GOVERNMENT OF ANDHRA PRADESH
A B S T R A C T

Municipal Administration & Urban Development – Waste Water Reuse & Recycle Policy as part of implementation of reforms under the AMRUT for the year 2016-2017 – Approved – Orders – Issued.

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MUNICIPAL ADMINISTRATION & URBAN DEVELOPMENT (UBS) DEPARTMENT

G.O.Ms.No.135 Dated:31-03-2017

Read:-

From the Director of Municipal Administration, Guntur Letter Roc No.1638/2017- M3 dated 14.03.2017.

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O R D E R:

In the circumstances reported by the Director, Municipal Administration, Guntur in the reference read above, Government hereby approve the "Waste Water Reuse & Recycle Policy" for effective Water Resource Management for Urban Local Bodies in Andhra Pradesh as annexed to this order.

The Director, Municipal Administration, Guntur shall take necessary further action in the matter.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

R.KARIKAL VALAVEN
PRINCIPAL SECRETARY TO GOVERNMENT

To
The Director, Municipal Administration, Gorantla, Guntur.
Sf/Sc

//FORWARDED BY ORDER//

ASSISTANT DIRECTOR

POLICY ON
"WASTEWATER REUSE & RECYCLE FOR URBAN LOCAL BODIES"
IN ANDHRA PRADESH

Towards Effective Water Resource Management

Table of Contents

Annexures

Annexure 1	Fact Sheets
Annexure 2	Effluent Discharge Standards for STPs, CPCB
Annexure 3	Use Based Surface Water Standards, CPCB
Annexure 4	Letter from Gerdau Steel Industry Requesting Draw Out of Reclaimed Wastewater from 3.5 MLD STP
Annexure 5	Reclaimed Water Quality Specifications, Gerdau Steel India Private Ltd
Annexure 6	Letter from Tadipatri Municipal Commissioner Communicating the Municipal Council Resolution Reg Permission to Gerdau Steel Industry to Draw Out Reclaimed Wastewater from 3.5 MLD STP
Annexure 7	Process Details of Proposed Project Scenarios
Annexure 8	Enacting Waste Water Regulations
Annexure 9	Waste Water Reuse Frame Work

ABBREVIATIONS

AMRUT	ATAL MISSION FOR REJUVENATION AND URBAN TRANSFORMATION
APSPCB	ANDHRA PRADESH STATE POLLUTION CONTROL BOARD
BOD	BIOLOGICAL OXYGEN DEMAND
C&D	CONSTRUCTION AND DEMOLITION
CA	CONCESSIONAIRE AGREEMENT
CAPEX	CAPITAL EXPENDITURE
COD	CHEMICAL OXYGEN DEMAND
CPCB	CENTRAL POLLUTION CONTROL BOARD
CPHEEO	CENTRAL PUBLIC HEALTH AND ENVIRONMENTAL ENGINEERING ORGANIZATION
GIZ	DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT
GO	GOVERNMENT ORDER
GOAP	GOVERNMENT OF ANDHRA PRADESH
HH	HOUSEHOLD
IRR	INTERNAL RATE OF RETURN
MLD	MILLION LITRES PER DAY
MOEF	MINISTRY OF ENVIRONMENT AND FOREST
MOU	MEMORANDUM OF UNDERSTANDING
NUSP	NATIONAL URBAN SANITATION POLICY
O&M	OPERATION AND MAINTENANCE
OPEX	OPERATIONAL EXPENDITURE
PPP	PUBLIC PRIVATE PARTNERSHIP
RCC	REINFORCED CEMENT CONCRETE
SAC	SWACHH ANDHRA CORPORATION
SBM	SWACHH BHARAT MISSION
SLB	SERVICE LEVEL BENCHMARK
SNUSP	SUPPORT TO NATIONAL URBAN SANITATION POLICY
SOTW	SECONDARY TREATED WATER
SPCB	STATE POLLUTION CONTROL BOARD
STP	SEWAGE TREATMENT PLANT
STW	SECONDARY TREATED WATER
TF	TRICKLING FILTER
TMC	TADIPATRI MUNICIPAL COUNCIL
TSS	TOTAL SUSPENDED SOLIDS
ULB	URBAN LOCAL BODY
UGD	UNDERGROUND DRAINAGE
VGF	VIABILITY GAP FUNDING
WHO	WORLD HEALTH ORGANISATION
WSP	WASTE STABILISATION POND

