Section 3b Punjab State Rural Water Supply and Sanitation policy 2014
[559] Ministry of Finance Department of Economic Affairs, The World Bank in India (Document No. 76535) 2013, Metering and Billing Water Use in Rural Punjab, Punjab Rural Water Supply and Sanitation Project

[560] Section 3b Punjab State Rural Water Supply and Sanitation policy 2014
[561] Georg Meran, Markus Siehlow, Christian von Hirschhausen, The Economics of Water: Rules and Institutions (1st edn, Spring Water 2021) pp. 125-126

groundwater water to supply the villagers). Such situations lead to dissatisfaction, which in turn is accompanied by a decreasing willingness to pay by consumers, as reported in the survey conducted for the present study. Data from the survey showed that 597 respondents out of 805 said that they were not satisfied with the service. Individual data from the districts are provided below in Figure 7. This has a significant impact on the recovery rate as 25 village Gram panchayats said people do not pay water charges (Table 5).

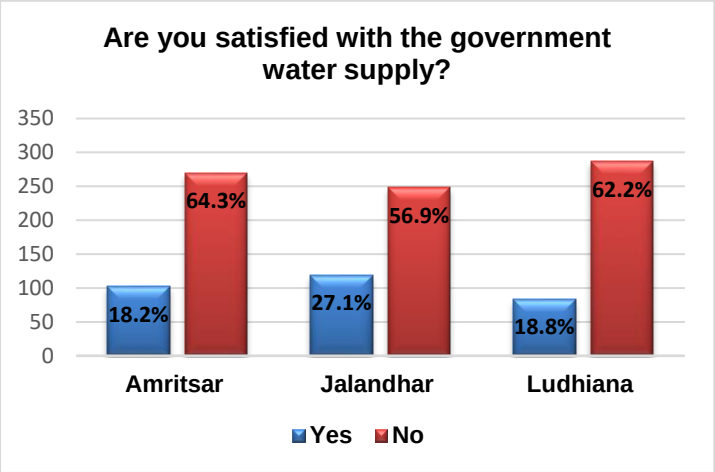

Figure 7 A Satisfactory Attitude of The Domestic Water Users in The State of Punjab:

To deal with fiscal issues arising due to poor water tariffs, the establishment of water regulatory authorities has been promoted in India. The establishment of water regulatory authority laws has been largely provided by policies set out by the central government and conditions precedent explicitly or impliedly set out by the internationally funded agencies (i.e., World Bank) for loan disbursement funded to state governments.[562] The policy push is also evident in the National water policy 2012[563] and the National framework bill 2016.[564] Both strongly encourage the establishment of autonomous water regulatory authorities. Besides that, the Planning Commission of India also played a significant role in encouraging states to establish water regulatory authorities by proposing recommendations from time to time. For instance, the 13th Finance Commission, recommended access to central government funding to the states upon the establishment of the water regulatory authority (WRAs) by them.[565] The 14th Finance Commission suggested bringing all the established WRAs into an operational mode to regulate the pricing of water independently and judiciously.[566] As a result, the Government of Punjab introduced the Punjab Water Resources (Management and Regulation) Act, 2020, to establish the Punjab Water Regulation and Development Authority (PWRDA) in the state.[567] However, their role in

[562] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04
[563] Section 7 of National Water Policy 2012
[564] Section 22 Draft National Water Framework Bill, 2016 Draft Of 18 July2016
[565] Finance commission, chapter 12 "Grants in aids" in Reports of the 13th Finance commission (2010-2015) p.216 (para 12.58) available at
http://fincomindia.nic.in/writereaddata%5Chtml_en_files%5Ctfc/Chapter12.pdf (assessed on 10-8-2021)
[566] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi
[567] Section 3 of the Punjab Water Resources (Management and Regulation) Act, 2020 (Act 2 of 2020)

the water pricing system is subject to several challenges that need to be addressed. for instance, the Authority presently proposes to issue tariff orders specifying the charges to be imposed by entities supplying water for industrial and commercial use, while the charges for drinking water supply shall be as per the policy of the state Government as notified from time to time.[568] This implies that this institution is technically separate from the government, but in practice continues to be controlled by the government.[569] The challenge with government control is that sometimes they prefer to serve their political interest above anything else. An example of this is the application of a flat rate for water in the state of Punjab, which was supposed to be set up as per the state government guidelines but failed to recover the financial cost that occurred to maintain the drinking water supply system. Therefore, to ensure the effectiveness of water regulatory authorities, freedom from political interference is among the key factors.

Another key function of the authority under this act that is a matter of concern is the principle of cost recovery. The price charged in theory includes recovery of capital, operation, and maintenance costs, as well as any costs born due to water extraction, supply costs, etc. The Punjab Water Resources (Management and Regulation) Act, 2020 has been very vague in defining what costs need to be recovered by water rates. It has on the contrary stated that water tariffs should be based on sustainability.[570] the problem here remains as there is no reference to costs to be covered under the cost recovery principle. Besides the Act of 2020, the State of Punjab rural water policy 2014, also needs to be modified. Since the policy has also defined only capital cost recovery while with other costs it has stated that rates should be enough to ensure the sustainable management of the assets.[571] In addition, to bring reform at the national level, the National water Policy 2012, and National framework bill 2016 also require reconsideration. The National water policy 2012 has encouraged the connection between the water rates and economic principles but failed to recognise the necessity to elaborate on the cost recovery principle such as reference to the costs to be recovered.[572] While the National framework bill 2016 has promoted the full cost recovery principle by adopting a graded pricing system with different water rates depending on the income of the users. Nevertheless, it failed to mention what costs need to be recovered under this principle.[573] These policy-related gaps need to be fixed to improve revenue sustainability and economic efficiency because, in the continuation of these policy gaps, the authorities in charge will continue charging for water the way they are doing now and will not improve revenue sustainability and economic efficiency in the future. As a result, the water supply system will continue to suffer and the threat of the mismanagement/wastage of water resources will remain the same.

[568] Section 17(1) of the Punjab Water Resources (Management and Regulation) Act, 2020 (Act 2 of 2020)
[569] Ibid
[570] Section 17(4) of the Punjab Water Resources (Management and Regulation) Act, 2020 (Act 2 of 2020)
[571] Section 3a Punjab State Rural Water Supply and Sanitation Policy 2014
[572] Section 7.2 National Water Policy 2012
[573] Sec 22(d) Draft National Water Framework Bill, 2016, Draft of 18 July2016

5.3 Economic Efficiency and Water Rates:

Water pricing is an important way of encouraging users to conserve scarce water resources and control the wastage of water.[574] The price which accurately reflects water's economic, or scarcity value gives information to users, which they use to make choices regarding water consumption and use. Thus, water pricing can affect water use efficiency, at both the individual and social levels.[575] the central government has always been very conscious of this matter and its example can be seen in the very first National water policy of 1987, which stated that water rates should be such as to convey the scarcity value of the water resource to the users and to foster the motivation for the economy in water use.[576] Subsequently, the National water policy 2012 introduced consumption-based tariffs that incentivise conservation and minimise the wastage of water.[577] In addition, the National framework bill 2016 has promoted volumetric pricing on economic principles to stop wastage. [578] At the state level, the Punjab rural water supply policy 2014 has followed the same principle as promoted in the National water policy 2012 and Bill 2016.[579] However, in practice not much has changed during all these years when it comes to valuing water. This is illustrated by the current flat-rate water charging system in the state of Punjab, which does not provide any incentive to consumers to economize on water use since each additional cubic meter of water comes free of charge[580] and has led to the wastage of water resources. Indeed, the present study found that it was widely perceived that people wastewater under the current system (Figure 8).

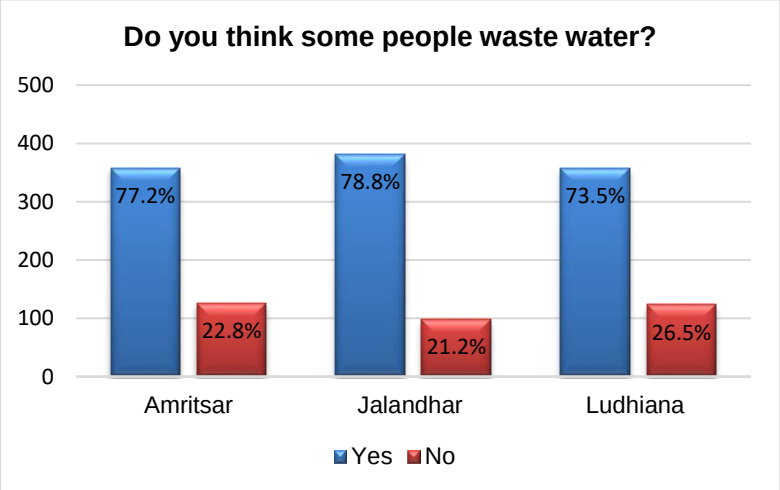

Figure 8 Wastage of Water by Domestic Users in Villages Comes Under Three Districts in The State of Punjab:

[574] Ariel Dinar Ashok, Water Pricing Experiences: An International Perspective: No.386. (World Bank Technical Paper) 1997, p. VII, available at https://documents1.worldbank.org/curated/en/580151468768597034/pdf/multi-page.pdf (assessed on 5-6-2021)
[575] Ibid
[576] Section 11 National Water Policy 1987
[577] Section 7.1, 7.2 National Water Policy 2012
[578] Sec 22 Draft National Water Framework Bill, 2016, Draft of 18 July2016
[579] Section 3b Punjab State Rural Water Supply and Sanitation Policy 2014
[580] Singh. Mamata, Upadhyay, V, Mittal, Atul. (2005) Water Tariff Structure and Reform Needs for Socio-Economic Sustainability in India (eds Raymond Walton) Impacts of Global Climate Change (American Society of Civil Engineers Copyright, 2005)

This discussion shows the negligence on the part of the government despite having evident policy push and the need for the government to change its attitude and implement the policy to improve the situation in the near future. Besides this, another issue that is of concern is the water pricing mechanism proposed under the water supply schemes. In practice, drinking water supply programs for instance NRDWP 2013 mainly focus on raising revenue to ensure the sustainability of water availability in terms of potability, adequacy, convenience, affordability, and equity on a sustainable basis, and do not charge water as a resource. [581] This means no consideration is paid to the scarcity value of water under the centrally and externally funded water supply schemes. This, therefore, requires the attention of the central government as well as other funding agencies to review its focus while introducing water supply schemes and shifting its focus from water as a social good to socio-economic good.[582]

5.4 Application of the Principle of Affordability/ Equity:

The principle of equity is another significant component of water pricing policy and is required to ensure the water supply service to those with low incomes and to achieve the goal of water as a social good.[583] In theory, equity is linked to poverty and discrimination in access to water and the need for preferential measures to ensure that the poorest and weakest are not further deprived because of their socio-economic conditions. [584] When it comes to India, poverty and the weakest/ disadvantaged sections of society are measured by using the caste system criteria set out under the Indian Constitution. The constitution of India has divided people into four categories namely Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Class (OBCs), and General caste. [585] The SCs and STs are those who are socio-culturally, and economically excluded, and discriminated against due to caste, [586] while the OBCs is a collective term used for people who are economically and socially disadvantaged and face or may have faced discrimination on account of their birth.[587] On the contrary, those who do not fall under SCs, STs, and OBCs come under the General caste such as Hindus, jat Sikh, etc. [588] Today, caste hierarchy remains a major feature of village life throughout India[589] and is the main criteria promoted under the National Rural Drinking Water Supply Programme (NRDWP) to grant subsidies in the rural drinking water supply sector without considering financial income.[590] in compliance with this centrally sponsored program, the state of Punjab has introduced its state rural

[581] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Programme Guidelines 2013
[582] ibid
[583] Georg Meran, Markus Siehlow, Christian von Hirschhausen, The Economics of Water: Rules and Institutions (1st edn, Spring Water 2021) pp. 124-128
[584] M Galanter, Competing Equalities --- Law and the Backward Classes in India (Berkeley: UC Press, 1984)
[585] All Caste List in India 2022 | Central Caste List of SC, ST, OBC & General, available at All Caste List in India 2022 | Central Caste List of SC, ST, OBC & General - All Caste List (assessed on 30-8-2021)
[586] United Nations in India Scheduled Castes and Scheduled Tribes, available at https://in.one.un.org/task-teams/scheduled-castes-and-scheduled-tribes/(assessed on 30-8-2021)
[587] Define Backward class? Available at https://www.toppr.com/ask/en-gb/question/define-backward-class/ (Assessed on 30-8-2021)
[588] All Caste List in India 2022 | Central Caste List of SC, ST, OBC & General, available at All Caste List in India 2022 | Central Caste List of SC, ST, OBC & General - All Caste List (assessed on 30-8-2021)
[589] Dennis B. McGilvray, Paraiyar Drummers of Sri Lanka: Consensus and Constraint in an Untouchable Caste, 10 AM. ETHNOLOGIST 97 (1983) (arguing that upper castes and lower castes share similar views about the ideological underpinnings of the caste system); Ashutosh Varshney, Is India Becoming More Democratic? 59 J. ASIAN STUD. 3 (2000) (arguing that politics in South India is increasingly caste-based)
[590] Ministry of Drinking Water & Sanitation Government of India, National Rural Drinking Water Supply Programme Guidelines 2013

water supply policy 2014 which stated that subsidies should be granted to those who are underprivileged, belong to scheduled castes, and persons residing in economically backward and other special areas (such as villages along the international border, the Kandi area of Punjab, and water-logged areas, etc.), without giving due consideration to the financial status of users in general.[591] The application of this policy was also confirmed by the data collected from three districts of the state of Punjab (namely Jalandhar, Ludhiana, and Amritsar) for the present study. The head of each village gram panchayat surveyed said that they provide free water to some houses in the village, mainly to those who belong to SCs or OBCs since they are considered poor, and weakest compare to the general caste, without considering their financial income or ability to pay the bill. In very exceptional cases this also applied to the General Caste (depending on their discretion). The validity of this data was further confirmed by the data collected from the domestic users from all ten villages surveyed that came under these three districts. As depicted in figure 9, 62 respondents belonging to SCs out of 326 and 44 belonging to OBCs out of 315 of the totals from three districts said that they receive free water while all the users belonging to the general caste reported paying for the water supply.

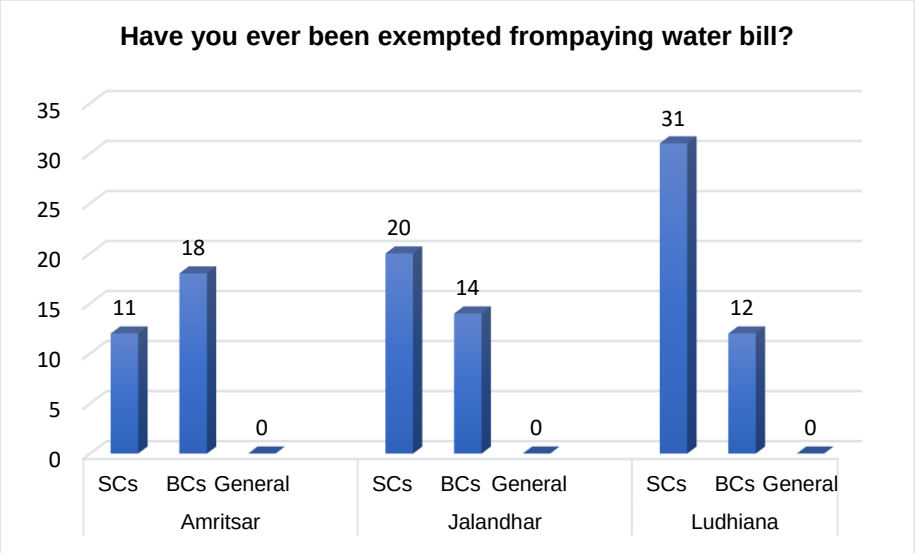

Figure 9 No. of People Exempted from Paying for Water in The State of Punjab

The problem with granting subsidies based on the caste system is that it has brought more inequities and does not align with the term equality, once promoted under the Indian constitution, to abolish the social inequalities associated with the caste system. [592] For instance, the majority of the Jat Sikh community in the state of Punjab are farmers and are considered a higher caste owing to both their demographic preponderance and the wealth and status associated with their large landholdings since the colonial period. After independence, this community was further financially strengthened as a result of the high agricultural productivity brought by the Green Revolution.[593] However, this success did not

[591] Section 3a State Punjab Rural Water Supply and Sanitation Policy 2014
[592] Scott Grinsellt, Caste and the Problem of Social Reform in Indian Equality Law, The Yale Journal of International Law, Vol. 35 (199)
[593] Judge, P. S. (2015). Caste Hierarchy, Dominance, and Change in Punjab. *Sociological Bulletin* vol *64*(1), 55–76

last long due to several factors, including land reorganisation, agricultural change, caste reservation, urbanization, etc.[594] Today, jat Sikh farmers in the state are struggling to survive and nearly 89% of farmers are under huge government debts.[595] To be precise, there is a USD 13,466.25 debt per farm household in the state, while the average income of a farm household is USD 8,079.75. it is important to note that the reported income is of those jat farmers who own more land and are considered big farmers, while the income of small, marginal, semi-medium jat farmers who own small land is even lower.[596] However, because jat Sikh farmers are considered higher caste, they are not entitled to be covered under OBCs, and consequently not entitled to get any subsidy on water rates. To improve the situation in the future, the government of Punjab needs to modify its existing rural water supply policy and bring the criteria of financial income to establish the principal equity. A similar approach needs to be adopted by the central government while introducing national water supply drinking policy programs. Moreover, to make this reform at the national level, the National water policy 2012[597] and the National framework bill 2016[598] need to be modified accordingly. Since both these documents have emphasised applying the principle of equity while introducing the water pricing system but failed to elaborate on the criteria to be followed to implement this principle in practice. In other words, no clear link between the concept of equity and the financial income of the users has been defined.

5.5 Conclusion:

The analysis in this chapter has shown that the recognition of the economic value of water calls for the introduction of the pricing of all water services. The only qualification is the consideration of the need of the poor and vulnerable people. The issue of the basic needs of the poor and vulnerable is thus conceived within the new definition of water as a good which qualifies water as a "social and economic good." To achieve the balance between the socio-economic value of water, four basic pillars including revenue sustainability, economic efficiency, environmental sustainability, and Equity are essential for any water pricing policy. However, the reform introduced in the rural drinking water supply sector in India as a result of water supply scheme guidelines and legislative policy framework has not been able to achieve a balance between these four basic pillars. The drinking water supply policy has focused on revenue sustainability while other issues such as economic efficiency and environmental sustainability are paid no consideration. Even with revenue sustainability, the focus is placed merely on the recovery of O&M costs, and a few percentages of capital cost. This shows that water is not charged as a resource and the concept of pricing water promoted under the drinking water supply program is based more on social factors than costs based on the economic value of water. The problem is further aggravated by the existing water rates system, which does not ensure revenue sustainability, although reform has

[594] N. Mooney (2013) The Yeoman Jats of Punjab: Time, Expertise and the Colonial Construction of Jat Sikh Identity, Anthropologica Vol. 55 (2) 277-290
[595] The Indian Express, Anuj Agnihotri, Chaba, Debts due to poor income, suicide, high interest loans - Punjab farmers don't paint a rosy picture, updated on 21st January 2021 available at https://indianexpress.com/article/india/punjab-farmers-loans-debt-income-suicide-7155446/ (assessed on 31-8-2021)
[596] ibid
[597] National Water Policy 2012
[598] Draft National Water Framework Bill, 2016, Draft of 18 July2016

been introduced in the form of metered water supply and the establishment of WRAs to address these issues. However, it requires the state government to introduce strict penalty provisions to implement metered water supply across the states. Secondly, there is a need to revise the existing Water Regulatory Authority Act 2020. This revised Act must include provisions to recover all the costs incurred during water supply, to ensure revenue sustainability while addressing the issues of economic efficiency, environmental sustainability as well as equity. Moreover, further provision is required to ensure the water regulatory authorities are required and empowered to work as independent authorities with free government control. Concerning the National Water Policy and National Framework Bill, both need revisions. Both need to supply detailed costs which should be included while fixing consumption-based water rates. Since both are significant documents. Where National Water Policy works as a guiding principle in the water sector, on the other hand, an act is an umbrella statement to guide the states.

Last but not least the principle of affordability/equity. It is highlighted based on findings that the existing caste system which has been dominating the water sector when it comes to applying subsidies needs to be reviewed and both the national policy, as well as state policy, should include the consideration of the financial ability to pay while applying the principle of equity.

Chapter 6

Analysis of Urban Water Pricing in India

6.1 Introduction:

This chapter examines the water pricing mechanism implemented in India's urban water supply sector. The urban water sector is considered one of the biggest water consumers and pollutants in India.[599] The population growth in this sector was recorded to be around 285 million in 2001, whereas in 2011 the growth rate rose to 377 million.[600] The rise in population has not only increased the water demand but has also increased the wastewater rate due to the mismanagement of water.[601] It has been reported that presently from 15 to 135 L/per person/day water is wasted and therefore causing critical challenges for water managers in the sector.[602] To improve the efficiency of water management, the concept of water pricing has been promoted both at the international and national levels (chapter 5). Following this notion, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) 2005 introduced the concept of water rates in the urban water supply sector. This program mainly focused on introducing the cost recovery principle through appropriate user charges.[603] Later this program was replaced with the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015, to extend its application to towns having a population of 100,000 and more. [604] Besides these central government funding schemes, the principle of full cost recovery was also promoted under the 9th five-year plan of India (1997-2002) to enhance the financial viability of Urban Local Bodies (ULBs).[605] In addition, the National Water Policy also introduced other essential components such as economic efficiency, equity along with cost recovery principles (chapter 5). Thus, based on these policy guidelines, today, the urban sector has a full-fledged water pricing model which the state governments implement in different tariff structures.[606] In addition, a subsidy is another significant component of the water pricing system in the urban sector. Roughly Rs. 12 billion goes to urban water systems as subsidies to ensure affordability and equality by providing water to the disadvantaged and poor people who cannot afford the actual cost

[599] Niti B. Jadeja, Tuhin Banerji, Atya Kapley, Rakesh Kumar (2022) Water pollution in India – Current scenario, Water Security, Vol 16

[600] Nathaniel B Dkhar, Qazi Syed Wamiq Ali, (2018) India's rampant urban water issues and challenges the energy and research institute (TERI)

[601] Census 2011 (assessed on 20-7-2021) Available online: https://censusindia.gov.in/2011-3. common/ censusdata2011.html

[602] Niti B. Jadeja, Tuhin Banerji, Atya Kapley, Rakesh Kumar (2022) Water pollution in India – Current scenario, Water Security, Vol 16

[603] Frederick Lee, Veena Aggarwal, James Nickum; (2016) Urban domestic water pricing in India and China. *Water Policy* vol 18 (S1): 68–82

[604] Ministry of Housing and Urban Affairs, Government of India, Atal Mission for Rejuvenation and Urban Transformation

[605] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report

[606] Government of India. 2005. Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas, National Institute of Urban Affairs, Govt. of India, New Delhi

of water.[607] However, despite these efforts, the current water pricing system in the cities has failed to achieve any of its objectives.[608] Poor revenue sufficiency has rendered most of the water utilities in the cities financially unsustainable leading to inefficient delivery of service.[609] In addition, economic efficiency and equity also suffer since the current tariff structure is not suitably designed to accomplish these objectives.[610]

This chapter will critically analyse the water pricing mechanism adopted in the urban sector to find the reasons for such reported failure. For this purpose, the three most adopted methods namely Connection fee, Water tax, and IBT[611], have been used as a case study to understand the underlying principles, followed to adopt these tariff structures and the extent to which they contribute to cost recovery, economic efficiency, equity, and fairness. Moreover, a critical analysis of the policy framework has been conducted under which each water tariff structure has been developed to highlight the gaps in each legislative framework and how they have contributed to the failure of these methods. Suggestions have been made accordingly to improve the current water tariff structure from a legal point of view. To analyse these three methods, three different locations have been selected. To analyse the Connection fee method, the focus has been placed on the state of Punjab. To scrutinise the effectiveness of the policy framework developed by the state government, the policy analysis is conducted against the data collected from three cities namely Jalandhar, Ludhiana, and Amritsar from the state of Punjab. Overall, the cities represented in the sample have an aggregate urban population of 1,161,171 (Jalandhar), 2,069,708 (Ludhiana), 1,334,611 (Amritsar), of the total urban population in the state of Punjab 1,03,99,146.[612] While for water tax and IBT, literature-based research has been conducted by focusing on the cities of Ahmedabad (state of Gujarat) and Delhi (capital of India). One of the main reasons for focusing on these two cities is firstly due to the availability of online data and secondly because both are major metropolitan cities in India. Ahmedabad is the seventh-largest city in India with a total population of 5.5 million[613], while Delhi is the capital of India with a total urban population of 1,63,68,899 [614] therefore, they are a good representative of the rest of Indian cities.

[607] UNDP, World Bank Water and Sanction Programme, Water for India's Poor Who Pays the Price for Broken Promises? Available at https://www.wsp.org/sites/wsp/files/publications/2122007110846_whopaystheprice.pdf (Assessed on 10-11-2021)
[608] Singh. Mamata, Upadhyay, V, Mittal, Atul. (2005) Water Tariff Structure and Reform Needs for Socio-Economic Sustainability in India (eds.) Raymond Walton, Impacts of Global Climate Change (American Society of Civil Engineers Copyright, 2005)
[609] Patwardhan, S.S. (1993). Financing Urban Water Supply Scheme. Journal of IWWA, Oct –Dec 1993
[610] Singh. Mamata, Upadhyay, V, Mittal, Atul. (2005) Water Tariff Structure and Reform Needs for Socio-Economic Sustainability in India (eds.) Raymond Walton, Impacts of Global Climate Change (American Society of Civil Engineers Copyright, 2005)
[611] Ibid
[612] Census Report of India 2011availeb at
Population finder | Government of India (censusindia.gov.in) (Assessed on 12-11-2021)
[613] Ahmedabad, the joyless city Published Mar 15, 2014) (Updated Apr 8, 2019) available at
Ahmedabad, the joyless city (deccanchronicle.com) (Assessed on 12-11-2021)
[614] Census Report of India 2011availabe at
Population finder | Government of India (censusindia.gov.in) (Assessed on 12-11-2021)

6.2 Development of Water Pricing Policy in Urban Domestic Sector in India:

Reform in the urban water supply sector was introduced in the 1990s as a result of centrally sponsored water supply schemes. In the absence of any comprehensive national law to deal with urban water supply, the Ministry of Urban Development has adopted policies and programs that include an urban water supply component. The two-fold objectives of the Accelerated Urban Water Supply Programme (AUWSP), launched for the first time during 1993-1994, were to adopt appropriate and cost-effective technologies to provide safe and adequate drinking water supply for towns having a population of less than 20,000. The second Scheme introduced in the same year aimed to provide project-related finance for urban infrastructure, including water supply, in five metro cities: Mumbai, Kolkata, Chennai, Bangalore, and Hyderabad.[615] Both these policies were later summoned up into Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT) under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) with effect from 2005-06.[616] This project for the first time introduced the principle of full cost recovery of operational costs through appropriate user charges.[617] In 2015 this program was replaced with the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) to extend its application to towns with a population of 100,000.[618] Besides these central government funding schemes, the principle of full cost recovery was promoted under the 9th five-year plan of India (1997-2002) to enhance the financial viability of Urban Local Bodies (ULBs).[619] In addition, the National Water Policy also introduced other essential components such as economic efficiency and equity along with the cost recovery principle (as discussed in chapter 5). As a result of these efforts, the urban sector has, in principle, a water pricing system that contains all the essential components except environmental sustainability.

However, the existing water pricing mechanism has not been able to achieve any of the four objectives (defined in chapter five) in practice.[620] The cost recovery in the urban sector is very low to even cover the operational costs. Poor revenue collection is further aggravating the lack of funds, poor maintenance, poor service coverage,[621] unreliable water supply service, and poor governance.[622] Moreover, economic efficiency also suffers since the current tariff mechanism is not suitably designed to accomplish this objective.[623] Further, despite having large subsidies, it comes nowhere near to achieving the affordability and equity principle put forward by the National Water Policy and National Framework law. The same policies that are designed to help suppliers to provide water at an affordable

[615] Environmental Law Research Society (ELRS) A Prime on Water Law and Policy in India, 2012 available at https://www.academia.edu/27155595/A_PRIMER_ON_WATER_LAW_AND_POLICY_IN_INDIA (assessed on 15-11-2021)
[616] Indian Water Policy at the Crossroads: Resources, Technology and Reforms, (eds) Vishal Narain, Annasamy Narayana Moorthy, Global Issue in Water Policy 16 (1st edn springer 2016) P.55
[617] Frederick Lee, Veena Aggarwal, James Nickum; (2016) Urban domestic water pricing in India and China. *Water Policy* vol 18 (S1): 68–82
[618] Ministry of Housing and Urban Affairs, Government of India, Atal Mission for Rejuvenation and Urban Transformation
[619] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report
[620] Singh. Mamata, Upadhyay, V, Mittal, Atul. (2005) Water Tariff Structure and Reform Needs for Socio-Economic Sustainability in India (eds.) Raymond Walton, Impacts of Global Climate Change (American Society of Civil Engineers Copyright, 2005)
[621] Ibid
[622] Saleth, R. and A. Dinar. 1997. 'Satisfying Urban Thirst: Water Supply Augmentation and Pricing Policy in Hyderabad City, India', Technical Paper No. 395, World Bank
[623] World Bank, 2011, Cost Recovery in Urban Water Services: Select Experiences in Indian Cities', Water and Sanitation Program, The World Bank

rate to the poor have resulted in poor operation and maintenance of the water supply system due to financial failures that led to the situation where they provide minimal service to the poor, and inadequate service to everyone else.[624] At the national level, the main reason for pricing mechanism failure in the urban sector is that water prices are based on socio-political considerations and are not determined based on economic principles.[625] This is because the focus of the JNRUM remained on availing water utilities of central government funding but nothing more.[626] Another challenge that occurs from the nationally funded scheme is its focus is solely on the recovery of operational costs, but no consideration is paid to the capital cost.[627] To further investigate the application of the water pricing system at the state level, a detailed analysis of three tariff systems is provided below.

6.2.1 Existing Tariff Structure:

Water is a state subject, as a result, water pricing remains highly political and under the direct control of the state government.[628] State governments generally select water tariff structures for water supply and prescribe minimum tariffs for municipal bodies of various categories, and ULBs then have the option to set the tariff above this specified minimum level in order to recover costs subject to state government approval. As a result, the water pricing structure in urban India is highly complex and varies substantially across states.[629] Normally, the urban water pricing structure is classified into volumetric and non-volumetric methods due to the relatively low coverage of metering.[630] Based on these criteria, different types of instruments are generally used when charging for water. A volumetric method is based on the quantity of water consumed and hence requires a water metering facility. Volumetric tariffs could either be a uniform metered tariff or an increasing block tariff (IBT). A uniform metered tariff is a single rate per kilolitre of water for the entire quantity of water consumed per month, applied uniformly to all consumers regardless of the amount consumed.[631] On the other hand, increasing block tariffs (IBT) is a slab system and charges are lower for lower levels of consumption (i.e., blocks) and higher for high levels of consumption (higher block).[632] While A non-volumetric flat rate is usually charged in the absence of metering wherein the monthly water bills are independent of water consumed. Two types of instruments are generally used in such cases where a flat rate is used. The first is a connection fee or a fixed access fee, with a charge based on the size of the plot or holding or the size of the connection

[624] UNDP, World Bank Water and Sanction Programme, Water for India's Poor Who Pays the Price for Broken Promises? Available at https://www.wsp.org/sites/wsp/files/publications/2122007110846_whopaystheprice.pdf (Assessed on 15-11-2021)
[625] Shukla, Rashmi, Nayak, Sanatan. (2014) Urban Water in India: Pricing and Challenges, Review of Development and Change vol.19(1) 93-108
[626] Frederick Lee, Veena Aggarwal, James Nickum; (2016) Urban domestic water pricing in India and China. *Water Policy* vol 18 (S1): 68–82
[627] Ibid
[628] Government of India. 2005. Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas, National Institute of Urban Affairs, Govt. of India, New Delhi
[629] Water and sanitation program, PPIAF, World Bank Institute, Water Tariffs & Subsidies in South Asia, A Scorecard for India, December 2002 available at World Bank Document (assessed on 17-11--2021
[630] Tsur, Y, Water Regulation via Pricing: The Role of Implementation Costs and Asymmetric Information', in Ariel Dinar (eds), The Political Economy of Water Pricing Reforms, (Oxford University Press, New York 2000)
[631] Government of India 2005 Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas, National Institute of Urban Affairs, Govt. of India, New Delhi
[632] Shukla, Rashmi, Nayak, Sanatan (2014) Urban Water in India: Pricing and Challenges. Review of Development and Change Vol 19(1) 93-108

and ferrule, or a combination of these.[633] The second one is a water tax typically generated based on the value of the concerned property.[634]

6.3 Application of the Connection Fee Method in The State of Punjab:

The Punjab Water Supply and Sewerage Board is a statutory body set up under the Punjab Municipal Corporation Act of 1976 to ensure the development, regulation, and control of the drinking water supply and sewerage services in the urban areas of Punjab. The Board essentially works for preparing, executing, promoting, and financing the water supply and sewerage schemes,[635] as well as fixing water rates. [636] In addition, the Municipal corporations, also known as ULBs, established in line with the 74th constitutional amendment Act 1994 deal with the construction and maintenance of works for supplying water for public and private purposes.[637] The state government of Punjab has introduced a connection fee method to implement a water pricing system in the state.[638] Currently, water is charged at two rates depending on the size of the plot. According to the survey undertaken for the present study, the Municipal Corporation (MCs) in Jalandhar city has fixed the water and sewage rate at the price of Rs. 210 a month for plot sizes from 5-10 Marla (126-252 m^2) and Rs. 280 a month for plot sizes from 10-20 Marla (252-506 m^2). While in the cities of Ludhiana and Amritsar water and sewage prices are charged at the rate of Rs. 105 a month for plot sizes from 5-10 Marla and Rs. 140 for plot sizes from 10-20 Marla (see table 6). The reason for the variation in water rates is that MCs are fully empowered to fix and revise their water charges under section 95 of the Act 1976, and section 97 of the Punjab Municipal Council Act 1911.[639]

Table 6 Water Tariff Criteria Followed to Set the Water Rates in the State of Punjab:

[633] T.E.R.I. 2010. Review of Current Practices in Determining User Charges and Incorporation of Economic Principles of Pricing of Urban Water Supply, Project Report No. 2009\ A02, Ministry of Urban Development, Govt. of India
[634] Shukla, Rashmi, Nayak, Sanatan (2014) Urban Water in India: Pricing and Challenges. Review of Development and Change Vol 19(1) 93-108
[635] Punjab Water Supply and Sewerage Board, available at https://pwssb.punjab.gov.in/profile/ (assessed on 21-11-2021)
[636] No. 3/3/21-1 lg3/352/1, Government of Punjab Department of Local government, Chandigarh, the 14th of February 2021, available at http://lgpunjab.gov.in/upload/uploadfiles/files/Water%20-%20Municipal%20Corporations-water%20_1_.pdf (assessed on 24-11--2021)
[637] Section 44 of the Punjab Municipal Corporation Act, 1976 Punjab Municipal Corporation Act, 1976 Punjab Act 42 of 1976
[638] Om Prakash Mathur Sandeep Thakur, Urban Water Pricing Setting the Stage for Reforms, 2003 National Institute of Public Finance and Policy New Delhi
[639] No. 3/3/21-1 lg3/352/1, Government of Punjab Department of Local government, Chandigarh, the 14th of February 2021, available at http://lgpunjab.gov.in/upload/uploadfiles/files/Water%20-%20Municipal%20Corporations-water%20_1_.pdf (assessed on 24-11--2021)

Plot Size	Jalandhar City	Ludhiana City	Amritsar City
Up to 5 Marla	Free	Free	Free
5 -10 Marla	210	105	105
10- 20 Marla	280	140	140
Over One Kanal	metred connection	metred connection	metred connection

The problem with such a tariff structure is that it has been unable to achieve any of the four objectives set by the water pricing policy. The current water charges for instance do not satisfy the cost recovery objective. [640] One of the reasons for the current tariff structure's failure to achieve revenue sufficiency is its link to the size of the plot or pipe etc. This suggests that water rates have no link to the costs incurred during water supply. Due to this, only 20-30% of the cost of water supply and sewage removal is reported to be recovered in the state, while the remaining 70-80% of O&M expenses are subsidised through the general budget of the ULBs, according to the data revealed by the government of Punjab.[641] Moreover, another challenge is the weak recovery collection mechanism. According to the data collected from the Municipal Corporation of Jalandhar City, only 40-50% of water rates are recovered. In comparison, in Ludhiana, it was reported to be nearly 65% and Amritsar Municipal Corporation claimed to recover only 60%. All three municipal corporations said they failed to recover the operation and maintenance costs. This adds a substantial burden on the government budget since approximately 69% of the annual revenues of the Municipal Corporations come through grants from its goods and services tax (GST) receipts from the state government. In this way, their own revenues and government grants are used to subsidise water supply O&M costs.[642] Owing to high investments and subsidies in water supply and sewerage services, the ULBs are not able to spend as much on other services like waste management and the environment, etc.[643]

From an equity perspective, this tariff structure fails as this tariff system do not currently differentiate between the poor and rich water users.[644] Though an exemption is granted based on the size of the plot (Table 6). A notification issued by the state government in 2006, under section 157 of the Punjab Municipal Corporation act 1976, read along with section 19 of the Punjab General clauses act,1898 has exempted all households having a plot area up to 5 Marla (126 m^2) from payment of water and sewerage charges and any pending arrears.[645] The problem with the such exemption is that it has been granted

[640] ibid
[641] ibid
[642] ibid
[643] Ibid
[644] No. 3/3/21-1 lg3/352/1, Government of Punjab Department of Local government, Chandigarh, the 14th of February 2021, available at http://lgpunjab.gov.in/upload/uploadfiles/files/Water%20-%20Municipal%20Corporations-water%20_1_.pdf (assessed on 24-11--2021)
[645] Government of Punjab Department of Local Government, Notification No.8/22/06-ILG-IV/3398, 11th of July 2006

based on the size of the plot without considering the financial situation of the residents/ occupiers.[646] This therefore cannot be considered the grant of subsidy on a fairness basis/ equity basis.

As far as the economic efficiency principle is concerned, charges based on a connection fee do not provide any incentive to consumers to economise on water use since water charges are the same irrespective of how much water is consumed, resulting in significant wastage.[647] An example can be seen in the state of Punjab, where the survey reveals that nearly 66% of the respondents in Amritsar City, 87% in Jalandhar, and 58% in Ludhiana said that people waste water by leaving their taps on (see figure 10). This has led to the situation in the state where the Municipal Corporations are currently pumping much more water than the prescribed norms of per capita water per day due to this wastage. [648] This results in higher costs and, critically, depletion of groundwater, whilst the increased wastewater produced contributes to the pollution of rivers and other water bodies. Moreover, if the consumers keep wasting water and drawing water indiscriminately, the water supply system will not be able to keep up with the increasing demand, which may result in insufficient water and subsequent intermittent water supply. Intermittent supply leads to water rationing and causes water contamination due to negative pressure and weakening of the distribution system.[649]

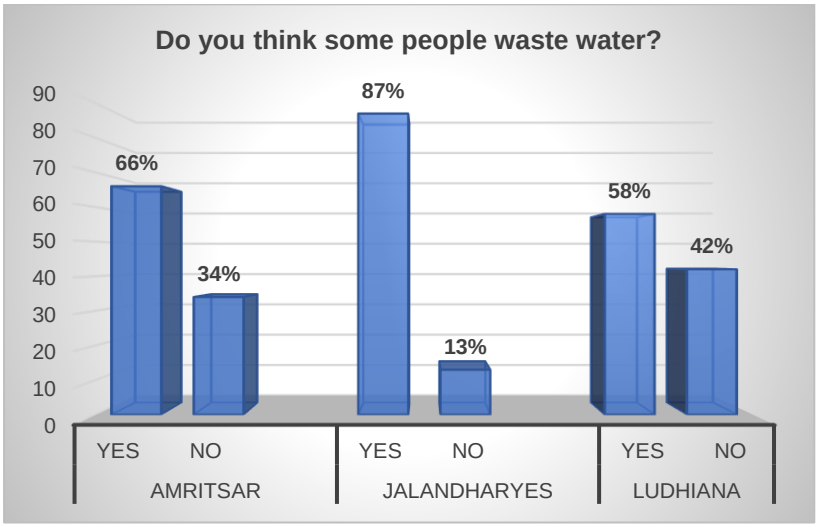

Figure 10 Wastage Of Water By Domestic Users In Three Major Districts In The State Of Punjab:

The analysis of the Punjab Municipal Corporation Act of 1976 has highlighted some policy gaps that need to be addressed to improve the situation in the future. Firstly, the Act of 1976 has provided

[646] No. 3/3/21-1 lg3/352/1, Government of Punjab Department of Local government, Chandigarh, the 14th of February 2021, available at http://lgpunjab.gov.in/upload/uploadfiles/files/Water%20-%20Municipal%20Corporations-water%20_1_.pdf(assessed on 24-11--2021)

[647] Brocklehurst, C., Pandurangi, A, Ramanathan, L. (2002). Tariff Structure in Six South Asian Cities. Water Tariff & Subsidies in South Asia, Paper 3 December 2002