1 INTRODUCTION

India faces serious environmental issues as a result of rapid economic growth, urbanization, and population growth. These include pollution in urban and industrial areas and resource constraints with respect to water, land, forests, and energy. Growing water scarcity and water pollution are the most severe environmental problems in the country. in addition, scanty rainfall due to climate change has had a compounding effect on these resources. Erratic and unfavorable monsoon conditions have led to over-exploitation of groundwater resources. Less than normal precipitation has resulted in less accumulation of fresh water. The low level of water inflow coupled with increased exploitation has resulted in depleting water levels in reservoirs and rivers.

The state of Andhra Pradesh is also witnessing similar status quo, while the growth of state is both desired and encouraged, water demands have increased beyond the capacity of the local water resources. A significant deficit exists between the potable water supply and water demands in the state of Andhra Pradesh. Since 1993 the water supply in the state has been restricted to several hours per day on alternate days. Even though state and ULBs is taking steps to increase the city's water supply, the gap between water supply and demand is projected to continue to increase in the future. closing this gap is a challenge as water has become a scarce commodity and the population, and the resulting demand for clean water, continues to grow at a fast pace.

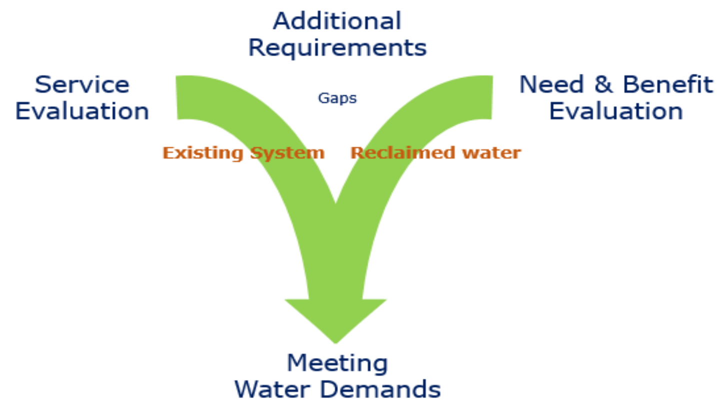
Wastewater generation has increased along with the increase in water consumption and the quantity of untreated wastewater discharged into local lakes and rivers has resulted in their becoming polluted and unattractive for most beneficial uses. The State has several rivers and river basins and the increased pollution has turned most of the rivers into a 'dead' waterway with high BOD concentrations (about 100 mg/L) and no dissolved oxygen. Since year 2000, state is tackling pollution abatement of various lakes in the state under the Lakes Restoration Projects with aid from the Netherlands Government. Despite polluted conditions; farmers and communities in the downstream continue to use the River water as raw water source for various purposes such as agricultural irrigation and for drinking water. The strain on water resources has led to excessive pumping of groundwater and groundwater levels are dropping fast.

The ever-increasing urban population coupled with poor sanitation facilities has put a severe strain on India's fresh water resources, such as rivers, lakes and aquifers. Industrialization and economic growth has increased the demand for fresh water while inadequate management and treatment of industrial and domestic wastewater has polluted such water sources. The combined effect of these has not only resulted in scarce and dwindling resources but has also made it difficult for cities to meet their increasing water needs. As a result, cities are adopting unsustainable practices, such as bringing water from distant places thereby increasing pumping stages (which increase the cost of landed water) and over-exploitation of groundwater resources.

To bridge the gap between demand and supply, State is executing the several Water Projects. The unit cost of water, inclusive of finance cost and operating cost, is estimated to be Rs. 18 – 23/m^3. Another option to help bridge the 'gap' is to recycle treated wastewater. The state generates about 1068 MLD of wastewater, Currently, only about 115 MLD of wastewater is discharged after treatment while the balance remains untreated. The state is evaluating the techno-commercial and environmental feasibility of recycling the treated wastewater to help bridge the demand-supply gap.