[648] No. 3/3/21-1 lg3/352/1, Government of Punjab Department of Local government, Chandigarh, the 14th of February 2021, available at http://lgpunjab.gov.in/upload/uploadfiles/files/Water%20-%20Municipal%20Corporations-water%20_1_.pdf(assessed on 24-11--2021)

[649] ibid

provisions to adopt water tax as a method instead connection fee.[650] However, the state government on the contrary has adopted a connection fee which indicates direct bureaucratic control and political interference. Secondly, the proposed method of water tax in the Act has also no link to cost recovery, economic efficiency, environmental sustainability, and equity principle. Since the rate is fixed based on the percentage of the property.[651] This indicates that the state government recognised water as asocial good and is yet to acknowledge the economic value of water. to improve the situation in the future, the Act of 1976 needs to be modified to introduce volumetric water supply and provide clear provisions regarding the cost recovery principle such as a detailed description of the costs to be covered to ensure revenue sustainability. In addition, water rates should be such to recognise the scarcity value of water to control water wastage. Furthermore, regarding the equity principle, the Act should also make a clear link between the subsidy and the financial income of the users. Environmental sustainability also needs to be addressed equally. Further, to implement this system uniformly at the state level and to regulate bureaucratic control, the water regulatory authority system needs to be set up with necessary modifications to the Punjab Water Resources (Management and Regulation) Act, 2020 (Act 2 of 2020).[652]

6.4 Application of Water Tax in The City of Ahmedabad:

Water tax is a common tariff structure adopted in metropolitan cities in the event of unmetered water supplies. It is a fixed monthly sum based on the annual rateable value of land and property and is meant to serve as a general tax.[653] Most municipal legislations prescribe the conditions under which a water tax is levied. [654] The Municipal Corporation of Ahmedabad (the state of Gujarat) has also adopted a water tax method to charge for water and sewerage services in the city. This method was introduced in 2008-09, and at present, the annual water tariff is equivalent to 30% of the property tax in the city.[655] However, the major problem with property-linked water charges is that it fails to recover the costs incurred to provide water supply since the costs involved in the provision of water supply and sewerage service are not considered and have no link to the 30%.[656] For instance, the approximate recovery rate is reported to be 60% of the water tax, [657] while the electricity cost alone constitutes approx. 60% of the total O&M cost.[658] This has caused a significant gap, adding more burden on the state government to cover such expenditures through grants, subsidies, etc.[659]

[650] Section 91 Punjab Municipal Corporation Act, 1976, Punjab Act 42 of 1976
[651] Section 91 Punjab Municipal Corporation Act, 1976, Punjab Act 42 of 1976
[652] the Punjab Water Resources (Management and Regulation) Act, 2020
(Act 2 of 2020)
[653] Whittington, D (2003) Municipal Water Pricing and Tariff Design: A Reform Agenda for South Asia', Water Policy, Vol.5
[654] Om Prakash Mathur Sandeep Thakur, Urban Water Pricing Setting the Stage for Reforms, 2003 National Institute of Public Finance and Policy New Delhi
[655] Ahmedabad Municipal Corporation, Insight on City Management Perspective from Ahmedabad, Gujarat, India, available at https://web.worldbank.org/archive/website01409/WEB/IMAGES/2010_1_1.PDF (assessed on 8-12--2021)
[656] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report
[657] Ahmedabad Municipal Corporation, Insight on City Management Perspective from Ahmedabad, Gujarat, India, available at https://web.worldbank.org/archive/website01409/WEB/IMAGES/2010_1_1.PDF(assessed on 8-12--2021)
[658] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report
[659] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report

Another issue with property-linked water charges is that they are a poor indicator of a household's water consumption level and do not encourage domestic users to use water wisely.[660] As a result, the city of Ahmedabad has reached an alarming stage regarding water wastage with nearly 393.4 million liters of water being wasted per day according to a report from the Ahmedabad municipal corporation.[661] Moreover, according to this report, an average person consumes 260-280 liters daily against the supposed 143-171 liters required for daily needs. [662] Furthermore, equity is another issue that has not been achieved to its full extent. The AMC charges a lower property tax, and subsequently lower water tax, to residents of smaller households than the residents of the bigger properties.[663] However, the biggest challenge here is its linkage to the property tax. Property tax is calculated based on four factors: location, age, type of building/use of the property, and occupancy. As the subsequent water tariff is set based on the amount of property tax, there is no consideration of the financial ability of the water user nor their income while fixing water tax. [664]

The gaps in the existing policy framework to regulate the water pricing mechanism in the city are contributing factors to such failure. For instance, in the absence of a state water policy, the Ahmadabad Municipal Corporation introduced its own water policy, but unfortunately not in line with the National Water policy. This policy does not emphasise the costs to be recovered while levying 30%.[665] By contrast, the state government of Gujarat has taken steps towards economic efficiency by introducing "the Gujarat Domestic Water Supply (Protection) Act, 2019." This act was introduced to monitor and control the illegal use and misuse of water in residences and other buildings for domestic purposes. Such actions have been defined as criminal offenses and are punished with fines and imprisonment under this Act. [666] Moreover, an authority may also pass an order of recovery for such loss or damages caused due to unauthorised or excess drawing of water or use of water for a purpose other than for which the connection was granted.[667] However, when it comes to water metered supply and water pricing this act has been very loose, since it does not make the authority in charge legally bound to provide metered water supply. in addition, the state government is given ultimate discretion to fix water rates without providing any guidelines to follow.[668] This issue could perhaps be addressed by setting up an autonomous water regulatory authority as proposed under the Gujarat Water Regulatory Authority

[660] Brocklehurst, C., Pandurangi, A, Ramanathan, L. (2002). Tariff Structure in Six South Asian Cities. Water Tariff & Subsidies in South Asia, Paper 3 December 2002

[661] The Times of India, Ahmedabad wastes 39 crore litres of water daily (updated on 26th March 2018) , available at https://timesofindia.indiatimes.com/city/ahmedabad/ahmedabad-wastes-39-crore-litres-of-water-daily/articleshow/63458092.cms (assessed on 14-12--2021)

[662] The Times of India, Ahmedabad wastes 39 crore litres of water daily (updated on 26th March 2018) , available at https://timesofindia.indiatimes.com/city/ahmedabad/ahmedabad-wastes-39-crore-litres-of-water-daily/articleshow/63458092.cms (assessed on 14-12--2021)

[663] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report

[664] Ahmedabad Municipal Corporation Property Tax, House Bill at Ahmedabadcity.gov.in (May 31st, 2021), available at https://nashikcorporation.in/ahmedabad-municipal-corporation/ (assessed on 18-12--2021)

[665] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report

[666] Section 11 of the Gujarat Domestic Water Supply (Protection) Act, 2019 Act 22 of 2019

[667] Section 14 of the Gujarat Domestic Water Supply (Protection) Act, 2019 Act 22 of 2019

[668] The Gujarat Domestic Water Supply (Protection) Act, 2019 Act 22 of 2019

Notification 2012 for fixing and regulating water tariffs. For this, the bill needs to be approved and implemented by the government soon as possible.[669]

6.5 Application of Increasing Block Tariff in Delhi:

An increasing block tariff (IBT) is another form of tariff structure currently applied by Water utilities in some metropolitan cities in combination with other price structures. An IBT is based on the volumetric component and is a series of prices that increase in steps as consumption rises. Under this tariff system, domestic users are charged a relatively low price per unit up to the first block of consumption and pay a higher price up to the limit of the second block, and so on until the highest block of consumption. At the highest block, consumers can use as much water as they desire, but for each additional water, unit consumed they pay the highest price in the rate structures.[670] In the city of Delhi, water is charged by the Delhi Jal Board (DJB) under a two-part pricing model. The first part is a fixed connection charge payable by all registered metered consumers to meet the cost of access to the network and operation and maintenance costs. The amount depends upon the type of dwelling and category of consumer. The second part is a volumetric water charge based on a block tariff rate, depending upon the actual consumption and category of consumers from metered users of the system.[671] The critical feature of IBT is that it contributes to the equity principle by allowing low-income households to pay lower rates for water than other households.[672] It is argued that the consumption rate among high-income households is high and therefore a higher percentage of wastewater occurs in higher blocks and they pay a higher price for water compared to lower-income users.[673] This method also claims to reduce the wastage of water. It increases the efficiency and sustainability of water use because the bill is determined by multiplying the volume of water used in a billing period by a per-unit price and thus discourages wasteful water use.[674] Nevertheless, there are some challenges that the city of Delhi has been experiencing with the Increasing Block tariff system, which need to be addressed. One of these is poor cost recovery since the current water rates are unrelated to the cost of O&M. Currently, water consumption is charged as per the rates shown in Table 7 below.[675]

[669] The Indian Express, Gujarat Water Crisis: Six yrs on, water regulatory body on paper (published on13th April 2018) (updated on 26th Aug. 2021), available at https://indianexpress.com/article/cities/ahmedabad/gujarat-water-crisis-six-yrs-on-water-regulatory-body-on-paper-5135430/ (assessed on 20-12--2021)

[670] John J. Boland and Dale Whittington, The Political Economy of Water Tariff Design in Developing Countries: Increasing Block Tariffs versus Uniform Price with Rebate, in Ariel Dina

[671] Ministry of Urban Development Government of India, Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply, April 2010 Draft Final Report

[672] Shukla, Rashmi, Nayak, Sanatan. (2014) Urban Water in India: Pricing and Challenges, Review of Development and Change vol.19(1) 93-108

[673] Om Prakash Mathur Sandeep Thakur, Urban Water Pricing Setting the Stage for Reforms, 2003 National Institute of Public Finance and Policy New Delhi

[674] ibid

[675] Planning Department, *Economic Survey of Delhi 2019-20*, (Delhi: Government of NCT of Delhi)240

Table 7 Water Tariff for Domestic Consumers with Effect From 1.02.2018

Monthly Consumption (In kl)	Service Charge (In INR)	Volumetric Charge (In INR per kl)
Up to 20 kl	146.41	5.27
20 to 30 kl	219.62	26.36
Above 30 kl	292.82	43.93

With such rates, the overall projected revenue collection (comprising income generated from water and sewerage maintenance charges, along with the sale of packaged water, development charges, operating expenditure incurred on establishment costs, electricity costs, etc.) by the DJB is Rs. 25.87 billion, against an expenditure of Rs. 27.64 billion, implying a budgetary deficit of Rs. 1.77 billion (£19 million). This adds a substantial burden not only on the DJB, but also on the central government because to fill this gap, the DJB is relying on funding, grants in aid, loans from the central government, and external funding agencies.[676] So far, the DJB has been granted loans to the sum of Rs. 26,620.04 crores during the period between 1998-2018. of which only Rs. 351.16 crores have been repaid by the DLB, leaving the remaining debt of Rs. 26,268.89 crores (equivalent to nearly £2.55 billion).[677] It would be incorrect to attribute this situation to the lower rates of the IBT system alone since the DJB also uses tanker services to provide water supply etc. However, their contribution to the current financial burden on the DJB cannot be ignored. The DJB acknowledges that due to the paucity of funds, it will neither be able to cover future operating costs nor pay interest on the loan it has borrowed.[678] Moreover, poor maintenance of the water supply system has also led to a substantial water loss in the city, as nearly 40% of the total treated water supplied by the DJB is reported to go to waste, lost due to pipeline leakages.[679]

From a legal perspective, one of the reasons for this is a lack of water policy and any strict enactment to guide DJB while setting the water tariffs. Without a legislative framework, the water sector actions in Delhi have always been flavoured with ad-holism changes in political governance. Even though the government of Delhi has taken initiatives by starting to work on a water policy since 2015, this is still a work in progress.[680] A further reason is bureaucratic control. Since the members of DJB are comprised of elected representatives of the government, the state government/ party in power has a major say in decisions related to tariff fixing and tariff revision. In addition, the final approval for tariff revision comes from the state government.[681] This has created a situation in the city where the party in power seems to

[676] Rumi Aijaz, "Water Supply in Delhi: Five Key Issues," *ORF Occasional Paper No. 252*, June 2020, Observer Research Foundation
[677] Government of National Capital Territory of Delhi Report No. 1 of the year 2019, State Finances Audit Report of the Comptroller and Auditor General of India for the year ended 31 March 2018
[678]Rumi Aijaz, "Water Supply in Delhi: Five Key Issues," *ORF Occasional Paper No. 252*, June 2020, Observer Research Foundation Rumi Aijaz, Water Supply in Delhi: Five Key Issues, *ORF Occasional Paper No. 252*, June 2020, Observer Research Foundation
[679] Ibid
[680] Draft water policy for Delhi 2016
[681] Aggarwal, V., Maurya, N., & Jain, G. (2013). Pricing Urban Water Supply, *Environment and Urbanization ASIA*, Vol *4*(1) 221–241

be looking after their best interest. For example, the recent political party in power in Delhi has been accused of putting the city under more debt by allowing a free water scheme as discussed below.

1. Water Meter Policy and Use of Subsidies:

The lack of adequate water metering is another issue for the DJB to implement IBT successfully. IBT are charged based on consumption of water usage, therefore this requires having a robust water meter system in place.[682] The Delhi government took steps in this regard by requiring all water supplied by the Board should be metered under the Delhi Water & Sewer (Tariff and Metering) Regulations 2012.[683] In addition, a free water policy was issued by the government of Delhi in 2013- 14. Under this policy consumers who have installed functional water meters are not required to pay any charge for consumption of up to 20 kilolitres (kl) of water per month, as well as sewerage charges. Any consumption beyond this limit is chargeable, as shown in Table 7. [684] A fundamental issue with the scheme is that it was launched without conducting research regarding the production, recycling, and supply of water in Delhi.[685] Delhi is already struggling with a water demand-supply gap of nearly 1.47 million kl per day.[686] In this situation, giving free water can only make the situation worse and serves to demonstrate the need for IWRM. Moreover, this policy does not serve the principle of equity, which requires granting subsidies only to those who cannot afford to pay for water. Regarding cost recovery, it is most likely to add more burden on the government to cover the costs of supplying water. To address this issue and to bring balance, the government needs to push the implementation of the Delhi Water & Sewer (Tariff and Metering) Regulations 2012 and for this, it could introduce penalty provisions for users to ensure the meter installation. Further, a draft policy is needed to be implemented to ensure that it has clear provisions reading the cost recovery principle by including the mention of all the relevant costs, as well as economic and equity principles. And environmental sustainability.

6.6 Conclusion:

A water pricing system introduced in the urban sector has not been able to achieve any of the four objectives of the water pricing policy which are considered an essential pillar of the water pricing mechanism. One of the key factors for the failure of the system particularly in the state of Punjab and Ahmedabad is the choice of tariff methods. Both connection fee and water tax have no relevance to water consumption at all. Though IBM is doing better since the water rates are more relevant to water

[682] Shukla, Rashmi, Nayak, Sanatan. (2014) Urban Water in India: Pricing and Challenges, Review of Development and Change vol.19(1) 93-108
[683] Section 23 of the Delhi Water & Sewer (Tariff and Metering) Regulations, 2012
[684] Delhi Jal Board, office of the director (revenue) Free Water Supply up to 20KL per month to Domestic Consumers, available at http://delhijalboard.nic.in/sites/default/files/All-PDF/Free_water_notification0001.pdf (assessed on 24-12--2021)
[685] The Hindu, over 14 lakh functional water meters in city DJB informs HC, published on February 21, 2019, available at https://www.thehindu.com/news/cities/Delhi/over-14-lakh-functional-water-meters-in-city-djb-informs-hc/article26325235.ece (assessed on 28-12--2021)
[686] Rumi Aijaz, "Water Supply in Delhi: Five Key Issues," *ORF Occasional Paper No. 252*, June 2020, Observer Research Foundation

consumption. Nevertheless, the water rates set by the DJB are not enough and are fixed without considering any cost. The main reason for the failure of the water pricing system in the urban sector is the attitude of the central and state governments. Since both the central and the state government has not recognised water as an economic good and therefore water rates introduced under different tariff structures are not determined based on economic principles. The lack of effective legislative and UpToDate legislative framework has been recognised as an essential contributor to the failure of the pricing mechanism in all three investigated case studies. This has paved the way for political interference and bureaucratic control.

To improve the situation in the future, central and state governments need to recognise water as an economic good, and state governments as well as union territories further need to introduce robust legislation in line with the water pricing policy introduced at the international level. Further, the provisions related to the cost recovery principles should be clear with a detailed description of the costs to guide the state governments as well as to avoid political interference. It is significant to note that merely introducing legislation is not enough, it also requires state governments to change their attitude and implement the legislation firmly. Moreover, uniform volumetric supply needs to be implemented across the states, and rates should be such to meet all four essential pillars of the water pricing policy. For this purpose, states need to introduce a meter supply policy with penalty provisions to make the authority in charge to be obligatory to install meter supply. in addition, to avoid political interference, setting up an independent water regulatory authority is suggested as a way forward. Few states have already taken policy initiatives to set up an independent authority to set water rates in their states such as the state of Punjab, but others are lacking behind. Moreover, policy initiative is not enough, the state government needs to bring the authority in charge.

Chapter 7

Water Pricing in the Irrigation Sector

7.1. Introduction:

The irrigation sector is a vital part of the agriculture-based economy in India. It makes a major contribution to the country's food security and contributes to the overall development of the economy. This growth has also made this sector the biggest water consumer, accounting for nearly 90% of water use in India. Consequently, higher water consumption by this sector poses a major threat to the per capita availability of water for other uses.[687] To regulate water use, the concept of water pricing was introduced in the irrigation sector under the Second Irrigation Commission in 1972, even before its recognition at the international level.[688] The Government's concern for a rational and pragmatic approach to levying water rates, in return for the water supplied to the users, was made possible by the development and construction of major, medium, and minor irrigation projects. The water rate is levied for the supply of water from a public or a private system to ensure the efficiency of the irrigation system and its management, equitable water distribution, and efficient use.[689] Since 1972, various Commissions examined the issue from time to time and have given their recommendations, based on which the water pricing model has been introduced and updated from time to time. However, despite all these efforts, the current water rates have not been able to keep pace with rising capital and O&M costs in most of the Indian States, leading to inadequacies in the created facilities, as well as a lack of economic efficiency in water use.[690]

To understand why a state's water pricing model is unable to support its irrigation schemes, and to achieve a higher water use efficiency, this chapter aims to analyse the existing pricing structure developed under the Irrigation Finance Commission to determine what the pricing model entails and whether it is in line with the water pricing framework developed under the Dublin statement and Agenda 21, which is one of the essential elements to implement IWRM. This chapter will further examine the challenges, particularly from a policy perspective, and suggests measures to improve future application.

As part of this analysis, the role of water regulatory authorities has also been analysed. The water regulatory authority is one of the primary thrusts of the reforms in the irrigation sector. The regulatory authority exercises rule-making powers and implements these rules. Part of the agenda is to fix water

[687] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007 p.9

[688] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

[689] ibid

[690] ibid

rates for water use at the state level which has been actively carried out by a few states in the country, while some others have initiated tentative changes. However, there are some shortcomings in the water authority laws adopted by the states which have a direct impact on the water pricing mechanism.[691] Therefore, critical analysis has been conducted to uncover the gaps and suggest amendments to improve the application of water pricing. The last part of the chapter analyses the water pricing framework adopted to regulate the use of groundwater, particularly for private tube wells since water from these wells is not priced as per the rates suggested by the finance commission. These rates are only applicable to public tube wells, but on the other hand, the water use by private tube wells is regulated under the electricity pricing policy. [692] This policy is not only highly subsidized but at the same time, political interference has also made it impossible to price water.[693] Therefore, analyses are conducted to highlight the gaps in the water pricing framework developed for groundwater (private tube wells), and what legal reform needs to be brought in to price the water fairly and recognise its economic value.

This chapter concludes with the suggestions made to fill the gaps in current legislative frameworks adopted at the state level to implement a water pricing mechanism. Further, suggestions have been made to improve the role of the water regulatory authority to strengthen the application of water pricing frameworks in line with the Dublin statement and Agenda 21. Last but not the least, suggestions have been made to implement the public trust doctrine to implement water rates for groundwater use to regulate the use of private tube wells.

[691] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04

[692] Chaudhuri S, Roy M (2019) Irrigation Water Pricing in India as a Means to Conserve Water Resources: Challenges and Potential Future Opportunities. Environmental Conservation 46: 99–102.

[693] Central Water Commission (CWC) (2010). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

7.2 Development of the Concept of Water Pricing in The Irrigation Sector in India:

In India, the agriculture sector contributes 4.1% per annum to the GDP[694] and accounts for nearly 48.9% of employment. [695] Irrigation in the agriculture sector has helped to achieve this target by occupying a central stage in global food supply and demand projections.[696] Today India is the world's largest producer of millet and the second-largest producer of wheat, rice, and pulses.[697] This growth has also made this sector the biggest water consumer that accounts for nearly 90% of water in the country.[698] Any marginal saving in the current use of irrigation water would then release a substantial amount back into the system for agricultural expansion as well as for meeting the needs of other sectors like domestic water demand.[699] With this under consideration, the concept of pricing was introduced under the Second Irrigation Commission in 1972, even before it was a matter of debate at the international level. The Commission suggested two separate water pricing rates: 5% of gross income for food and 12% of gross income for cash crops. These water rates were introduced when irrigation schemes were initiated through the development and construction of major, medium, and minor irrigation projects.[700] Major and medium irrigation projects would cover the Cultivable Command Area (CCA) of more than 10,000 hectares and less than 10,000 hectares but more than 2,000 hectares respectively[701], with water being sourced from canals or artificial water storage such as dams.[702] Small irrigation schemes would cover an area of up to 2000 hectares, with both groundwater (dug-wells, tube wells) and surface water (tank and pond, etc.) being the main source.[703] This initiative has evolved with the introduction of the Dublin statement 1992 and Agenda 21, where the introduced pricing model has to be such to achieve full cost recovery and thereby enable expansion of the service area and assure more reliable delivery, economic efficiency, environmental sustainability, and equity. As a result, in the irrigation sector in India, the emphasis has been on the full recovery of operation and maintenance costs and 1% interest on the capital cost from the 10th Finance Commission in 1995 and then the 12th Finance Commission (2005-2010) introduced the concept of equity to ensure the interest of disadvantage and poorer sections of the society was considered.[704]

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[694] Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare, State of Indian Agriculture 2015-16 p.2

[695] India's Economic Survey 2015-2016 Key Highlights available at https://home.kpmg.com/content/dam/kpmg/pdf/2016/04/KPMG-Flash-News-India-Economic-Survey-2015-16%E2%80%93Key-Highlights-3.pdf (assessed on 5-5-2022)

[696] U.A. Amarasinghe, T. Shah, T. Hugh Turral, B. K. Anand, Research Report 123 India's Water Future to 2025–2050: Business-as-Usual Scenario and Deviations 2007, p.1

[697] B.S. Khatkar, N. Chaudhary, P. Dangi, Production and Consumption of Grains: India, (eds). Colin Wrigley, Harold Corke, Koushik Seetharaman, Jon Faubion, Encyclopaedia of Food Grains (2nd edn, Academic Press, 2016) p.367

[698] Reddy, V. (2009). Water Pricing as a Demand Management Option: Potentials, Problems and Prospects

[699] Ibid

[700] Central Water Commission (CWC) (2017) Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

[701] Chapter 12 Irrigation, available at http://mospi.nic.in/sites/default/files/Statistical_year_book_india_chapters/ch12.pdf (assessed on 8-5-2022)

[702] UNIT 10 IRRIGATION IN INDIA, available at https://egyankosh.ac.in/bitstream/123456789/19614/1/Unit-10.pdf (assessed on 8-5-2022)

[703] Report of 5th Census of Minor Irrigation Schemes, Government of India Ministry of Water Resources, River Development and Ganga Rejuvenation Minor Irrigation (Statistics) Wing November 2017

[704] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

In the irrigation sector today, given the need for adequate provision required for the maintenance of irrigation schemes, the 13th Finance Commission has introduced a new pricing model with the aim of a full cost recovery following the proposals of the Dublin statement 1992. Dependent on the area of the irrigation scheme, the following pricing model was proposed to support O&M costs[705]:

- Large/medium irrigation schemes
    - Used farmland -INR 1175 per hectare and then a yearly increase of 5% to a maximum level of Rs. 1500 per hectare
    - Not used farmland - INR 588 per hectare and then a yearly increase of 5% to a maximum level of Rs. 750 per hectare
- Small irrigation scheme
    - Used farmland-INR 588 per hectare

It is essential to note that irrigation and water both being state subjects[706], irrigation water rates are managed at the state level and not by the central government. As a result, several states are yet to introduce water rates for irrigation use such as the states of Arunachal Pradesh, Meghalaya, Mizoram Nagaland, and Puducherry.[707] Additionally, the states who have introduced water rates have reported that the income they receive is not covering the operational and maintenance costs of the irrigation schemes due to a low recovery rate. This has caused the irrigation systems to operate at a level much below their capacity due to poor maintenance and continued neglect.[708] Moreover, the overall efficiency of surface irrigation ranges between 30-65 %.[709] The situation with groundwater is also alarming since over 250 districts in 11 states report acute water scarcity due to excessive use of groundwater. This is now raising concerns within the state about having a sustainable irrigation supply for their farmlands and its impact on the state economy, ecosystem, and a person's livelihood.[710]

7.3 Cost Recovery Principle and Challenges to Its Application:

The aim of levying water rates is to generate sufficient revenue to ensure the efficiency of the irrigation management system. However, the recovery rate recorded in the irrigation sector is as low as less than 1% with a maximum of 2.9% for both types of crops (food/cash) in most of the states,[711] against the prescribed limit of 5%, and 12% of gross income for food and cash crops, respectively. Such low recovery rates are causing poor O&M of the irrigation infrastructure, the unreliability of supply, and more economic losses. [712] Currently, the states of Gujarat, Haryana, and Himachal Pradesh have the lowest

[705] ibid
[706] Article 246 of the Indian Constitution 1949
[707] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi
[708] ibid
[709] Bharat R. Sharma, A. Gulati, G. Mohan, S. Manchanda, I. Ray, U. Amarasinghe, Water Productivity Mapping of Major Indian Crops, NABARD and ICRIER 2018
[710] Chaudhuri S, Roy M (2019) Irrigation Water Pricing in India as a Means to Conserve Water Resources: Challenges and Potential Future Opportunities. Environmental Conservation 46: 99–102
[711] J.S. Sindhu, (2010) Water pricing and sustainable surface irrigation management, Indian journal of science and technology, Vol. 3 (8)
[712] Chaudhuri S, Roy M (2019) Irrigation Water Pricing in India as a Means to Conserve Water Resources: Challenges and Potential Future Opportunities. Environmental Conservation 46: 99–102.

water rates for lift irrigation[713] in respect of major crops such as paddy, sugarcane, and wheat, followed by the states of Uttarakhand, Utter Pradesh, Delhi, and Madhya Pradesh (table 8). For flow irrigation[714], Tamil Nadu has the lowest water rates for these crops (table 9)[715] which is a direct link to the state having one of the lowest recovery rates in India of 0.1%.[716]

Table 8 Water Rates (Rs.) For Lift Irrigation in Selected Indian States To Explain The Range of Rates From High, Medium To Low Adopted In The Indian Irrigation Sector

States	Paddy	Sugarcane	Wheat
	Min - Max	Min - Max	Min - Max
Maharashtra	357 - 357	36000 - 5405	535 - 535
Madhya Pradesh	85 - 155	960 - 960	75 - 125
Delhi	148 - 148	NA	66.69 - 66.69
Uttarakhand	20 - 143	49 - 237	20 - 143
Utter Pradesh	20 - 143	49 - 237	20 - 143
Himachal Pradesh	99.81 - 99.81	99.81 – 99.81	99.81 – 99.81
Haryana	74.10 - 74.10	86.45 - 98.80	55.58 - 61.75
Gujarat	53.33 - 53.33	100 - 100	53.33 - 53.33
Tamil Nadu	NA		

Table 9 Water Rates (Rs.) For Flow Irrigation in Selected Indian States To Explain The Range of Rates From High, Medium To Low Adopted In The Indian Irrigation Sector

States	Paddy	Sugarcane	Wheat
	Min - Max	Min - Max	Min- Max
Maharashtra	119 – 476	6297 - 6297	47 6 - 476
Madhya Pradesh	85 - 155	960 - 960	75 - 125
Delhi	148 - 148	NA	66.63 - 66.63
Uttarakhand	40 - 287	99 - 474	128 - 287
Utter Pradesh	40 - 287	99 - 474	40 - 287
Himachal Pradesh	49.92 - 49-92	49.92 - 49-92	49.92 - 49-92
Haryana	123 - 148	172.90 - 197.60	111.15 - 123.50
Gujarat	160 - 160	300 - 300	160 - 160
Tamil Nadu	5.56 - 49-42	5. 56 - 55.60	NA

[713] Lift irrigation is a procedure where water is lifted from perennial source of river with the help of electric pump and then distributed to nearby fields using pipelines

[714] Flow irrigation is a procedure in which water flows directly to the filed from the channel without help of any other equipment.

[715] Central Water Commission (CWC) (2017) Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

[716] J.S. Sindhu, (2010) Water pricing and sustainable surface irrigation management, Indian journal of science and technology, Vol. 3 (8)

The poor State legislative framework is one of the contributing factors for most of the states having a lower recovery rate since they do not link irrigation water charges to generating revenue.[717] Currently, only 9 states - Andhra parades, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, and Sikkim, have emphasised the recovery of operation and maintenance costs, while only 3 states - Jharkhand, Orrisa, and Uttar Pradesh (Water Policy 1999) has also recognised the capital cost as part of recovery component. Thus, in total, only 12 states out of 24 have introduced the cost recovery principle in full and in part. Moreover, the states of Goa and Tamil Nadu have enacted their state water policies but failed to introduce the concept of water pricing.[718] Several states are yet to finalise their first drafts of the water policy, such as the states of Assam, Bihar, Delhi (UT), Gujarat, Manipur, Punjab, and Uttarakhand.[719] Political interference is another reason for low recovery since most of the time, water rates are decided by political decisions to serve the interest of the party in power. Therefore, in states, water rates are highly subsidized despite having a state water policy in place.[720] Examples of such incidents are more visible in the states of Himachal Pradesh, Madhya Pradesh, and Uttar Pradesh where states have enacted their water policies including recovery of few costs, but the rates as shown in table 1 and 2 are highly subsidized, indicating the control of the political party in force while levying water rates.

However, this is not the case with all states, particularly with the state of Maharashtra. This state is an exception and introduced water rates for flow irrigation in respect of non-cash crops at roughly 6% of the gross income and about 12% of the gross income in the case of cash crops. These rates were not only sufficient to meet the expenditure on maintenance and repairs of irrigation projects but also enough to ensure a 1% return on capital cost.[721] The state has taken a step further by introducing a Water Policy in 2019 that explained all the relevant costs relating to the O&M of an irrigation scheme that should be considered such as electricity charges, establishment, and administrative charges, cost of special repairs (including the replacement cost of any component, restoration of structure), etc, as well as infrastructure cost.[722] This means that the irrigation water charges suggested by the Maharashtra government should be compliant with the state policy in the future regardless of the political party in power. The water pricing model introduced by the state of Maharashtra, as well as its state policy, is an example of a state's determination to consider the irrigation sector above its political interest and its intentions to improve the system, which could be used by other states as an example to improve the cost recovery.

[717] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

[718] Goa State Water Policy 2000, and Tamil Nadu State Water Policy 1994

[719] State of Assam water policy 2007 (draft), state of Bihar water policy 2010 (draft), state of Gujarat water policy 2011 (draft), state of Manipur water policy 2015(draft), state of Punjab water policy 2008 (draft), and Uttarakhand

[720] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

[721] Ibid

[722] Section 17 Maharashtra State Water Policy 2019

7.4 Water Rates and Their Impact on Economic Efficiency in Irrigation Sector:

Economic efficiency is critically linked to water pricing since it encourages water users to save water and use it judiciously. [723] In the irrigation sector in India, the government has put forward different approaches to improve agricultural productivity, while simultaneously increasing water use efficiency.[724] Such measures include the implementation of sprinkler and drip irrigation systems, flood irrigation, and the introduction of agronomic practices like raised bed planting, ridge-furrow method of sowing, and sub-surface irrigation. Despite these measures, the uptake of water conservation has generally been poor, and India is now rapidly heading towards being classed as a water-stressed country.[725]

Water rates, on the other hand, do not compensate for the economic value of water. To understand this narrative better it is important to understand how some Indian states use a season-based criterion to levy water rates as there appears to be a direct correlation between the season, water usage, and water rates. The Indian cropping season is classified into two main seasons known as the Kharif and Rabi seasons. The Kharif cropping season is between July –October (monsoon) and the Rabi season occurs from October to March (winter). The crops grown between March and June are classified as summer crops.[726] Depending on the season, crop water requirements would also change; crop water requirement is higher during the summer season than during the Kharif season as expected, whilst the water requirement is higher during the Kharif season compared to the Rabi season.[727] As crop water usage is based on seasons, then the quantity and availability of supply should play a dominating factor when states fix water rates. However, a number of states do not consider any link between the season and the increasing intensity of crop water requirement, and therefore the element of economic efficiency is missing in water rates levied. Examples of this can be seen in the states of Assam, Chhattisgarh, Madhya Pradesh, and Manipur, which charge lower rates for crops during high water requirement season and higher rates when water requirement is less. Other states, including Gujarat, Himachal Pradesh, Punjab, and Tripura, apply an annual uniform flat rate irrespective of crop water requirement (Table 10).[728] The pricing model introduced by these states has not correlated with the water rates to be levied to ensure gains in economic efficiency as for most of these states it was not in their water policies except for the state of Madhya Pradesh. Currently, only the state water policies of Kerala, Madhya Pradesh, Maharashtra, and Rajasthan have recognised economic efficiency as an essential component of water pricing. [729] Again the lower water rates in the state of Madhya Pradesh point to direct political inference. This indicates that the scarcity value of water is not well understood by most States. To encourage States to consider how water efficiency can increase and be introduced into their

[723] ibid

[724] Dhawan, V., Water, and agriculture in India: background paper for the South Asia expert panel during the Global Forum for Food and Agriculture (GFFA) 2017. 2017, OAV German Asia-Pacific Business Association p. 16

[725] Ibid

[726] Cropping seasons of India- Kharif and Rabi, available at http://www.arthapedia.in/index.php%3Ftitle%3DCropping_seasons_of_India-_Kharif_%2526_Rabi (assessed on 17-5-2022)

[727] Mehta, Rashmi, Pandey, Vyas. (2016). Crop water requirement (Etc.) of different crops of middle Gujarat. Journal of agrometeorology vol.18(1) 83-87

[728] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

[729] The state of Kerala water policy 2008, state of Madhya Pradesh water policy 2003, state of Maharashtra water policy 2019, and state of Rajasthan water policy 2010

policy, the Irrigation Commission should consider playing a pivotal role in this as they were a major contributor when introducing the concept of water pricing into this sector. The Commission needs to promote water rates and economic efficiency together in contrast to its existing approach of concession and incentives to improve water use efficiency.[730]

Table 10 Water Rates for Crops Charged in The States in India Which Are Based on The Seasons They Are Grown In, (Indian Rs.):

State	Paddy			Sugarcane			Groundnut			
	Rabi	kharif	Summer season	Rabi	Kharif	Summer season	Rabi	Kharif	Summer season	
Assam	562.50	281.24		222.00	222.00					
Chhattisgarh	494.00	200.07					247.00	123.50		
Gujarat		160.00	160.00					160.00	160.00	
Himachal Pradesh				49.92	49.92					
Madhya Pradesh	155.00	85.00					75.00	50.00		
Maharashtra	119.00	238.00					724.00		1438.00	
Manipur	602.00	305.00								
Punjab	123.50	123.50	123.50	123.50	123.50	123.50	123.50	123.50	123.50	
Tripura		312.50	312.50					312.50	312.50	

7.5 Water Metred Supply and Challenges to Its Application:

A volumetric water supply if implemented correctly, would help to increase economic efficiency by ensuring that the pricing is based on use and would also support financial stability, reliability of supply, and increase of water availability. Since water rates will be based on actual consumption rather than land size or a season-based approach, which is difficult to quantify or has little relation to the amount of water consumed. Moreover, a metered supply in irrigation systems will not only support volumetric measurement but will also help to increase accuracy and billing efficiency. [731] In the irrigation sector in India, full volumetric measurement of the use of irrigation water has been recommended to be implemented in each state under the 14th Finance Commission set up in 2013.[732] However, so far only

[730] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi
[731] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141
[732] The Fourteenth Finance Commission of India 2015-20, Government of India, New Delhi

four states including the states of Jharkhand[733], Karnataka[734], Maharashtra[735], and Rajasthan[736], have introduced volumetric supply into their water policies. The states of Jharkhand and Rajasthan were the first two states to introduce volumetric water supply under their respective water policies, even before the National Water Policy 2012[737] and before its introduction by the Finance Commission in the irrigation sector. However, actual implementation has taken place only in the state of Maharashtra so far, where water rates are based on the volume of water supplied.[738] In the state of Maharashtra, water is supplied on a volumetric basis to the Water User Association (WUAs) which further supplies water to the occupiers of land. As a result, improvement in water use efficiency[739] , as well as higher cost recovery, has been recorded in the State.[740] However, to bring this reform in at the national level, a number of challenges need to be addressed. Since the situation and conditions vary from state to state, the major problem for many states is the lack of guidance since neither the Finance Commission[741]nor any of the State Water Policies and the Nation Water Policy have elaborated on how to implement this approach into practice.[742] Besides policy challenges, in order to develop a fully-fledged volumetric pricing system in the irrigation sector, the government of India needs to consider some other factors including finance, technology support, and an operational plan to support the states. Setting up an extensive network of water metering systems in a country as vast as India requires considerable investment. These funds can then be used to build the necessary infrastructure changes in the country's irrigation water supply system, technology support system, and operational planning.[743] Moreover, the irrigation authorities at the state level need to take responsibility for the management, maintenance, and monitoring of the system. To bring this into action, the government should perhaps start by initiating a phase-wise approach with agreed long-term plans which will help mitigate challenges that will be encountered when setting up such a network.[744]

7.6 Water Regulatory Authority and Irrigation Water Pricing Mechanism:

Volumetric supply is not enough in itself to achieve revenue sustainability and economic efficiency. It also requires a water rate to be such that it recognises the economic value of water as well as covers all the incurred costs to ensure the effective management of the system. To deal with water tariff-related

[733] Jharkhand state water policy 2011
[734] Karnataka State Water Policy 2019
[735] Maharashtra state water policy 2019
[736] Rajasthan State Water Policy, 2010
[737] National water policy 2012
[738] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141
[739] Shivaji Sangle, Role of Water Users' Association in Management, Operation and Maintenance of Irrigation Systems in India 2nd World Irrigation Forum, 6-8 November 2016, Chiang Mai, Thailand
[740] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141
[741] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi
[742] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141
[743] Ibid
[744] Ibid

issues, reform was introduced in the water sector in the form of a water regulatory authority (how they were introduced is explained in sub-section 2 of section 5.1.2 in chapter 5). However, only 8 states so far have enacted their water regulatory authority laws, 2 further states are at the drafting stage (table 11), whilst only three states' water policies have recognised the need for the formation of state water regulatory authorities such as the Chhattisgarh State Water Resources Development Policy, 2012, Orissa State Water Policy 2007, and West Bengal State Water Policy 2011. When it comes to WRAs functioning, it is reported that the only one in an operational mode is that in the state of Maharashtra[745], which could perhaps also be the contributing factor for the state to have a better recovery rate as well as improved economic efficiency as reported above. Nevertheless, the existing water regulatory authority laws suffer from a number of shortcomings that need to be addressed not only to improve its application in the state of Maharashtra but also in other states, so that when the authority comes into force it has clear law guidance to implement the water pricing model more effectively.

Table 11 State Water Regulatory Authority Enactments:

1.	**Andhra Pradesh**	**Andhra Pradesh Water Resources Regulatory Commission Act, 2009**
2.	**Arunachal Pradesh**	Arunachal Pradesh Water Resources Regulatory Authority Act, 2006
3.	**Gujarat**	Gujarat Water Regulatory Authority Notification 2012 (Draft)
4.	**Haryana**	Haryana Water Resources (Conservation, Regulation, and Management) Authority Act, 2020
5.	**Himachal Pradesh**	The Himachal Pradesh Water Regulatory Authority Act, 2011 (Draft)
6.	**Jammu & Kashmir**	Jammu And Kashmir Water Resources (Regulation and Management) Act, 2010
7.	**Kerala**	Kerala State Water Resources Regulatory Authority Bill, 2012
8.	**Maharashtra**	Maharashtra Water Resources Regulatory Authority Act, 2005
9.	**Punjab**	Punjab Water Resources (Management and Regulation) Act, 2020
10.	**Uttar Pradesh**	Uttar Pradesh Water Management and Regulatory Commission Act, 2008

7.6.1. Cost Recovery Principle and Legislative Gaps in Water Regulatory Authority:

One of the key functions of the water regulatory authorities is to fix and regulate the water tariff system based on the principle of cost recovery and reducing subsidies. The progressive strengthening of the

[745] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04

principle of cost recovery in water regulatory laws varies from state to state. As discussed below, states have introduced different accts to support the principles of cost recovery and subsidies.