To augment the deficient water resources, Indian cities need to adopt innovative ways such as the rainwater harvesting and recycle/reuse of wastewater. The thinking of town planners needs a paradigm shift to view wastewater as a valuable supplemental source for various applications, such as non-potable municipal and industrial applications, and to augment water sources through appropriate technology and management interventions. Several studies have been conducted to evaluate the options for reuse of reclaimed water. Groundwater recharge, irrigation use, industrial use have figured as possible options.

However, mechanisms to monitor the benefits and revenue generation need to be established to effectively implement and derive the desired benefits from reuse and recycle besides the public health and environmental benefits which are paramount. Implementation of recycle and reuse water projects immensely depends on the site conditions, financial cost-benefit analysis and stakeholders' acceptance. Rainwater harvesting is also being implemented under the "NEERU CHETTU" project with reasonable success. Thus, many



initiatives are being taken by state to augment the fresh water supply.

FIGURE 1: MEETING WATER DEMANDS WITH RECLAIMED WATER

2 The Policy Rationale

The rationale behind the adoption of the wastewater reuse, recycle policy by the state of Andhra Pradesh entails the following:

a) Coping with the water scarcity situation
b) Protecting the public health and the environment
c) Water allocation and movement among sectors also needs to be driven by economic motives
d) Applying the Integrated Water Resources Management (IWRM) approach and best practices
e) Considering the Policy as part of mitigation measures of the effect of climate change
f) Increasing the amounts of treated Wastewater (WW) and considering it as a potential water and revenue source

With the current population of 49.38 million across 13 districts, the urban population is substantial at 30% of the total population. Total wastewater generated in the state of Andhra Pradesh is approximately 1068 MLD, however, amongst all 110 ULB[1]s in the state have a total capacity of the waste water treatment of 295 MLD and about 197 MLD capacity of waste water treatment plants are under construction.

This volume of wastewater generation, combined with the decreased volumes of fresh water available for drinking water supply, irrigated agriculture, and industries caused the state of Andhra Pradesh to consider the adoption of 'source substitution[2]' and wastewater reuse, recycle policy.

Varieties of crops are grown using irrigated blended wastewater; Principal concerns in the use of wastewater for irrigation include its salinity, chloride concentrations, and the presence of faecal coliforms and nematode eggs. Industrial operations and processes also can use reclaimed wastewater, however there are. several implementation and management issues related to development and implementation of wastewater recycle and reuse projects, including site conditions, local issues and needs, financial cost benefit analysis, stakeholder sensitivities, application specific criteria for treated wastewater quality, and public health. Since any inadvertent or unauthorized use or discharge of the treated wastewater may pose a huge public health risk, maintaining treated wastewater quality to optimum levels is of utmost importance. Therefore, a risk management framework approach is imperative to provide an ongoing and measurable assurance that performance requirements are being continuously met.

The Indian standards and regulations specify the quality of treated effluents allowed to be discharged or destined for reuse in various urban reuses; where there will be a requirement for a secondary level of treatment. Quality specifications should be in harmony with WHO guidelines for the safe use of treated effluent

Benefits of Wastewater Recycling

Instituting wastewater recycling presents several advantages to the state of Andhra Pradesh. First, it reduces the demand for conventional water and sewerage infrastructure. It is important to note here that these costs are not excessive, and in fact less than what would be required to build, extend, and operate a conventional sewerage system. State money saved can then be redirected for other purposes – expanding access to piped water and sanitation, for example.

Second, **wastewater recycling conserves water**. Depending on the extent of the treatment and reuse possibilities, water usage can be cut by 20-50%. Many of India's cities such as Bangalore, Pune, and Delhi suffer from shortages of drinkable water and are currently attempting to institute wastewater recycling polices to combat current crises – Andhra Pradesh has the opportunity to avoid those crisis in the first place by enacting 21st century policies like wastewater recycling.

Lastly, **wastewater recycling** reduces pollution. Currently, the vast majority of wastewater is directed straight to open drains. Flowing through drains, this wastewater passes on into surface water bodies and groundwater, contaminating these twin sources of water, and in turn, spreading diseases through the population – particularly women and children. Moreover, sometimes the water doesn't flow through open drains, instead sitting stagnant and providing disease-spreading mosquitos ample breeding grounds. Instituting a wastewater recycling policy would meet this problem at its source – treating water and reducing the amount of polluted water in open drains.