- MWRRA Act 2005, and the HPWRA Act 2011 (draft), are restricted to the recovery of O&M costs
- UPWMRC Act 2008 allows for recovery of the cost of depreciation and subsidies along with O&M costs.
- APWRRC Act 2009, and the KSWRRA Bill 2012 have on one side authorized their authorities to determine the adequate O&M cost of irrigation projects, but on the other hand, have encouraged the subsidies through appropriate government budgetary support to ensure that the quality of the service delivery is not allowed to suffer for want of systems Operation and Maintenance needs.[746]

This indicates that the water regulatory authority laws in the state of Andhra Pradesh and the state of Kerala have not understood the concept of water as an economic good and the use of water has a price. Moreover, the most recent water regulatory authority laws enacted in the state of Punjab[747] and Haryana in the year 2020[748], have been very vague regarding the principle of cost recovery and failed to provide any guidance as to what should be recovered under the cost recovery. The State of Jammu and Kashmir Act has not referred to the cost recovery principle at all. [749] Further, the capital cost is something that is missing in all the water regulatory authority laws, including in the state of Maharashtra. Even though the state of Maharashtra seems to be doing well compared to the other states when it comes to water rates, this is something that needs to be addressed by the government and would help to improve recovery efficiency in the future.[750]

7.6.2 Principle of Economic Efficiency:

Another key function of the authority is to encourage water use efficiency and minimise the wastage of water. for this purpose, water authority laws have promoted different water use efficient models than using water rates.[751] for instance, the states of Maharashtra, Arunachal Pradesh, Jammu Kashmir, and Utter Pradesh water authority laws have promoted sound water conservation and management practices. A major problem with these laws is that they are silent regarding the mechanism to achieve the objectives promoted by them.[752] Even though the states of Andhra Pradesh, and Kerala specify that these objectives are to be reached by fixing and monitoring the implementation of stipulated quality standards. These quality standards are defined for the management of water resources, as well as for

[746] Ibid
[747] Punjab Water Resources (Management and Regulation) Act, 2020
[748] Haryana Water Resources (Conservation, Regulation, and Management) Authority Act, 2020
[749] Jammu And Kashmir Water Resources (Regulation and Management) Act, 2010
[750] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04
[751] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04
[752] Ibid

the disposal of wastewater by various water users, and government departments. These Acts have further recommended actions against violations. It is, however, unclear whether the authority will stipulate these standards or simply implement the standard stipulated by another authority such as the government. [753] On the other hand, the majority of these authority laws have failed to recognise the fact that water has an economic value, and it should be priced to ensure its sustainable management. the exceptions here are the states of Punjab and Haryana, where both states have explicitly required water regulatory authorities to consider the water use efficiency aspect while fixing water rates within their water regularity authority laws.[754]

Now, one could argue why it is important to price water since the state Maharashtra water regulatory authority act has not linked to water rates and water efficiency, yet the state is reported to be doing good when it comes to water conservation as mentioned above. It is important to note that the state of Maharashtra has adopted a volumetric water supply with the highest water rates against the prescribed rates by the Finance Commission. This doe shows that in the wake of clear policy legislation, water conservation is possible. Nevertheless, it cannot be guaranteed in all states. Therefore, it becomes important for the government to modify its existing water authority laws including the state of Maharashtra. Moreover, to bring about this change at the country level, both the Central government and the Finance Commission of India need to acknowledge and implement the link between water rates and water use efficiency.

7.6.3 Equity Principle and Water Pricing:

The application of the equity principle is another concern that has not been addressed under a number of state water policies or water regulatory laws, except by the water regulatory authority laws of the states of Punjab and Haryana. The constitution of India guaranteed a fundamental right to water under Article 21, as part of the right to life. This means every human has a constitutional right to water without any discrimination on a socio-economic basis. In the irrigation sector, the application of this norm was ensured by the 12th Finance Commission by encouraging the concept of subsidy on water rates to ensure the water supply to the disadvantaged and poorer sections of society.[755] The literature suggests that states are giving due consideration by including the paying capacity of the consumers in the fixating of water rates while keeping the cost recovery principle in mind. However, due to data limitations, it is not possible to explain how well and how often this principle is implemented and to what extent it is applied by the states, but an attempt has been made to highlight the current challenges faced by the country and what needs to be done to improve the application of this principle.[756]

[753] Section 14 (4) of the Andhra Pradesh Water Resources Regulatory Commission Act, 2009
section 13(7) of the Kerala State Water Resources Regulatory Authority Bill, 2012
[754] Punjab Water Resources (Management and Regulation) Act, 2020, Haryana Water Resources (Conservation, Regulation and Management) Authority Act, 2020
[755] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi
[756] Ibid

Firstly, an adequate system is missing to determine the current income of the farmers, which is very important to ensure that the subsidy benefit is guaranteed to those who are financially vulnerable. Currently, farmers have the liberty to sell their produce to the local middleman for cash. This makes it difficult for the irrigation department to ascertain the true income of farmers. On the other hand, crops that are sold at government corporates are recorded and so are the amounts transferred to the farmer's bank account. [757] Therefore, there is an urgent need for the government to review existing Agricultural Produce Marketing Corporation Acts passed by state legislatures all over India. These acts were passed to protect the interest of farmers by creating a system wherein a group of carefully monitored functionaries would be allowed to purchase agricultural produce. [758] Unfortunately, these acts backfired in action, ultimately creating a coterie of middlemen, who along with the complicity of the market committees, formed a virtual barrier between the farmer and the consumer, paying the former a pittance for his produce. [759] Therefore, such policies need revision not only to demolish the middleman system but also to ensure that there is a sufficient market for farmers to sell their products with a fixed minimum support price. Moreover, all the transactions should be done through banks.[760] This would help to serve both equity principles as well as to protect the interest of small and marginal farmers.

Secondly, Policy challenges are another concern that needs to be addressed. Only five States, namely Himachal Pradesh (Policy- 2013), Jharkhand (Policy-2011), Kerala state (Policy-2008), Maharashtra (Policy-2019), and Rajasthan (Policy 2010), have recognised the need to rationalize water rates in the interest of small and marginal farmers in mind. The states of Himachal Pradesh and Jharkhand have also proposed a mechanism of cross-subsidization to implement the principle of equity into practice[761], but after analysing all enacted state water policies, it is found that other states are yet to provide legal backup to this principle.

The third challenge is the water regulatory authority laws and the missing link to the equity principle. Even though the Planning Commission of India introduced a Draft Model Bill. The proposed Model Bill intends to address this gap by introducing the concept of appropriate, prudent, fair, equitable, and affordable charges and costs for accessing and using water services, especially for the weaker and disadvantaged sections of society. However, this bill again failed to provide an appropriate mechanism for the states to follow to achieve this objective.[762]

7.6.4 Bureaucratic Control and Water Regulatory Authorities:

Political interference and bureaucratic control are other challenges to the integrity of the water regulatory authorities. Currently, water regulatory authorities are managed by bureaucrats who are subject to government control and this limitation arises from the water authority law itself. For instance,

[757] Singh, Aditya. (2010). The Indian Farmer, Middlemen and the APMCs. (Assessed on 25-3-2022)
SSRN Electronic Journal. 10.2139/ssrn.1694096
[758] Ibid
[759] ibid
[760] ibid
[761] Himachal Pradesh (Policy- 2013), Jharkhand (Policy-2011), Kerala state (policy-2008), Maharashtra (policy-2019), and Rajasthan (Policy-2010)
[762] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04

the authority laws require that the chairperson of all the water regulatory authorities be the chief secretary of the state government, or equivalent rank, or chief engineer who are bureaucrats. Further, the laws state that members of the authority are to be selected from among water experts to introduce a measure of independence to regulation, but in practice, as can be seen in the state of Maharashtra, the experts are drawn from among the retired bureaucrats. [763] As a result, the independence of the authority may be compromised. [764] To address the shortcomings of existing water regulatory authority laws, a Draft Bill for State Water Regulatory System (also known as Model Bill) was introduced by the Subgroup of Model Bill for State Water Regulatory Authority Act constituted by the Planning Commission (2012-17). This bill introduced a new institutional setup in the form of a State Independent Water Expert Authority (SIWEA) in each state. [765] The SIWEA is to be a multi-disciplinary body of independent professionals from different fields of civil engineering, ecology, environmental science, social science, economics, accountants, geology, and hydrology. This is a momentous change from the water regulatory authorities which comprise bureaucrats. [766] Besides ensuring independency, the Model Bill also proposes several changes to overcome the critique of water regulatory authority laws insofar as transparency, accountability, and financial independence are concerned. it shows that the Model Bill presented by the planning commission represents a commendable effort to overcome the criticism faced by the water regulatory authority laws. However, the implementation of the Model Bill is a complex task, since it will need coordination amongst a range of vertical and horizontal institutional linkages while ensuring that persons with the required expertise are appointed to discharge these institutional responsibilities. This presents a daunting task for the implementing agencies. [767] Therefore, the Model Bill requires more debate and discussion given its ambitious nature since it is one thing to prepare a document, but its implementation is another thing, particularly in a country like India where its implementation depends on the willingness and capacity of states.[768]

7.7 Regulation of Groundwater and Water Pricing Policy:

The analysis of water pricing policy developed to regulate the use of groundwater also raises significant concerns. Groundwater is another mainstream of agricultural irrigation in India, accounting for nearly 39 million ha of land,[769] supporting 70% of crop production, and providing livelihood opportunities to half the population.[770] However, groundwater depletion has become one of the biggest major concerns for the country due to its uncontrolled overuse. Currently, over 250 districts in 11 states are prone to drought events, leading to acute water scarcity, concerns for sustainable irrigation water supply, crop

[763] Ibid
[764] Ibid
[765] Ibid
[766] Ibid
[767] Ibid
[768] Ibid
[769] Dhawan, V., Water and agriculture in India: background paper for the South Asia expert panel during the Global Forum for Food and Agriculture (GFFA) 2017. 2017, OAV German Asia-Pacific Business Association
[770] World Bank (2010) Deep Wells and Prudence: Towards Pragmatic Action for Addressing Groundwater Overexploitation in India. Washington, DC, USA: World Bank

damage, and economic loss as well as lost ecosystem services.[771] A water pricing framework is essential to regulate groundwater use and conserve dwindling water reserves. The current water pricing framework recommends a different pricing model if water is retrieved from a public or private tube well for irrigation purposes. Water rates for the use of public tube wells for irrigation are based on the number of hours of watering, or the volume of water supplied.[772] However, water charges for private tube wells are regulated under a separate policy system such as subsidized credits and electricity under the existing power tariff systems. The issue with these policies is electricity charges are levied based on the connected load rather than the consumption of units of power, and consumption of water.[773] Electricity supply charges to the agricultural sector in India are vastly subsidized under the existing power tariff system. [774] This has not only triggered groundwater exploitation but also caused huge financial losses to the state's electricity board.[775] For instance, due to the highly subsidized provisions, the increase in the number of groundwater wells has gone up from about 10,000 in 1960 to about 12 million in 2006.[776] Since pumps on the deepest tube wells are predominantly electric, 85% of the groundwater pumping energy is provided by electricity.[777] This is now impacting the electricity department financially, as well as causing server groundwater depletion.[778] It is essential to note that this situation is further aggravated due to the provision of free groundwater for the irrigation sector in some states. This can be seen in the states of Rajasthan, Haryana, Uttar Pradesh, and the state of Punjab.[779] These states are reported to be providing free groundwater under a grant subsidy and the promotion of incentives schemes introduced by the Indian government.[780] These measures have been introduced by the central government to address certain crises such as to ensure that the financially vulnerable have a continuous supply of water. [781] However, some states do not use these criteria to provide free groundwater to some users. it is a decision based on political motivation as happened in the states of Karnataka, Tami Nadu[782], and the state of Punjab. The state of Punjab for instance introduced free electricity in 1997 to agricultural consumers having up to 7 acres of land with effect from the 1st of January 1997. This was immediately extended to all agricultural tube well connections. Then in October 2002, the facility of free electricity was withdrawn till 31st August 2005 and then was

[771] Chaudhuri S, Roy M (2019) Irrigation Water Pricing in India as a Means to Conserve Water Resources: Challenges and Potential Future Opportunities. Environmental Conservation 46: 99–102.
[772] Dajun Shen, V. Ratna Reddy (2016) Water pricing in China and India: a comparative analysis. *Water Policy* vol 18 (S1) 103–121
[773] Scott, C. A, Sharma, B. (2009) Energy supply and the expansion of groundwater irrigation in the Indus–Ganges basin. International Journal of River Basin Management vol 7(2) 119–124
[774] ibid
[775] Kumar, M. D. (2005) Impact of electricity prices and volumetric water allocation on groundwater demand management: Analysis from Western India. Energy Policy vol 33(1), 39–51
[776] Bassi, N. (2014) Assessing potential of water rights and energy pricing in making groundwater use for irrigation sustainable in India. Water Policy 16, 442–453
[777] Dharmadhikary, S, Bhalerao, R, Dabadge, A, Sreekumar, N. (2018). Understanding the Electricity, Water and Agriculture Linkages, Volume 1: Overview, Prayas (Energy Group), Maharashtra, India
[778] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141
[779] Chaudhuri S, Roy M (2019) Irrigation Water Pricing in India as a Means to Conserve Water Resources: Challenges and Potential Future Opportunities. Environmental Conservation 46: 99–102.
[780] ibid
[781] Ranjit Singh Ghuman, Rajeev Sharma, Emerging Water Insecurities in India, Lessons from an Agriculturally Advanced State, (Cambridge Scholars Publishing 2018) p. 229
[782] Kannan, Elumalai (2013) Do Farmers Need Free Electricity? Implications for Groundwater Use in South India. Journal of Social and Economic Development. 15. 16-28

reintroduced in September 2005 and has been in operation since then. These were political decisions for state parties to win the state assembly elections. As no political party is willing to become unpopular with the state farmers. As a result, no tariffs are now applied when water is retrieved from tube wells in the state of Punjab.[783]

For the states to implement a water pricing mechanism to regulate the sustainable use of groundwater, a few policy-level changes need to be introduced. Firstly, the electricity policy needs revisions to introduce separate rates for agricultural use that bring efficiency and achieve sustainable groundwater extraction.[784] Moreover, such rates should be charged based on volumetric supply as happens in the case of public tube wells. Furthermore, to implement this policy uniformly, the common law principle that regulates the groundwater needs to be re-examined. This common law principle links the landownership and groundwater and consequently gives landowners a de facto monopoly over its use. In the irrigation sector, it is applied under the Indian Easement Act of 1882.[785] Given the reality that Groundwater is a shared resource, the government of India has introduced Groundwater Model Bills on several occasions since 1970. The Bill introduced in 2011 is considered very significant since it changed the legal status of groundwater by including it under the public trust doctrine and provided for a unitary framework for water regulation that allows groundwater protection at the aquifer level, something which has not been addressed in the previous Groundwater Bills.[786] This bill was again updated in 2017 to conserve, protect, and regulate groundwater use.[787] Later, to implement this reform uniformly, The Indian Easements (Amendment) Bill, 2018 was introduced under which landowners' right to groundwater has been brought under the jurisdiction of the local government bodies for public use by introducing the “public trust doctrine.”[788] This Bill is indeed a positive step forward to control the overexploitation of groundwater and the introduction of the “Public Trust Doctrine” is a major step forward in modernizing the existing legal regime. However, so far only a few states have enacted laws, and some states, such as the state of Gujarat, which was one of the first states to introduce the groundwater Act even before the amended versions were introduced, are still due to bring its legislation into operation.[789] Therefore, with the lack of a comprehensive legislative framework, it is difficult to abolish the old colonial common law principle and to implement a water pricing mechanism uniformly as it has been done in the case of surface water (With the use of the public trust doctrine, the government has been given right over surface water).

[783] Ranjit Singh Ghuman, Rajeev Sharma, Emerging Water Insecurities in India, Lessons from an Agriculturally Advanced State, (Cambridge Scholars Publishing 2018) p. 229

[784] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

[785] Section 7 of the Indian Easements Act, 1882

[786] Philippe Cullet (2014) Groundwater Law in India: Towards a Framework Ensuring Equitable Access and Aquifer Protection, *Journal of Environmental Law*, Vol 26(1) 55–8

[787] Philippe Cullet (2019) Model Groundwater (Sustainable Management) Bill, 2017: a new paradigm for groundwater regulation, Indian Law Review, 2. 1-14

[788] The Indian Easements (Amendment) Bill, 2018

[789] Philippe. C, Alix Gowlland. G, Roopa. M, Usha. R, Water Law for The Twenty -First Century, National and International Aspects of Water Law Reform in India, P. 123

7.8 Conclusion:

The above-mentioned discussion concludes that the existing water pricing model introduced in the irrigation sector is not in line with the water pricing model introduced under the Dublin statement 1992 and Agenda 21. The pricing model introduced by the Finance Commission has remained restricted to the recovery of O&M costs with a % recovery of capital costs only while the other costs are completely neglected. When it comes to the economic value of water, the discussion highlights that the Finance Commission has failed to recognise water as a recourse. The situation is further aggravated due to the lack of comprehensive legislation to guide the states while fixing water rates. This consequently has led to the adoption of different water policies by the states, with different provisions. Most of the state water policies are not clear regarding cost recovery principles, economic efficiency, and equity. Political interference is another challenge that has become a problem to implement a water pricing system in the states. To solve this problem in the future, the water pricing model introduced in the irrigation sector needs re-evaluation. Firstly, the Finance Commission needs to reconsider its approach to the water pricing model by recognising all the costs as part of the recovery principle to guarantee the water rates set by the state governments ensure full cost recovery, including all the relevant costs incurred during irrigation water supply. It should also recognise the link between the water rates and economic efficiency and promote this notion besides other water conservation schemes, as well as promoting environmental sustainability. It is essential to note that as irrigation is a state subject, it will always be challenging for the central government to ensure the water pricing model introduced by the Finance Commission is implemented uniformly. In this regard, state governments need to take a step ahead and act like the state of Maharashtra and put the irrigation sector above their political interest. They should start with updating and introducing state water policies by introducing water as a socio-economic good. Moreover, policies should have clear provisions about the cost recovery principle and the costs to be covered under it. The state policies should recognise the scarcity value of water and promote water pricing to ensure water conservation. A clear policy is particularly important to make any political party in force legally bound to set water rates appropriately, which would ensure the implementation of the prescribed water pricing model. In addition, political will is also very important to implement an effective water pricing system as seen in the state of Maharashtra.

The reform introduced in the form of water regulatory authorities also needs revision and a uniform application across states. As discussed above, the Planning Commission has already taken steps in this regard by introducing a Model Bill, which suggests setting up a new institutional framework. Nevertheless, implementing new reform in a big country like India is not an easy task since it requires the state's willingness and financial ability to implement such reform. Therefore, instead of putting focus and energy into introducing a new system, it is suggested to revisit the existing water regulatory authority laws and make the necessary changes to them. For this, the Model Bill could be used as guidance, particularly to introduce transparency, accountability, financial independence, and its constitution as an independent statutory body. Furthermore, the existing and new water regulatory authority laws need to reconsider the approach to the cost recovery principle, since none of the existing acts have recognised the recovery of all the incurred costs under the cost recovery principle. Moreover,

the scarcity value of water and water rates should be linked together to ensure economic efficiency. In addition, there is a need for the incorporation of social goals, such as equity, as part of the core objectives of water authority laws, as promoted under the Model Bill. It is essential to note that mere incorporation of the equity principle under authority laws is not enough. Other challenges, such as the system of middlemen and cash payment, also need to be addressed. To achieve this, agricultural policies must also be revised.

Last, but not least, the water pricing policy developed to charge for groundwater, particularly for private tube wells, needs to be revised. For this, a separate policy needs to be enacted to regulate the use of private tubes. Such a policy should introduce water rates based on volumetric consumption. Moreover, the rates should be such to ensure the recovery of the full cost, as well as economic efficiency and environmental sustainability. In addition, as stated before existing agricultural policies need revision to set up a framework to ensure all selling and buying transactions are done through bank accounts to create an auditable trail. This would help to implement the equity principle on a fair basis. Furthermore, to implement this policy uniformly across the states, the government needs to enact comprehensive legislation to introduce groundwater as a public source the same as surface water.

Chapter 8

General overview and Conclusion

This thesis investigated the legal challenges to the implementation/ application of Integrated Water Resources Management (IWRM) in India. It encompassed 5 research chapters. Chapter one (introduction) provided an overview of water resources in India, its availability and utilisation particularly concerning surface water resources, and a potential increase in water demand in the near future, as well as the mediocre quality status of surface water resources in India. It explained how Indian rivers are facing water scarcity and links of all these waters related problems to the sectoral approach adopted in the past to regulate water resources management. By giving the background story, this chapter suggested a potential solution for adoption by the Indian government was IWRM. The following research chapters (from chapter 3 to chapter 7) therefore, investigated the legislative framework adopted in the water sector to ascertain the challenges the application of IWRM may face in India.
Chapter 3 investigated the principle of public participation and decentralised decision-making in the domestic water sector and found both the decentralisation and participation of domestic water users in the water sector are not in line with IWRM. IWRM promotes decentralised water governance by setting up institutions for the direct management of water demand at the local, basin, national, and internal levels.[790] In the water sector in India, decentralisation is an essential attribute for effective governance,[791] here decentralisation is referring to democratic local governance bodies also known as PRIs). PRIs, particularly gram panchayats, are given a specific role in water management under the 73 constitutional amendment act 1992.[792] However, analysis of data collected from the state of Punjab has found that decentralisation of local governance here means a mere transfer of responsibilities without giving them any power or equal status to other government bodies such as the state government. This lack of authority has made gram panchayats subordinate bodies to the other authorities in charge such as DWSS. It further highlighted the need to have a clear power division between the state governments and local governance under the seventh schedule of the Indian constitution, particularly with respect to water. The legal analyses suggested that without this amendment it is hard for the government to implement decentralised decision-making in the water sector at the local level as promoted under the IWRM. Furthermore, to ensure domestic water users' participation in the planning process, the 73rd Amendment Act 1992 needs revision to enshrine provisions to ensure gram Sabha meetings are in line with the National water supply schemes.