3 Objectives of the Policy: "Moving from Theory to Action"

(Convergence w/SDG Goals)

This policy is intended to direct the water sector towards more efficient use of water resources. It details the intention to reuse treated wastewater in irrigation that enables freeing fresh water to be utilized for municipal uses. It also provides for using the treated wastewater in other economic activities. It calls for expanding collection and treatment of wastewater, updating and development of standards and practices for substituting fresh water used in irrigation and industry by treated wastewater after blending it. The policy aims also at increasing surface water utilization for municipal uses and thus decreasing the strain on groundwater.

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[1] *Amongst 110 urban local bodies only 8 ULBs have partial sewerage network coverage and sewage treatment capacities & 3 additional ULBs are in the process of implementation of sewerage facilities.*

[2] *Use of reclaimed water for non-potable purposes offers the potential for exploiting a "new" and captive resource that can substitute the potable water source. This idea, known as "source substitution," is not new. In fact, the United Nations Economic and Social Council (UNESC) enunciated a policy in 1958 that "No higher quality water, unless there is a surplus of it, should be used for a purpose that can tolerate a lower grade." Many urban, commercial and industrial uses can be met with water of less than potable water quality.*

Although the policy can be better implemented through centralized wastewater collection and treatment systems, the decentralized systems are still needed to suit different locations. Local reuse systems should also accompany the decentralized systems.

The objectives are:

1. Managing the scarce water resources efficiently, maximizing the benefits and returns, and proposing actions required for implementation
2. Protecting the public health, environment and nature
3. Enhancing economic efficiency
4. Ensuring sustainability and preserve fresh water The main Pillars of this Policy are:

1. Water needs and competition between economic centres
2. Public health and Environmental considerations
3. Availability of infrastructure
4. Public acceptance
5. Suitability and adequacy of high quality water
6. Sustainability and enforcement of regulations, and adequate collaboration with research and development departments.

4 Policy Statements

4.1 On Substitution Priorities

1. Government of Andhra Pradesh and the local bodies will work on increasing amounts of treated wastewater, through developing existing and new facilities.
2. Priority for substitution shall be given to industry or irrigated and irrigable lands with high productivity potential.
3. Reclaimed water shall be used for industry and agriculture as much as possible in order to save the fresh water for domestic uses.
4. Water quantities for agriculture shall be determined and tied to the area allowed to be

irrigated from ground waters. Substituting the groundwater with blended (treated wastewater or surface water) shall be a major principle. [Convergence with Groundwater Mission, Neeru Chettu]

5. Lands adjacent or close to the substitute water shall have priority in exchange for fresh underground water.
6. Priority utilization and use shall apply to impounded waters in reservoirs; such waters shall be treated for its intended use.

4.2 On Institutional and Administrative Arrangements

7. A mechanism to price (tariff setting) treated wastewater, as well as blended treated wastewater will be developed taking into consideration fairness, cost recovery and economic activities support. Consideration shall be given to suitability, quality, and percentage of fresh water, location and reducing freshwater usage. This will reduce groundwater over- abstracting. A robust mechanism to adjust the prices shall be explored and agreed upon.
8. Technical, financial, economic and legal capacities shall be rebuilt under strong administrative body responsible for water substitution plans implementation. Responsibilities shall focus on change management and capacity building.
9. In cooperation with MOA (Ministry of Agriculture), farmers shall be assisted to choose the right types of produce and adopt the best irrigation and marketing practices.
10. The Water Users Associations shall have a role in implementing this policy. The ministry will work with this association by building their capacities toward better implementation.
11. Monitoring programs shall be crafted and implemented. The reuse of sewerage effluent is in wide use across Jordan and gaining an acceptance by government, farmers and communities, and cannot be disputed. Nevertheless, there are areas within the regulatory processes that need to consider a uniform approach to acceptable guidelines, such as the requirements for disinfection and monitoring of indicators (quality and characteristics) at particular times and intervals.
12. The state government or any particular department will adopt and implement a State-Level and ULB-Level Plan for Operation and Maintenance of Wastewater treatment plants aiming at achieving efficiency. The plan will include best available models based on integrated wastewater and septage management principles including private sector participation.
13. Private sector participation in reuse plans will be introduced; community based initiative organizations (CBO's) and Nongovernmental organizations (NGO's) will also be part of the process.

4.3 On Resource Management

14. Rain water harvesting in identified critical areas shall be expanded to collect and impound rain water that can be used as substitute water directly and indirectly through ground injection.
15. Wastewater collection and treatment shall be expanded in all parts of the country and according to priorities; substitution requirements is part of.
16. Irrigation schemes shall be rehabilitated and expanded.
17. Ground Water Users Associations will be established in identified critical areas.

Industries, Farmers, being the recipients and prime beneficiaries, shall participate in managing and monitoring the ground water used, treated wastewater use and possibility of blending.

18. Fresh water allocated to industries and irrigated agriculture shall be capped and eventually reduced according to medium and long term plans to be prepared and implemented after which the reallocation plan can be updated accordingly.
19. A dynamic and sustainable economic development plan coupled with investment program shall be formulated and implemented for the use of surface waters and treated wastewater efficiently.

4.4 On Legislations

20. State Level Treated wastewater specifications and standards shall be amended to include and ensure a safe reuse and to produce high economic return products, in line with the substitution goals and development requirements in a state suffering from water scarcity.
21. Strict regulatory measures to manage the use of reclaimed water for agriculture or other purposes shall be followed.
22. An integrated approach to water resources management (IWRM), combined with locally appropriate and sustainable risk reduction measures, and the active involvement of stakeholders from different sectors shall be established.

4.5 On Public Acceptance and Awareness

23. Awareness and educational programs and campaigns shall be crafted and implemented. These shall target citizens, farmers, industries and grouping them via unions according to their areas so that 1the amount of ground water pumping is reduced and benefits and economic return per cubic meter are optimized.
24. The programs should take into consideration belief and perception of public based on scientific and logical proofs.

4.6 On Technology, Research and Development

25. Modern treatment technologies shall be employed that produce reclaimed water directed towards maximizing saving and replacing freshwater for municipal consumption.
26. The Effluent quality standards shall be revised to suit various reuse purposes.
27. Domestic wastewater shall be treated and purified for full utilization for industrial, agricultural, cooling and other uses.
28. The related data and information will be tabulated and organized for easy use and reference. It will be part of the information system that will facilitate research.

Annexure 4

Wastewater Reuse and Opportunities

Urban reuse

While there are several major categories of water reuse, urban water reuse is only now emerging in India. Some important components of the reclaimed water portfolio of many emerging urban reuse plans are:

- irrigation landscape irrigation
- fire protection toilet flushing
- recreational opportunities without human contact Urban reuse is often divided into the

following categories:

- **Unrestricted**: The use of reclaimed water for non-potable applications in municipal settings where public access is not restricted.
- **Restricted**: The use of reclaimed water for non-potable applications in municipal settings where public access is controlled or restricted by physical or institutional barriers, such as fences or timings of application of the reuse water or temporal access restriction.

When treated, wastewater is used to irrigate residential areas, public parks and related sports etc. or is used for toilet flushing and washing, it has to receive significant treatment and high-level disinfection so as to be not considered a threat to public health. Suggested minimum water quality criteria for urban non-potable water reuse are as below.

TABLE 1: SUGGESTED MINIMUM WATER QUALITY CRITERIA FOR URBAN NON-POTABLE REUSE

Parameter	Units	Value
BOD_5	mg/L	≤ 3[3]
Turbidity	NTU	≤ 2
Faecal coliforms	MPN/100 ml	NIL
Chlorine residual	mg/L	1 – 2
pH		6 – 9
Colour (Hazen)		Non-detectable

Agricultural reuse

Use of wastewater in agriculture has a long history and currently represents a significant percentage of use worldwide, especially in emerging economies such as India. With increasing population and sanitation, more treated wastewater is available. The cost of treating wastewater to secondary (and sometimes even higher) standards is generally lower than the cost of pumping potable water from distant sources or for producing it from unconventional water sources (e.g., desalination).

The option of allocating treated wastewater to irrigation is often the preferred and least expensive alternative for municipalities. Irrigation of crops (both food and non-food) with untreated wastewater is widely practiced in many parts of the developing world with accompanying adverse public health outcomes. Nonetheless, this practice represents an

[3] *Designated best use classification of inland surface water – Class B Outdoor Bathing*

Economic necessity for many farming communities and for the rapidly expanding population at large, much of which is dependent on locally grown crops.