Besides constitutional revision, Nation Water Policy 2012 also requires revision as it has failed to recognise the participation of domestic water users in line with IWRM. The principle of "public participation" in IWRM requires the involvement of relevant stakeholders in the planning process in response to specific water challenges. To support this notion, consideration of the definition of the term

[790] Philippe Cullet, Water Law, Poverty, And Development, Water Sector Reforms in India (Oxford University Press 2009) p.65
[791] Sundararajan, Rajnarayan.Indu, Arriving at principles for effective water management by the panchayats in India
[792] 73rd Amendment Act 1992, the Constitution of India

“participation” used in National Water Policy requires analysis. National Water Policy has been a significant document in the introduction of a participatory approach to water management in the water sector. However, this policy has failed on two accounts. Firstly, the word “participation” used in National Water Policy 2012 refers to mere consultation and therefore does not meet the criteria of the “public participation” principle of IWRM. Secondly, the term beneficiaries and stakeholders used in the policy requires more explanation to provide clarity and direct mention of water users. Furthermore, regarding the role of the gram panchayats in the planning process, National Water Policy 2012 requires a clear provision that would leave no room for bureaucratic control in the future.

Participation also requires access to information, which constitutes a condition for effective participation. in this regard, the Informative mechanism, i.e capacity building, was addressed using a thorough literature review. The outcome showed that even though water sector reform has given consideration to ensure states have an effective regulatory setup to provide the capacity-building requirements of the participants, states are however yet to implement this regulatory framework in line with the national water supply program, as is the case in the state of Punjab. The state of Punjab is lacking institutional setups at the block level to strengthen the capacity-building wing. Further, the state is also facing a lack of staff that needs to be addressed to ensure sustainable support to the Gram panchayat and domestic water users.

Regarding Gram panchayats, the present study has also investigated their role in water quality monitoring. This was considered essential since being the lower level of local governance bodies, they are given a significant role under the NRDWP 2013 to conduct routine water quality monitoring of the source at the ground level, to help to identify a problem at an early stage and to determine appropriate control measures. This would then help to conserve water resources and tackle water scarcity at the ground level. However, the research suggests that the implementation of these provisions at the state level is a question of debate since states, for instance, the state of Punjab, are yet to recognise their role in water quality monitoring. On the contrary under its “State Punjab Rural Water Supply Policy 2014” Punjab has left this role with the DWSS along with the community. This is a clear indication of bureaucratic control. The present study has found the gap in the state policy arises due to the lack of any such provisions in the National Water Policy since the Nation Water Policy 2012 has taken no initiative to recognise the role of gram panchayats in water quality monitoring.[793] Besides these legal issues, the literature review has also found gaps in the existing laboratories set up at the state level. This needs to be fixed urgently because mere law implementation without an effective laboratory system to monitor and identify violations will not be effective in tackling the water quality problem.

In addition, the examined fiscal support given to the local governance also suffers challenges. Gram panchayats have three distinct kinds of fiscal powers and all three-need revision. Firstly, the taxation power given to the gram panchayats under the Indian constitution is subject to the state government's discretionary power. This is due to the use of the word “may” which has given the state government ultimate authority over the fiscal devolution without providing any condition precedent. Secondly, for grants in aid, there is a need for direct transfer to gram panchayats with a clear mandate of expenditures. This would help to avoid unnecessary delays in the transfer of funds to them. Thirdly,

[793] National Water Policy 2012

issues faced by the SFCs also need to be addressed to resolve the issues of finical autonomy of the panchayats.

Chapter 4 of this thesis also investigated the principle of “public participation” with a particular focus on farmers' role in the irrigation management system. This research found a lack of uniform legislation to regulate the implementation of PIM at the state level. Due to this reason, states have adopted different approaches to introducing PIM, with some introducing this reform through respective legislations while others through government departments. The biggest challenge found with both approaches is the lack of transfer of ownership to the farmers and bureaucratic control. This notion is followed by the fact that states have ultimate control over irrigation with a larger public interest. [794] It is essential to note that “Self-governance" in canal irrigation occurs when essential water management tasks and activities are divided between the users and the Irrigation Department,[795] but there are no corresponding powers or rights assigned to the farmers except the fiscal responsibility of the maintenance of the watercourse. This indicates that the formation of WUAs is not encouraged by the notion to establish control relations between users and the irrigation department, but by the main purpose of sustaining the irrigation system financially.[796]

The same problem has been found with regard to participation in decision-making. The impression of participation promoted under PIM refers to participation in the planning and project design through to implementation and management. Participation in the planning process, however, is found to be lacking in practice. The challenge to farmers' participation in decision-making arises from the National Water Policy also. The Nation Water Policy 2012 has no doubt been instrumental to the recognition of the role of farmers in irrigation management. Nevertheless, with regard to their role in the decision-making process in irritation water management, it indicates the role given to them depends on the wish of the government.[797]

Moreover, WUAs are in favour of restricting the membership of WUAs to landholders or land occupiers.[798] This indicates that the notion of equity promoted through WUAs is more group specific. It is inappropriate to restrict membership of WUAs to land occupiers since it takes the platform away from tenants[799] who cannot afford to have their own land. The criteria followed by the WUAs to grant membership needs to be widened by including all farmers irrespective of their status. In fact, some states have taken steps in this direction by including tenants as a member in their respective WUAs legislations. Furthermore, to provide more security to tenants and legal status, initiatives have been taken by the central government by introducing the Model Agricultural Land Leasing Act, of 2016, which has given tenants legal status. However, this problem remained at a bigger level since this act is yet to be implemented by the states.

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[794] Sec 69 Mahahrhstar Management of Irrigation System by the Farmers Act 2005

[795] Narain. Vishal. (2003). Institutions, technology, and water control; water users associations and irrigation management reform in two large-scale systems in India pp. 114-115

[796] Ibid

[797] Section 9.6 of the National Water Policy 2012

[798] Land holder means an owner under section 1(q) of the Chhattisgarh Sinchai Prabandhan Me Krishkon Ki Bhagidari Adhiniyam, 2006

[799] Tenant means a person holding land from a Bhumiswami (land holder) under section 2(y) of the Chhattisgarh Land Revenue Code, 1959 Act 20 of 1959

Literature also suggested a conflict of power between the PRIs and WUAs. Findings reveal that it is more appropriate to grant minor irrigation to WUAs. Firstly, they are the right organisations to represent farmers against PRIs since the members of WUAs are all farmers, unlike PRIs. Secondly, though the PRIs are constitutionally mandated bodies, the division of powers in the Indian constitution does not guarantee the supremacy of the gram panchayats and consequently, they are still working under the state government. This, therefore, is not the right organisation to represent the interest of farmers.

The findings of the present study suggested the reform introduced in the form of WRAs has become a challenge to the integrity and legitimacy of WUAs. This reform is no doubt of significant importance since it intends to reduce the role of the government in irrigation water management. Nevertheless, the reform clashes with the jurisdiction of WUAs. Since they have been given exclusive power to perform some of those tasks which are required to be performed by the WUAs under the PIM such as fixing water rates. More importantly, they are a big threat to the integrity of the WUAs since they have the ultimate power to break up WUAs without giving them any reason. The lack of institutional stability seriously hampers local people's effective control over water and requires the state governments to provide statutory status to the WUAs under their respective PIM Acts and review the existing water regulatory authority enactments to define the jurisdiction of WRAs over the existence of WUAs.[800]

The thesis has also investigated the financial independency of the WUAs and found that WUAs have access to multiple financial resources, including grants, donations, borrowing, and water charges, to ensure that WUAs are financially autonomous.[801] Among all these sources, they have more direct control over water charges by being allowed to collect and retain % of the charges under the National Water Policy 2012.[802] However, the investigated framework found some legislative loopholes to implement these provisions in uniformity across the country. This is due to the lack of national PIM and states discretionary power granted to them under the Indian constitution. This has also been found to be encouraging bureaucratic control where collected water rates are deposited to the government department, which then allots some of the rates back. a process that sometimes takes time and can create extensive delays. In addition, lower water rates and a lack of awareness regarding the available financial resources need to be addressed to make them financially self-sufficiently in the future. The present study has further found the challenges faced by the institutions involved to meet the capacity-building requirements of the farmers and its impact on the lower participation of the farmers. These challenges were particularly in the form of a lack of methods and training resources. In other words, the approach adopted by these institutions, which is more theoretical, needs to be changed and perhaps needs to apply farmer-field schools instead of the current approach.

The role of women as stakeholders was also investigated in both chapter 3 and chapter 4. Given their huge contribution to the domestic and agriculture sector, Women are recognised as essential stakeholders in both these sectors and many international conferences have encouraged their involvement in the planning, implementation, and management of water management programs. The

[800] Philippe Cullet, WATER LAW IN INDIA OVERVIEW OF EXISTING FRAMEWORK AND PROPOSED REFORMS, IELRC WORKING PAPER 2007 – 01, International Environmental Law Research Centre

[801] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) p.151

[802] Amarjit Singh, Dipankar Saha, Avinash.C. Tyagi (eds) Water governance challenges and prospects (1st edn. Spring Water 2019) P. 155

literature review suggested that the focus of the international community has shifted from recognising their role merely as water users to makers by promoting their participation as a member of governance bodies. When it comes to India, women's participation is perceived as a basic attribute to achieving effective water governance, and both domestic and irrigation sectors have taken some policy initiatives to recognise the participation of women in decision-making to implement and manage programs. However, despite these efforts, a number of challenges were identified by the present study in the form of individual factors and institutional factors that have impacted the active involvement of women. In addition, a lack of legislative framework particularly to support the women's role as water users in the domestic sector and their involvement as a member of WUAs in the irrigation sector were also found as a gap that needs to be addressed.

In the domestic sector, the role of women was investigated in two separate capacities: as a member of local governance and as domestic water users. Based on literature review findings, the role of women as a member of local governance has been secured both under the Indian constitution and rural water supply schemes by providing reservation provisions. These provisions have secured Women's role at all levels in water resources programs, including decision-making, implementation, and management. This indeed is a step taken in the right direction to change their role from Chooser to maker and shaper. However, findings suggested that these reservation provisions should not be confused with effective participation because, despite these provisions, women's participation has been recorded as being extremely low in local governance. A number of factors were identified both at the individual and institutional levels. At the individual level, factors such as low education, lack of leadership and professional experience outside the household, and lack of confidence were identified. At the institutional level, factors included lack of support from their spouse or family, and cultural, religious, and patriarchal norms and values that are either expressly forbidden to them or at least discourage them from attending male meeting places. These factors have not only impacted the role of women as a member of local governance, but they are also equally responsible for the lower participation of women as domestic users. Besides these factors, women's role as domestic users is also facing some legislative challenges that need to be addressed. Based on drinking water supply policy analysis it was found that women's role as domestic water users has been not considered in the recently developed drinking water supply schemes. The most recent NRDWP 2013 has instead promoted community participation. This however does not guarantee women's role as domestic users in water supply schemes. In addition, National Water Policy has also remained loose on this subject. The National Water Policy has been adopted on three different occasions in 1987, 2002, and 2012 but all these policies failed to give concrete guidelines to make the policy more gender neutral.

When it comes to women's role in the irrigation management system, the adopted legislative framework in this sector in the form of PIM Acts, varies from state to state, with only six states so far recognising women as water uses under their PIM Acts and have therefore been given the right to be a member of WUAs.[803] Besides the lack of legislative framework at the state level to support their role, the National

[803] The Bihar Irrigation, Flood Management, and Drainage Rules, 2003, Chhattisgarh Sinchai Prabandhan Me Krishkon Ki Bhagidari Adhiniyam, 2006, Rajasthan Farmers' Participation in Management of Irrigation System Act, 2000, Madhya Pradesh Sinchai Prabandhan Me Krishakon Ki Bhagidari Adhiniyam, 1999, MAHARSHTRA ACT No. XXIII OF 2005, Uttar Pradesh Participatory Irrigation Management Act, 2009

Water policy is also lacking in recognition of women as essential stakeholders and providing them equal status to men (as discussed above). Movement in this area has begun and the central government has taken the initiative by introducing the National Policy for Women 2016. This policy has not only recognised women as essential water users in the irrigation sector but has also given the significant emphasis on capacity-building programs to create awareness amongst women regarding the conservation and utilisation of water. Nevertheless, this policy is yet to be finalised.

Besides the policy challenges, other challenges in the form of institutional factors and individual factors are also found responsible for lower participation in this sector, like the domestic sector.

Based on the findings in both chapters, it is suggested that the central government not only brings an effective legislative framework to recognise women's role as essential stakeholders, but it is also important to give due consideration to the capacity-building component in relation to women.

Chapters 5, 6, and 7 investigated the application of the principle of water pricing in India. Chapter 5 focused primarily on the rural water supply sector. Findings suggested that water as socio-economic good was introduced in this sector under the centrally and internationally funded water supply schemes. Nevertheless, the water pricing mechanism introduced in this sector is far from reaching its goal. Several challenges have been identified in the form of poor legislation, bureaucratic control, lack of recognition of water as a resource, particularly under water supply schemes, and application of flat rates, etc.

Firstly, with the cost recovery principle, the focus is primarily placed on the recovery of operation and maintenance costs along with some percentage of capital costs only. This indicates that the water supply schemes are mainly concerned with social factors to ensure adequate water supply and do not recognise water as a resource. In addition, a legislative framework introduced in the form of the National Water Policy and Nation Framework Bill 2016 has also failed to fill this gap. The National Water Policy 2012 encouraged volumetric supply, but it failed to elaborate on what costs should be recovered under the water rates.[804] A similar approach was followed under the National Framework Bill 2016. [805] The lack of effective legislation at the national level has left the door open for the states to make a wider interpretation while formulating their water policies, as seen in the state of Punjab's Rural Water Supply Policy 2014. Under this policy, the state has adopted a very vague approach regarding the cost recovery principle by emphasising that the costs should be enough to ensure the recovery of capital costs and the sustainability of the water supply system.

With economic efficiency, findings suggested that the legislative framework adopted at the national level has been more aware and active in recognising water as a scarce resource and has from time to time promoted the link between water rates and economic efficiency. For instance, the National Water Policy 1987, even before its recognition as an economic good at the international level, established the correlation between the water rates and the economic efficiency of water.[806] Subsequently, the National

[804] Section 7.2 National Water Policy 2012
[805] Sec 22(d) Draft National Water Framework Bill, 2016, Draft of 18 July2016
[806] Section 11 National Water Policy 1987

Water Policy 2012[807] and National Framework Bill 2016[808] announced consumption-based tariffs that incentivised conservation and minimise the wastage of water. The state water policy in the state of Punjab also followed a similar approach to control water wastage.[809] However, the data collected from the state revealed that in practice, nothing much is changed in Punjab by showing that a large number of people wastewater regularly by leaving the water supply taps on for no reason. Literature has further suggested a link to the current application of flat rates, which does not provide any incentive to the users and led to the wastage of water. The application of flat rates is the result of bureaucratic control, as illustrated by using the state of Punjab as an example. As discussed above, National Water Policy and National Framework Bill 2016 both have promoted volumetric supply as further followed by the state of Punjab in its policy. Nevertheless, despite the policy framework in place, the state has yet to implement volumetric supply in all villages. As per the data obtained for the present study, meter supply was available only in two villages out of 30, with only one village reported to have it in operational mode. The failure on the part of the state government to implement these provisions is largely because of a lack of penalty provisions to make the authority in charge implement volumetric supply within the time-bound period.

With the equity principle, findings based on both literature and data collection revealed that the notion of equity is linked to the caste system in the rural water supply sector. The Principe of equity in its true sense means to provide subsidies to those who cannot financially afford to pay for water due to their socio-economic conditions.[810] However, in the water sector in India, the socio-economic conditions of users are decided by using caste criteria promoted under the Indian constitution. As per the literature findings, there are four casts prevalent in India namely SCs, STs, OBC, and General caste. People belonging to the first three casts are mostly given concessions in the water sector since they are believed to be discriminated against and deprived of opportunities. This notion is followed under the water supply schemes as well as under the rural water supply policy of the state of Punjab while granting subsidies. However, using the caste system to grant subsidies has further increased the wider gap by depriving those who cannot afford to pay for water. It is, therefore, necessary for the central and state governments to change this approach and familiarise the association between equity and financial income of the users irrespective of the caste they are born in.

Finally, this chapter has addressed some issues faced by the WRAs. The introduction of water as an economic good developed the idea of introducing a new institutional framework in the water sector. This was encouraged with the view to transfer regulatory powers and functions from the government to independent authorities introduced in the form of WRAs. This form of the institution was introduced to check bureaucratic control and political interference. WRAs are vested with the power to deal with water tariffs in the water sector. Findings suggested that water regulatory authority laws have been enacted in several states including the state of Punjab. Punjab introduced the Punjab Water Resources (Management and Regulation) Act, 2020 to establish the Punjab Water Regulation and Development

[807] Section 7.1, 7.2 National Water Policy 2012
[808] Sec 22 Draft National Water Framework Bill, 2016, Draft of 18 July2016
[809] Section 3b Punjab State Rural Water Supply and Sanitation Policy 2014
[810] M Galanter, Competing Equalities --- Law and the Backward Classes in India (Berkeley: UC Press, 1984)

Authority (PWRDA). This Act has empowered the authority to fix water rates for volumetric water supply and such rates should be based on economic principles, efficiency, and equity. However, when it comes to the cost recovery principle, this act has also remained silent, like the State Rural Water Supply Policy 2014. Secondly, when it comes to drinking water supply, the Authority is subject to work under the direction of the state government, particularly while fixing water rates. This, therefore, does not change anything the central government was hoping for.

Another challenge here is a conflict of jurisdiction. As discussed in chapter 3, with the introduction of decentralised decision-making and participatory planning, both gram panchayats and domestic water users have been given the right to fix water rates as part of their right to participate in the planning process of water supply schemes. However, with the introduction of the WRAs reform, authorities have also been given the right to fix water rates with an aim to control bureaucratic control. Though the Act 2020 has brought some clarity by stating that entities supplying water are required to make an application to the Authority for the determination of water rates, more clarification is needed.[811] For example, does this application also include water rates fixed by both the gram panchayats and domestic users? whether the water regularity authority going to work in collaboration with the gram panchayats, and what is the guarantee that the water regularity authority law will not work against the spirit of decentralised decision-making and participatory planning?

Chapter 6 investigated the application of the water pricing mechanisms implemented in the urban water supply sector. The concept of water pricing was introduced in the urban sector as a result of centrally funded water supply schemes, along with the National Water Policy. For instance, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) introduced the principle of full cost recovery of operational costs through appropriate user charges.[812] The National Water Policy introduced other essential components such as economic efficiency and equity along with the cost recovery principle. The state governments further introduced water pricing mechanisms under different tariff structures based on volumetric and non-volumetric methods. Following this criterion, the three most popular methods were investigated, i.e connection fee, water tax, and IBT. Findings revealed that none of the adopted methods have been able to achieve any of the objectives proposed under the international water pricing policy, i.e revenue sustainability, economic efficiency, equity, and environmental sustainability. Challenges were identified in the form of a poor legislative framework and bureaucratic control.

The biggest challenge found in the state of Punjab and the city of Ahmedabad (state of Gujarat), which has adopted a connection fee method and water tax method to charge for water, is the approach of the government towards the water. Findings highlighted that the state government of Punjab and the Municipal Corporation of Ahmedabad are more concerned with the social aspect of water than its economic value. This is more evident in the adopted methods since both connection fee (fixed based

[811] Section 18 of the Punjab Water Resources (Management and Regulation) Act, 2020 Act 2 of 2020

[812] Frederick Lee, Veena Aggarwal, James Nickum; (2016) Urban domestic water pricing in India and China. *Water Policy* vol 18 (S1): 68–82

on the size of the plot or pipe etc) and water tax methods (water rates based on the percentage of the property) have no link to equity, environmental sustainability, economic efficiency of water, and revenue sustainability. To improve the situation in the future, the state government of Punjab and the municipal corporation of Ahmedabad are proposed to make some legislative changes in their respective legislations. For instance, the state of Punjab needs to modify its Act of 1976 to introduce volumetric supply along with provisions to include all four pillars of the water pricing system introduced at the international level. When it comes to the city of Ahmedabad, the Municipal Corporation of the city is required to implement its water policy by ensuring the inclusion of provisions to guide the MCs to implement volumetric water supply, as well as to have direct provisions to ensure that water rates are linked to economic efficiency, revenue sustainability, environmental sustainability, and equity.