The WHO guidelines (WHO, 2006) for irrigation with treated wastewater have been successfully applied to irrigation reuse applications throughout the world. However, the CPHEEO Manual 2013 has suggested the following standards which should be followed at a minimum.

TABLE 2: SUGGESTED MINIMUM WATER QUALITY CRITERIA FOR AGRICULTURAL REUSE (SOURCE: CHAPTER 7, PART A OF THE CPHEEO 2013 MANUAL ON SEWERAGE AND SEWAGE TREATMENT)

Parameter	Units	Value
Intestinal nematodes	No./litre	< 1
Faecal coliforms	MPN/100 ml	Nil (for crop eaten raw) & $\leq$230/100 ml (for crops eaten cooked or non-edible crops)
pH		6 – 9

Environmental/Recreational Reuse

Environmental reuse primarily includes the use of treated wastewater to support wetlands and to supplement stream and river flows. Aquifer recharge also may be considered environmental reuse, but because this practice is integral to management of many complex issues it is recommended as an area of future study.

TABLE 3: SUGGESTED MINIMUM WATER QUALITY CRITERIA FOR ENVIRONMENTAL/ RECREATIONAL REUSE (SOURCE: CHAPTER 7, PART A OF THE CPHEEO 2013 MANUAL ON SEWERAGE AND SEWAGE TREATMENT)

Parameter	Units	Value
BOD_5	mg/L	≤ 10
TSS	mg/L	< 5
Faecal coliform	MPN/100 ml	Nil
pH		6.5 – 8.3
Total Kjeldahl Nitrogen (as N)	mg/L	< 5 for impoundments, < 10 for Horticulture
Dissolved Phosphorus (as P)	mg/L	1
Colour (Hazen)		Non-detectable

Impoundments

As with any form of reuse, the development of water reuse projects that include impoundments will be a function of water demand coupled with a cost-effective source of suitable quality reclaimed water. Regulation of impoundments that are maintained using treated wastewater has to be according to the potential for contact for that use. Please refer above Table 3 for minimum suggested standards.

Wetland and river/stream flow augmentation

As with impoundments, water quality requirements for wetlands and river or stream augmentation will be based on the designated use of the water course and the aim to enhance an acceptable appearance. In addition, there should be an emphasis on creating a product that can promote native aquatic life. The quality of the reclaimed water discharged to the receiving water body is critical to evaluating its benefits to the stream. Water reclamation for stream augmentation applications requires consideration of a complex set of benefits and risks. Suggested minimum water quality criteria are given in Table 4.

TABLE 4: SUGGESTED MINIMUM WATER QUALITY CRITERIA FOR WETLAND AND RIVER/STREAM FLOW AUGMENTATION (SOURCE: USEPA 2004 GUIDELINES)

Parameter	Units	Value
BOD_5	mg/L	≤ 3[4]
TSS	mg/L	≤ 5
Faecal coliform	MPN/100ml	≤ 50[a]
Chlorine residual	mg/L	1 – 2
pH		6 – 9

Industrial reuse

Traditionally, pulp and paper facilities, textile facilities, and other facilities using reclaimed water for cooling tower purposes have been the primary industrial users of reclaimed water. However, the industrial use of treated wastewater has grown in a variety of industries ranging from electronics to process industries, food processing, as well as a broader adoption by the power-generation industry. Over the past few years, these industries have embraced the use of such water for purposes ranging from process water, boiler feed water, and cooling tower use to flushing toilets and site irrigation. Since industry can control water quality within their processes, specific standards for industrial use are not being provided here. Table 5 provides typical water quality requirements for different industrial applications.

High technology reuse

The use of reclaimed water in high-technology manufacturing, such as the semiconductor industry, is a relatively new practice. Within the semiconductor industry, there are two major processes that use water:

- microchip manufacturing, which has rarely utilized reclaimed water
- circuit board manufacturing, which uses water primarily for rinse operations.