A similar challenge was found in Delhi (the capital of India). Delhi has applied an IBM under which water rates are based on volumetric water supply in contrast to the other two methods. This method is recorded to be more effective to ensure economic efficiency and equity since the bill is determined by multiplying the volume of water used in the billing period which helps to reduce the wastage of water. Moreover, in line with the equity principle, it allows lower-income households to lower rates for water. However, findings revealed that the city is facing several challenges to implement this system effectively. Due to this, the IBT has not been able to achieve any of the objectives of the water pricing policy. Firstly, with revenue sufficiency, water rates are not linked to any costs, which has led to Delhi Jal Board being in financial debt. Secondly, IBT requires a metered water supply, which is not uniform across the city. Both these challenges are linked to a lack of legislative framework and bureaucratic control. Regarding the metered water supply, the Delhi Water and Sewage (Tariff and Metering) Regulations 2012 was introduced to regulate the metered water supply in the city, but its application was suppressed by a free water policy issued by the government of Delhi in 2013- 14. Under this people who install meters were entitled to get free water up to 20 kilolitres per month. Though this was an attempt to encourage people to install water meters, it worked against the equity principle by further providing free water to people, helping to push the city further into water debt. This analysis shows that the city requires effective policy legislation in place to ensure the volumetric supply and provide provisions to guide the DJB while fixing water rates. Secondly, the membership of the DJB is from government departments, which shows the direct control of the government. Due to these reasons, the Delhi government enjoys discretionary power while fixing water rates.

Chapter 7 investigated the water pricing system introduced in the irrigation sector. The findings revealed that the water pricing system in this sector was introduced under the irrigation commission in 1972 and has further been implemented through major, medium, and minor irrigation projects. Despite this, a number of challenges, particularly in the form of a weak legislative framework, lack of guidance from the irrigation commission, lack of volumetric supply, etc., were found that have made it challenging for the irrigation sector to implement a water pricing system in line with the international water pricing policy.

At the national level, a challenge to revenue sustainability was identified in the approach adopted by the finance commission. The finance commission has remained restricted to the recovery of O&M costs with a % recovery of capital costs only, while the other costs are completely neglected. At the state level, the problem is further aggravated due to the lack of a comprehensive legislative framework. In the absence of a national framework, some states have adopted their own state water policies, but their approach toward promoting water pricing systems in their respective states varies. Analysis revealed that none of the state water policies have clear provisions regarding the cost recovery principle, with some emphasising only operation and maintenance costs, while only 3 states happen to recognise capital cost as part of the recovery principle. Nevertheless, no one of them has paid attention to the other costs incurred during the water supply. This shows that state governments and irrigation commissions are under the impression that water can be treated more like a social good.

When it comes to economic efficiency, the pricing model promoted by the irrigation commission and further introduced by the states has not correlated with the water rates to be levied to ensure gains in economic efficiency. For most states, it was not in their water policies except for the state of Madhya Pradesh, Kerala, Maharashtra, and Rajasthan which have recognised economic efficiency as an essential component of water pricing. [813] This indicates that the scarcity value of water is not well understood by the central government and most states. To encourage states to consider how water efficiency can be increased through water rates, the irrigation commission should consider playing a pivotal role in this as they were a major contributor when introducing the concept of water pricing into this sector. The commission needs to promote water rates and economic efficiency together in contrast to its existing approach of concession and incentives to improve water use efficiency.[814]

Another challenge was found with the volumetric water supply. A volumetric water supply, if implemented correctly, would help in many ways such as to increase economic efficiency by ensuring that the pricing is based on use and would also support financial stability, reliability of supply, and increase of water availability. [815] By following this notion, the 14th finance commission set up in 2013 has recommended the full volumetric measurement of the use of irrigation water.[816] However, despite this only four states including the states of Jharkhand[817], Karnataka[818], Maharashtra[819], and Rajasthan[820], have so far introduced volumetric supply into their water policies. While the actual implementation has taken place only in the state of Maharashtra so far, where water rates are based on the volume of water supplied.[821] The biggest challenge here was found to be a lack of guidance both

[813] The state of Kerala water policy 2008, state of Madhya Pradesh water policy 2003, state of Maharashtra water policy 2019, and state of Rajasthan water policy 2010

[814] Central Water Commission (CWC) (2017). Pricing of Water in Public System of India. Information System Organization, Water Planning and Project Wing, CWC, Government of India, New Delhi

[815] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

[816] The Fourteenth Finance Commission of India 2015-20, Government of India, New Delhi

[817] Jharkhand state water policy 2011

[818] Karnataka State Water Policy 2019

[819] Maharashtra state water policy 2019

[820] Rajasthan State Water Policy, 2010

[821] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

under the finance commission's recommendations and the National Water Policy 2012 since they both have promoted volumetric water supply but not provided guidelines to the states on how to implement this system into practice.

Some policy-related challenges were also found with WRAs. As discussed above reform was introduced in the form of WRAs to fix and regulate the water tariff system in the water sector and some states have taken an action in this regard by introducing WRA acts in their respective states. However, only the state of Maharashtra is reported to have an operational WRA. Nevertheless, the policy analysis of all WRA enactments revealed that all the enactments have followed the same approach, which was promoted under the finance commission. Firstly, with the cost recovery principle, the Acts have remained restricted to recover mainly operation and maintenance costs. Moreover, with regard to economic efficiency, all states except the states of Punjab and Haryana, have water regulatory authority enactments that have failed to recognise the link between water rates and water use efficiency. The third challenge is water regulatory authority laws and the missing link to the equity principle. except by the water regulatory authority laws of the states of Punjab and Haryana, other states are yet to recognise the link between water rates and the equity principle. Even though the planning commission of India introduced a Draft Model Bill to address this gap. the proposed Model Bill intends to introduce the concept of appropriate, prudent, fair, equitable, and affordable charges and costs for accessing and using water services, especially for the weaker and disadvantaged sections of society. However, this bill again failed to provide an appropriate mechanism for the states to follow to achieve this objective.[822]

Moreover, the application of the equity principle was also found missing in several state water policies. The literature suggested that only five states, namely Himachal Pradesh (Policy- 2013), Jharkhand (Policy 2011), Kerala state (policy-2008), Maharashtra (policy 2019), and Rajasthan (Policy 2010), have recognised the need to rationalise water rates with the interest of small and marginal farmers in mind. The state of Himachal Pradesh and Jharkhand have also proposed a mechanism of cross-subsidization to implement the principle of equity into practice.[823] however, after analysing all enacted state water policies, it is found that other states are yet to provide legal backup to this principle.

The analysis of the water pricing policy developed to regulate the use of groundwater also raises significant concerns, particularly with the use of private tube wells for irrigation use. The literature review revealed that the water use from private tube wells is currently charged as subsidized credits and electricity. The issue with this is the electricity charges are levied based on the connected load rather than the consumption of units of power, and consumption of water and therefore does not recognise the economic value of water. This has not only triggered groundwater exploitation but also caused huge financial losses to the state's electricity board.

[822] Sujit Koonan, Loveleen Bhullar, Water regulatory authorities in India, the way forward? IELRC Policy Paper 2012-04

[823] Himachal Pradesh (Policy- 2013), Jharkhand (Policy-2011), Kerala state (policy-2008), Maharashtra (policy-2019), and Rajasthan (Policy-2010)

To regulate the use of private tube wells effectively, firstly, the electricity policy needs revisions to introduce separate rates for agricultural use that bring efficiency and achieve sustainable groundwater extraction.[824] Moreover, such rates should be charged based on volumetric supply as happens in the case of public tube wells. Furthermore, to implement this policy uniformly, the common law principle that regulates groundwater under the Indian Easement Act of 1882 needs to be re-examined. This common law principle links the landownership and groundwater and consequently gives landowners a de facto monopoly over its use. Though the government of India has introduced the Indian Easements (Amendment) Bill, 2018 to bring the use of groundwater under the control of the central government by applying the principle of public trust doctrine. Nevertheless, the application of the notion at the state level is still a big challenge due to the lack of a comprehensive legislative framework. In order to solve this problem in the future the government needs to enact comprehensive legislation to introduce groundwater as a public source the same as surface water

1. Overall Findings to Support the Implementation of IWRM In the Water Sector in India:

From a legal perspective to implement IWRM in the water sector in India, the government of India is suggested to make some changes in their legislative framework: firstly, the government of India needs to introduce some changes in their National Water Policy 2012 to clarify the definition of beneficiaries as well as to introduce clear provisions to ensure the participation of water users and gram panchayats in the decision-making process. These policy provisions also need to be followed by the state water policies. Further, there is also a need to define power division under the seventh schedule of the Indian constitution between the central, and state governments and gram panchayats particularly with respect to water. this would help the gram panchayats to be set free from government control and work more effectively. Moreover, the constitutional amendment also needs to be made to avoid the conflict of jurisdiction between the gram panchayats and WUAs. Since WUAs are the more appropriate organisations to represent the farmers. it, therefore, is suggested to bring the subject of minor irrigation under the jurisdiction of WUAs.

Regarding the farmer's participation, there is a need for a national comprehensive law to regulate the functioning of WUAs. This would help to implement the PIM at the state level in line with the national law. Moreover, the national law also needs to ensure that the participatory provisions make clear reference to the transfer of ownership to the framers to avoid bureaucratic control in the future. This legislation is further required to bring provisions to grant landholders and tenants equal rights to be a member of the WUAs irrespective of the legal status of the tenants under the tenancy law. When it comes to the role of women again National water policy and drinking water policy both need to be amended. In addition, to support women's participation in the irrigation sector the national policy for women 2016 needs to be implemented. Moreover, financial support and Capacity building components for all the stakeholders need to be strengthened by addressing the discussed gaps.

[824] Fakeha. P, Pratibha. K, Ajai. S (2021) Irrigation water pricing policies and water resources management, Water Policy 23, 130–141

To implement a water pricing mechanism, all three sectors namely rural, urban and irrigation needs to implement volumetric supply and further require legislation to not only support the volumetric supply but also ensure that the water rates are fixed by considering all four pillars of water pricing policy introduced at the international level to their best effort. This firstly requires changes in the National Water Policy and National Framework Bill 2016 and then for the state governments to follow these changes in their respective legislations. In addition, the Finance Irrigation Commission also needs to change its approach and promotes water more as socio-economic good. regarding groundwater, the central government needs to introduce groundwater as a public good under the public trust doctrine and introduce more robust legislation to price groundwater under metered supply. Moreover, legal gaps found in the discussion regarding the WRAs need to be addressed.

2. Future Proposed Work:

In this project, an attempt was made to investigate the legal framework to see whether it supports the application of IWRM in the water sector in India or not and suggest necessary changes to help the implementation of IWRM in the future. Nevertheless, this work has left some doors open for the researchers to conduct their research to bring more knowledge into the light in the future. For instance, a researcher can investigate the roles played by the water users in water management at the ground level by collecting data to see what other changes need to be made in the capacity-building component to strengthen their participation in water management such as what kind of programs and subjects would be more effective to create awareness among people to control water wastage. Moreover, what do domestic users and gram panchayats think of their given roles? and what suggestions are made by them to improve the effectiveness of their role given under the legislation?

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Appendix 1

DO: Permissible limit of Indicator Dissolved Oxygen is 6 mg/l or more for Category A, 5 mg/l or more for Category B, and 4 mg/l or more for Category C, and D

River	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Baitarani	6.8 -9.3	5.4 -11.3	5.9- 9.8	5.2- 8.8	7.4-8.0	5.6- 8.8	6.3- 9.2	6.1- 9.0	5.6- 8.8	5.2-11.9	5.6- 10
Beas	5.2 - 11.5	7- 12	6.8- 11.8	4.8- 13	5.8- 11.0	5.9- 12.8	3.8- 12.5	6.4- 11.8	5.8- 11.2	5- 12.5	3.8- 12
Brahmani	5.2 -9.8	6.1 -10.2	6- 9.6	5.1- 13.8	4.6-8.9	1.9 -8.9	5.3- 9.7	4.5- 18.3	5.6- 12	5.0-9.9	5.2- 12.0
Brahmaputra	1.1 -10.5	1.2 -11.5	1.1- 9.4	2- 10.5	4.2- 10.2	5.1-10	3.3- 9.6	4.4- 10.5	3.6- 9.4	4.4 -3 0	4.2- 11
Cauvery	0.1 -12.6	2.1 -13.5	3.3 -9.9	0.3- 9.8	2.7- 8.9	0-12.4	0.6- 14	1.5- 10.3	0.4- 12.2	1.7- 10.9	1.3- 12.9
Ganga	2.7-11.5	4 -11	0.3 -13.2	3.2- 12.8	2.2- 11.9	1.4-11	1.2- 11.6	4.3- 11.2	3.6- 12	4- 14.3	0.6 -14.1
Godavari	3.1 -10.9	3.2 -9.3	2.4 -9.2	0.8 -8.7	1.1- 9.6	3.2-7.5	1.2- 11.3	3.2- 12.3	1.8- 14.2	1.2- 12.2	0.0- 12.6
Krishna	2.9- 10.9	0.7 -12.6	0.4- 9.2	1.4 -8.8	3.0- 8.5	3.0-10	1.1- 9.8	0- 12.6	15- 11.8	1.7- 15.8	0.0- 15
Mahi	0.2 -8.5	2.9 -10.1	2.7- 8.7	4.1 -11.1	7.3- 12.1	0.4-10.7	4.6- 13	3.5- 8.6	3.5- 9.9	3.2- 8.9	4.41 -20
Mahanadi	1.3- 10.4	4.7 -10.1	4.4- 9.4	4.5 -10	4.7- 8.5	6.2-8.9	0.8- 8.9	0.2- 11	4.4- 11	4.9- 10.5	4- 12
Narmada	5.8 -9.8	4.5 -9.5	5.5- 9.6	4.8 -10.9	6.2- 11	6.2-10.4	4.9- 13	4.2- 11.5	4.8- 11	6.2- 9.9	5.8- 13
Sutlej	3.8- 11.4	3.4 -11.5	1.6- 10.3	2.8 -14.2	2.8- 10.6	3.2-11.9	1.2- 12.4	0.6- 11.4	4.1- 11.1	3.8- 12	4- 12
Tapi	4.8- 8.8	3.1 -10.4	1.2 -8.7	4 -8.4	4.6- 9.7	3.7- 8.7	2.1-8.8	3.7- 8.2	1-8.1	3.2- 7.6	3.3-7.7
Yamuna	0.1 -22.7	0.3 -22.8	0.3 -19.5	0.5 -17.3	1.3 -18.8	0 -17.7	0.0 -20.6	0.0 -17.9	0.0 -21.1	0 -17	0.0 -11.4

BOD: Permissible limit of BOD 5 days 20C is 2 mg/l or less for Category A, 3 mg/l or less for Category B, and C

River	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Baitarani	2.0- 6.8	0.3- 3.5	0.4 -2.6	0.4- 4.3	0.3- 1.8	0.4 -2.2	0.8- 2	0.6 -3.4	0.4 - 2.6	0.3- 3.2	**0.3- 2.8**
Beas	0.3- **5.0**	0.1 -**6**	0.2- **4.8**	0.2- **10**	0.2- **3.2**	0.1- 2.9	0.1 -**7.6**	01 -**4.3**	0.1- 2.8	0.1- 1.5	**0.1 -8.7**
Brahmani	1.5- 6.0	0.2 -6	0.2-7	0.3 -5.2	0.3 -5.4	0.3 -4.9	0.4 -6.2	0.2 -5.8	0.4 -5.6	0.6- 6.6	**0.6 - 7**
Brahmaputra	0.1-3.9	**0.4-3.5**	**0.4-4.3**	0.3-**6.2**	0.3-**5.7**	0.1-**3.4**	**0.4 -5.4**	0.3 -**5.4**	**0.6- 6.3**	0.3-**9.2**	**0.4- 3.6**
Cauvery	0.1 -26.6	0.2 -10	1- 9	1- 12	1- 6	0.1 -38	0.1- 23	0.1 -17	0.1 -27	0.1 -7.2	**0.0 -21.9**
Ganga	**0.5 -16.8**	**0.8 -27**	**0.7 -14.4**	0.1-**15.2**	0.1- **16.4**	0-**14**	0.5 -**21.0**	0.2- **16**	0.2- **15**	0.2-**11**	0.**7 -27**
Godavar**i**	0.5 -78.0	1.7-53	0 .2-15	0.5- 20	1.2- 32	0.2-36	0.2 -20	0.0- 26	0.3- 60	0.0-37	**0.1 -40**
Krishna	0.2 -**10.0**	**0.5-17**	0 .3-9	**0.4 -40**	**0.4- 14.8**	0.1-**9.8**	0.2 -17.6	0.3- 9.6	0- 10	0.4-16	**0.0- 24**
Mahi	0.1-3.0	0.**5-3**	0.3-**4.9**	0.2- **5.9**	1.1- **8.5**	0.3-**5.7**	0.2 -**6.8**	0.1- **4.0**	**0.22 -4.0**	**0.6 -8.0**	**0.3 - 6**
Mahanadi	1.0 -7.6	0.3 -5.6	0.2 -4	0.2 -16	0.2 -3.8	1.2 -3.6	0.2 -4.6	0.2- 7.1	0.2- 14.3	0.6- 3.6	**0.4 -4.9**
Narmada	0.1 -3.8	0.4 -3.3	0.2 -3.8	0.6 -4.5	0.4 -3.7	1.2 -3.5	0.2 -11.4	0.2 -30	0.21 -5.4	0.8 -5.0	**0.1 -7.9**
Sutlej	0.1 - **45.0**	0.1 -24	0.1 - 64	0.1 -40	0.1 - 32	0 -28	0.0 -48	0.1 -55	0.1 -40	0.1 -32	**0 - 27**
Tapi	0.6- 10.0	1- 10	0.7- 36	1- 25.1	0.3- 24	1.1 -25	0.1 -21	0.6 -12	0.4- 16	1.2- 10	**0.8- 18**
Yamuna	1.0- **36**	1 -**58**	1- **40**	**0.8- 59**	1.0 - **144**	0 -**93**	**0.4 -70.0**	0.2 -**103**	**08 -84**	0.2 -**41**	**0.8- 113**

pH: Permissible limit of pH is between 6.5 and 8.5 for categories A, B, and D, between 6-9 for Category C, and between 6.0-8.5 for Category E

River	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Baitarani	**7.3 -8.3**	**6.7** -7.8	**6.6** -8.1	**7 -8.6**	**7.6 -**8.4	**7.3** -8.2	**7.5 -**8.2	**6.7- 8**.4	**6.6**-8.3	**7.1** -8.4	**7.1- 8.4**
Beas	**7.1-8.7**	**7.3-8.9**	6.9-8.5	7-8.8	7.0-8.2	6.2-8.9	7.0-8.4	7.1-8.5	6.2-8.8	6.5-8.87	**6.6-7.9**
Brahmani	**7.0** -8.4	**6.6** -8.4	6.3- 8.4	6.3- **8.7**	**6.9**- 8.4	**6.7 -**8.5	6.4- 8.4	**6.6**- 8.5	**6.6-** 8.5	**6.7**- 8.5	**6.4 -8.5**
Brahmaputra	6.5- 9**.0**	6.4- 8.4	5.2- **9**	5.9- **7.6**	**6.9-** 8.0	5.9- **7.9**	6.1 -8.1	6.1- 8.1	6.5 -8.1	6.1 -8.5	**6.6-** 8.1
Cauvery	0.2- **9.2**	**7- 9.2**	**6. 6-9**	6.2- **9.5**	**7.0 -9.3**	6.5- **8.8**	6.5- **8.8**	6.5- **8.9**	6.5- **8.9**	4.3- **8.9**	**6.6-9 .1**
Ganga	6.4- 9.0	**6.8 -8.9**	**7 -8.8**	6.1-9	**7.0- 8.88**	6.1--**8.8**	6.1- **8.9**	6.5- **8.9**	**6.7- 9.0**	**6.7- 9.1**	**5.9- 9.1**
Godavar**i**	**7.0- 9.0**	**7.1- 8.7**	6.5 -**9**	**6.7- 9.1**	**6.65- 9.11**	5.9 -**8.9**	5.2 -**9.6**	6 -**9.2**	5.4- **8.9**	6.4 -**9.1**	**6.51-9.3**
Krishna	**6.8 -9.5**	**6.7- 8.9**	**6.7- 9**	6.5- **9.9**	**6.32- 9.30**	6.2- **9.1**	5.8 - **8.9**	**6.7- 9.0**	6.5- **9.1**	**6.9- 8.7**	**6.15- 8.8**
Mahi	**7.1-9.2**	**7- 8.8**	**7.4-9.2**	**7.5 -9**	**7.2- 8.9**	**7.6- 8.89**	**7.2- 8.9**	**7.1- 10**	**7.4- 8.7**	**7.1- 9.1**	**7.43- 8.6**
Mahanadi	**7.3- 8.9**	6.5-**8.6**	6.3- **8.8**	6.1-**8.7**	**6.97- 8.9**	**7.3 -8.54**	**6.7- 8.8**	**6.7- 8.8**	**7.0 -9.3**	**7.1**- 8.5	**7.0 -8.4**
Narmada	**6.9 -9.3**	**7.1-** 8.5	**7-8.6**	3.3 -**9**	**7.1-8.6**	**7.5 -8.8**	**6.8- 10**	6.5- **8.9**	**7.2** -8.5	**7.1- 8.6**	**7.1- 8.8**
Sutlej	**6.8- 8.8**	**6.9- 8.9**	**7.1**- 8.3	**7.1**- 8.3	**7.1- 8.26**	**7- 8.6**	**7.0 -**8.5	6.3 -8.5	4.2- **8.6**	**6.8 -8.69**	**6.8 -8.7**
Tapi	**7.4- 9.0**	3.1- **9.2**	3.1- **9.5**	**7.2- 9.4**	**7.7-9.28**	**7.3-** 8.5	**6.6- 8.9**	6.2- **8.9**	**7.0 -8.7**	**7.0 -8.7**	**7.02- 8.8**
Yamuna	**6.7- 9.8**	**6.6- 10**	**6.8 -9**	**6.8 -9.1**	**7.14 -9.5**	5- 8.4	**6.8- 9.5**	**7.0 -8.8**	6.1- **9.4**	**6.9- 8.8**	6.1**- 8.9**

Total Coliform Organism MPN/100 ml shall be 50 or less for Category A, 500 for Category B, and 5000 for Category C

River	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Baitarani	900-22000	330-16x10^3	640-92000	790-24x10^3	1400-4300	330-5400	940-5400	630-5400	470-16000	350-54000	230-17000
Beas	2-2400	2-2400	2-5x10^4	2-11x10^3	2-11x10^3	0-2400	2-1600	7-2400	7-39000	8-2400	34-1600
Brahmani	80-90000	90-24x10^3	490-28x10^3	490-16x10^4	940-5400	210-54x10^3	750-21x10^3	940-22000	330-92000	330-92000	78-200000
Brahmaputra	360-240000	360-24x10^4	360-24x10^4	300-24x10^4	1-24x10^4	0-24x10^4	1-24x10^4	1-24000	0-3000	0-15000	0-2800
Cauvery	39-16x10^3	4-22x10^3	2-5x10^4	2-9500	90-3500	40-28x10^3	27-5400	7-9200	70-15000	90-6200	2-22000
Ganga	300-25x10^5	47-45x10^5	11-45x10^5	13-45x10^5	1-25x10^5	0.28x10^5	0-101x10^5	2-65x10^5	3-14x10^5	5-25x10^5	30-5x10^6
Godavari	8-5260	70-68200	4-22x10^4	2-33x10^3	2-31x10^3	0-2200	3-28x10^3	5-16000	2-2400	7-2400	3-2700
Krishna	17-33300	6-7x10^4	15-124x10^3	17-84x10^3	4-86x10^3	0-17x10^3	8-16x10^3	8-170000	2-4000	4-16000	50-2700
Mahi	3-24000	4-24000	4-16000	3-14x10^3	3-180	4-160	0-210	3-170	4-110	7-28	4-201
Mahanadi	15-30000	4-35X10^3	3-92X10^3	3-92X10^3	14-92X10^3	27-35x10^3	15-16x10^4	5-1600000	10-160000	10-160000	11-200000
Narmada	9-2400	4-1600	3-2400	3-2400	3-2400	7-1600	0-2400	2-1600	4-11000	4-1600	5-900
Sutlej	8-35000	3-3x10^4	7-2x10^5	1-35x10^4	1-17x10^4	3-17x10^4	12-11x10^4	4-250000	6-1x10^5	4-90000	27-100000
Tapi	40-2100	30-930	3-5X10^5	2-46X10^4	5-11X10^4	17-46x10^3	0-46X10^4	14-39000	9-9300	22-24000	26-1600
Yamuna	27-26.3x10^6	110-171x10^7	21-1103x10^6	14-307x10^6	7-231x10^7	0-32x10^7	0-103x10^6	4-23x10^9	13-39x10^7	10-16x10^8	12-20x10^8

Appendix ii

Data sample from the Gram Panchayats

Part I- domestic users and water pricing

1. Do you provide water to the whole village?

☐ Yes
☐ No
☐ Other

2. what is the main source of water?

☐ Groundwater ☐ Canal
☐ Both ☐ Tank
☐ Other

3. How many times do you supply water during the day?

☐ Once ☐ Twice
☐ Three times ☐ all-day
☐ other

4. Do you use a metered supply?

☐ Yes
☐ No

If yes, then how does this work

5. What is the difference between metered water supply and a normal water supply

6. Is government water supply optional for people?

☐ Yes
☐ No

7. Are there any houses exempted from paying the bill?

☐ Yes
☐ No
☐ if yes then how many and why

8. How much do you charge for water supply and how do you collect the payment?

9. Does water charges are fixed by following the below-mentioned criteria

☐ size of the house ☐ income of the user
☐ number of the house members

10. If the water bill is fixed by following the size of the house, then how much is charged maximum- minimum

11. Has it ever happened that people have refused to pay the bill?

☐ Yes
☐ No
☐ if yes then how many times and what actions were taken?

12. Has anyone ever complained about some people wasting water?

☐ Yes
☐ No
☐ if yes then how many times and what actions were taken?

13. What is the percentage of the water recovery bill?

14. Does water bill recovery cover the operation and maintenance expenses?

☐ Yes
☐ No

15. How often government revise the water bill?

16. Is there any medium for people to use to express their opinion about the quality of water, service, and price?

☐ Yes
☐ No

If yes, then how often people have expressed their opinion on what matters?

Part II – Demography

17. What is your age range?

☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39
☐ 40-64

18. What is your biological sex?

☐ Male ☐ Female ☐ Prefer not to say

19. which cast do you belong to?

☐ jatt ☐ schedule ☐ Prefer not to say

Data samples from the domestic users

Part I –water pricing for domestic sector (General public) villages

1. What are the main sources of water you use for domestic purposes?

☐ Hand pumps(groundwater)
☐ Tap (government source)
☐ Both
☐ Well
☐ A tank
☐ Other

In the case of water supplied by the government

2. How many times do you get a water supply during the day?

☐ Once
☐ Twice
☐ Three times
☐ Four times
☐ Whole day

3. Does the government provide a limited amount of water during the day or every time you get water, you can save as much as you want?

4. Is the water supply provided by the government reliable?

☐ Yes
☐ No
If not, then why

5. Are you satisfied with the service you receive from the government?

☐ Yes
☐ No
If not, then why

6. Is receiving water from the government source optional?

☐ Yes
☐ No

7. Do you have metered water supply?

☐ Yes
☐ No

8. How much do you pay and how do you pay?

9. Do you always pay on time?

☐ Yes
☐ No

10. Have you ever skipped paying the water bill?

☐ Yes
☐ No
If yes, then how many times and what actions were taken by the gram panchayat?

11. Is the water bill fixed for a whole year? If not, then how often government revises the bill?

12. Do you think the water bill is reasonable according to your financial income?

☐ Yes
☐ No

13. Have you ever been exempted from paying tariffs for water you receive from the government and why?

☐ Yes
☐ No

If yes, then how many times and why

Part II --- In the case of groundwater used for domestic purposes:

14. How much do you pay and how do you pay for groundwater supply?

15. Do you think the water bill is reasonable according to your financial income?

☐ Yes
☐ No

16. Have you ever been exempted from paying tariffs?

☐ Yes
☐ No

If yes, then why and how many times and why?

Part III public role in water management:

17. How do you store water?

☐ A big tank
☐ three- four buckets
☐ Others

18. How long does that stored water last?

- ☐ One day
- ☐ Two days
- ☐ Three- four days
- ☐ One week
- ☐ Others

19. How many people live in the house?

Part IV Summer season:

20. How many times do you make tea and coffee during the day?

- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Other

21. How many times do you cook during the day?

- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Other

22. How many times do you take a shower during a week?

- ☐ everyday
- ☐ Twice a week
- ☐ Three times a week
- ☐ Other

23. How often do you wash your clothes during the week?

- ☐ everyday
- ☐ Twice a week
- ☐ Three times a week
- ☐ Other

Part V ----- Winter season

24. How many times do you make tea and coffee during the day?

- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Other

25. How many times do you cook during the day?

- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Other

26. How many times do you take a shower during a week?

- ☐ everyday
- ☐ Twice a week
- ☐ Three times a week
- ☐ Other

27. how many times do you wash clothes during a week?

- ☐ everyday
- ☐ Twice
- ☐ Three times
- ☐ Other

28. Do you think some people wastewater?

- ☐ Yes
- ☐ No

If yes, then did you try to stop them

- ☐ Yes
- ☐ No

29. Did you inform the concerned gram panchayat about this?

- ☐ Yes
- ☐ No

If yes, then what actions were taken by the gram panchayat?

Part VI----- public role in decision making

30. Have you ever participated in any program regarding water management in your village?

- ☐ Yes
- ☐ No

If yes, then can you provide some details:

31. Has the gram panchayat ever asked you to share your opinion regarding water management in the village?

- ☐ Yes
- ☐ No

If yes, then can you provide some details:

32. are you aware of any medium to make your voice heard about your ideas of how to save more water or how to control pollution?

- ☐ Yes
- ☐ No

If yes, then can you provide some details:

33. Has gram panchayat ever consulted you while fixing the water supply rates?

- ☐ Yes
- ☐ No

34. Have you ever been asked by the panchayat to share your opinion about the price you pay for water or the service you receive?

- ☐ Yes
- ☐ No

If yes, then how often?

35. Do you think Gram panchayat will take note of your opinion?

- ☐ Yes
- ☐ No

Part VII----Awareness regarding water quality status:

36. What do you think about the quality of water you receive from the gram panchayat?

☐ Good
☐ Bad
☐ Very bad
☐ Others

37. Have you ever made an official complaint about this?

☐ No
☐ Yes

If yes, then to whom the complaint was made and how and what action had been taken by the authorities?

38. What do you think about the status of small, ponds, and small rivers in their area, if any

☐ Good
☐ Bad
☐ Very bad
☐ Others

39. If you are not happy with the status of your surrounding water bodies, then to whom the complaint was made, and how and what action had been taken by the authorities?

Part VIII – Demography

40. What is your age?

☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39
☐ 40-64

41. What is your biological sex?

☐ Male ☐ Female ☐ Prefer not to say

42. which cast do you belong to?

☐ jatt ☐ schedule ☐ Prefer not to say

Data sample from farmers

Part I---- farmers and water pricing

1. What is the main source of water you use for agriculture?

☐ Tube wells (groundwater)
☐ Canal
☐ Both

2. What crops do you grow in the summer season and how often in a year?

3. What crops do you grow in the winter season and how often in a year?

4. Do all crops require the same amount of water?

☐ Yes
☐ No

5. Do you get the same amount of water for each crop you grow?

☐ Yes
☐ No

If no, then how much water do you receive for the following crops

Paddy
Wheat
sugarcane
Cotton
Oilseed crops

6. How do you store extra water?

Part II---In the case of canal water

7. How long do you get water supply for your crop?

☐ Twice
☐ Four times
☐ Until the crop reaches its maturity
☐ Others

8. Do you get water supply under any agreement with the canal officer/ government?

☐ Yes
☐ No

If yes, then what agreement and how long is the agreement last?

9. Is water price fixed for all crops and if so, then how much do you pay?

10. If water price varies from crop to crop, then how much do you pay for the following crops:

Paddy
Wheat
sugarcane
Cotton
Oilseed crops

11. Do water rates differ for flow irrigation and lift irrigation?

☐ Yes
☐ No

12. How much do you pay for canal water and how do you play?

13. Do you think the water price is reasonable according to your financial income?

☐ Yes
☐ No

Part III in the case of groundwater:

14. How much do you pay for groundwater and how do you pay?

15. Do you think the water price is reasonable according to your financial income?

☐ Yes
☐ No

16. Do you also pay betterment charges or Mandi charges?

☐ yes
☐ No

17. Do you face any challenges as a farmer?

☐ Yes
☐ No

if yes then how government assists you in this matter?

18. Does government provide you with any financial assistance or training on how to increase profits?

19. Is Agriculture; is the only source of income for you?

☐ Yes
☐ No

If yes, then

20. Do they think you can have a good normal life with the money you make by growing crops, like children's education, marriage, etc?

☐ Yes
☐ No

21. Have you ever been exempted from paying for water?

☐ Yes
☐ No

If yes, then when and how many times?

22. Have you ever been consulted by government officials or anyone to share your experience and views regarding the price you pay?

☐ No
☐ Yes

If yes, then how many times and how do you consult them?

23. Are you aware of any WUAs or Regular Water Authorities?

☐ No
☐ Yes

If yes then, any details if they could provide

Part IV – Demography

24. What is your age range?

☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40-64

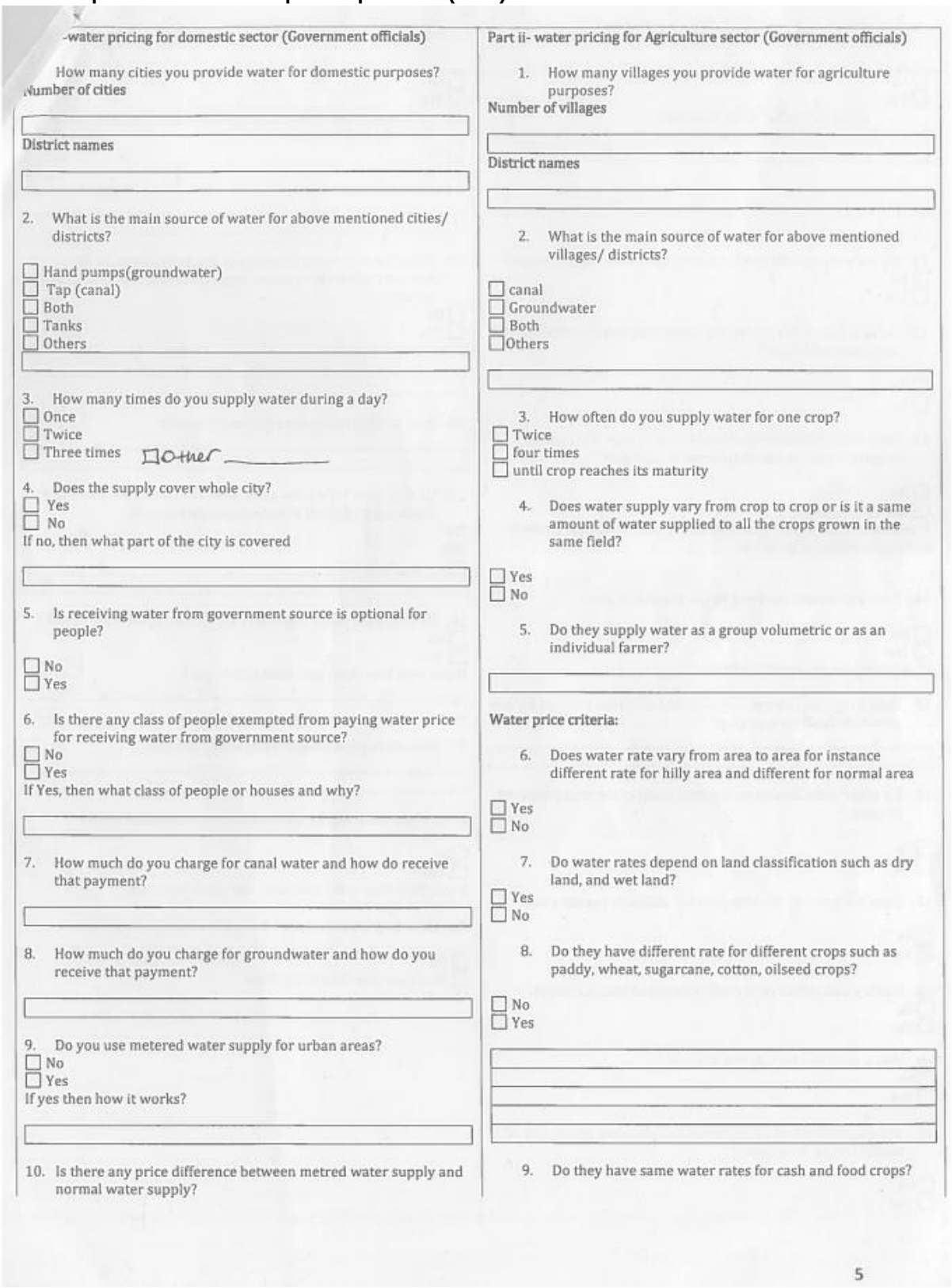
25. What is your biological sex?

☐ Male ☐ Female ☐ Prefer not to say

26. which cast do you belong to?

☐ jatt ☐ schedule ☐ Prefer not to say

Data sample from the Municipal Corporation (MCs)



-water pricing for domestic sector (Government officials)

How many cities you provide water for domestic purposes?
Number of cities

District names

2. What is the main source of water for above mentioned cities/ districts?

☐ Hand pumps(groundwater)
☐ Tap (canal)
☐ Both
☐ Tanks
☐ Others

3. How many times do you supply water during a day?
☐ Once
☐ Twice
☐ Three times ☐ Other

4. Does the supply cover whole city?
☐ Yes
☐ No
If no, then what part of the city is covered

5. Is receiving water from government source is optional for people?

☐ No
☐ Yes

6. Is there any class of people exempted from paying water price for receiving water from government source?
☐ No
☐ Yes
If Yes, then what class of people or houses and why?

7. How much do you charge for canal water and how do receive that payment?

8. How much do you charge for groundwater and how do you receive that payment?

9. Do you use metered water supply for urban areas?
☐ No
☐ Yes
If yes then how it works?

10. Is there any price difference between metred water supply and normal water supply?

Part ii- water pricing for Agriculture sector (Government officials)

1. How many villages you provide water for agriculture purposes?
Number of villages

District names

2. What is the main source of water for above mentioned villages/ districts?

☐ canal
☐ Groundwater
☐ Both
☐ Others

3. How often do you supply water for one crop?
☐ Twice
☐ four times
☐ until crop reaches its maturity

4. Does water supply vary from crop to crop or is it a same amount of water supplied to all the crops grown in the same field?

☐ Yes
☐ No

5. Do they supply water as a group volumetric or as an individual farmer?

Water price criteria:

6. Does water rate vary from area to area for instance different rate for hilly area and different for normal area

☐ Yes
☐ No

7. Do water rates depend on land classification such as dry land, and wet land?

☐ Yes
☐ No

8. Do they have different rate for different crops such as paddy, wheat, sugarcane, cotton, oilseed crops?

☐ No
☐ Yes

9. Do they have same water rates for cash and food crops?

5

☐ No
☐ Yes

If Yes then what is the difference?

11. Do water rates different for flow irrigation and lift irrigation?
☐ No
☐ Yes

12. Do they have different rate for water supplied by perennial and non- perennial canal?

☐ Yes
☐ No

13. Does water rates are fixed based on the major and medium irrigation projects initiated for particular area?

☐ No
☐ Yes
If yes, then is there is price difference for small irrigation projects and major irrigation projects?

14. Does water rates are fixed by per hectare of area?

☐ No
☐ Yes
If yes, then how much per hectare?

15. Does irrigation charges are combined with land revenue for any particular land, area, or crop?

16. Do water rates depend on the total profit of the farm produced in a year?

☐ No
☐ Yes

17. Does it depend on the beneficiaries' ability to pay the rates?

☐ No
☐ Yes

18. Do they also collect betterment charges or Mandi charges?
☐ No
☐ Yes

19. 1Do water rates include O & M costs?
☐ No
☐ Yes

20. Does operation and maintenance include some percentage of capital cost of the scheme?

☐ No
☐ Yes

☐ No
☐ Yes

22. Is there any class of farmers exempted from paying price for domestic water supply?
☐ No
☐ Yes
if yes then who and why

23. If they have to repair drainage or any such source, do they normally adjust that amount in tariffs or that would be charged as surplus?
☐ No
☐ Yes
if yes then how much

24. How do they collect water rates for canals?

25. Do they have WUAs like other state to collect water rates and manage distribution of water amongst farmers?
No
Yes
If yes, then how many

26. Do they have water regulatory authorities in the state Punjab?
☐ No
☐ Yes
If yes, then how many and what is their job?

27. How often government revise water charges?

Is there any provision for automatic revision of water rates?

☐ No
☐ Yes
If yes, then what is the provision and under what Act?

28. Have they ever received a complain about wasting water?

☐ No
☐ Yes, if yes then how many times

21. Do they recover 100% from people from water supplied to them?

☐ Yes
☐ No

if no then why

7