While only circuit board manufacturing uses reclaimed water in the actual production process, both microchip and circuit board manufacturing facilities do use treated wastewater for cooling water and site irrigation. Reclaimed water for circuit board manufacturing requires very advanced treatment and is not discussed here.

TABLE 5: TYPICAL WATER QUALITY REQUIREMENT FOR INDUSTRIAL REUSE (SOURCE: CHAPTER 7, PART A OF THE CPHEEO 2013 MANUAL ON SEWERAGE AND SEWAGE TREATMENT)

Constituent, mg/L	Industrial Application				
	Boiler feed	Pulp and paper	Textiles	Petroleum and coal	Cooling water
Calcium	0.01 – 0.4	20	–	75	100
Iron	0.05 – 1.0	0.3 – 1.0	0.1– 0.3	1	–
Manganese	0.01 – 0.3	0.05 – 0.5	0.1– 0.05	–	–
Alkalinity as $CaCO_3$	40 – 350	100	–	125	–
Chloride	–	200 – 1,000	–	300	100
TDS	200 – 700	–	100	1,000	–
Hardness as $CaCO_3$	0.07 – 350	100	25	350	–
Ammonium-N	0.1	–	–	–	1 – 3
Phosphate-P	–	–	–	–	0.6
Silica	0.7 – 30	50	–	–	20
Colour (Hazen)	–	10 – 30	5	–	–

[4] *Designated best use classification of inland surface water – Class C drinking water source with conventional treatment followed by disinfection*

Reuse by construction industry

The construction industry is the newest entrant to the industrial category and many urban utilities are now supplying treated wastewater for construction. The suggested standards for construction should follow the standards as provided in the CPHEEO Manual and established by the Bureau of Indian Standards.

Ground water recharge

Groundwater recharge to aquifers not used for potable water has been practiced for many years but has often been viewed as a disposal method for treated wastewater effluent. In addition to providing a method of treated effluent disposal, groundwater recharge of treated wastewater can provide a number of other benefits, including the following:

- Recovery of treated water for subsequent reuse or discharge
- Recharge of adjacent surface streams
- Seasonal storage of treated water beneath the site with seasonal recovery for agriculture.

In many cases, groundwater can be recharged in a manner that also utilizes the soil or aquifer system where such water is applied as an additional treatment step to improve the quality. Suggested water quality criteria that need to be met at a minimum for groundwater recharge are given in the Table 6.

However, as cautioned by the CPHEEO, 2013 Manual, such use should be considered after careful study of site conditions and requirements with strict monitoring measures.

TABLE 6: SUGGESTED MINIMUM WATER QUALITY CRITERIA FOR GROUNDWATER RECHARGE (SOURCE: USEPA 2004 GUIDELINES)

Parameter	Units	Infiltration basins	Vadose zone / recharge wells	Direct injection
Drinking water standards	mg/L	Not applicable	Not applicable	As applicable
Total nitrogen	mg/L	≤ 12	≤ 12	≤ 12
pH		6 – 9	6 – 9	6 – 9

Indirect & direct potable use

Water reclamation for non-potable applications is well established, as discussed earlier in this chapter. The use of reclaimed water to augment potable water supplies has significant potential for helping to meet future needs, but planned potable water reuse only accounts for a small fraction of the volume of water currently being reused worldwide. On the other hand, the unplanned reuse of wastewater effluent as a water supply is common, with some drinking water treatment plants using waters for which a large fraction originated as wastewater effluent from upstream communities, especially under low-flow conditions. This is true in India as well. However, in India and other developing countries direct potable water reuse is an area of future growth and there needs to be more research and success before it is promoted in India.

Currently, there are only general discharge standards available for discharge of wastewater in India and this Policy has attempted to provide some minimum criteria as a starting point for reuse of discharged wastewater.

Annexure - 8

Enacting Wastewater Regulations

To institute wastewater regulations, the state would first institute regulations for new construction, and after a grace period, apply this regulation to existing construction as well wherever feasible.

New Construction

All new construction of buildings over a certain water usage threshold should include provisions for to treat and re-use greywater. There are many treatment providers on the market: most treatment consists of a sedimentation tank, followed by a simple anaerobic multi-baffled series of chambers, and lastly followed by a gavel filter (or planted filter) based aerobic process, whereby water is increasingly treated as it moves through each section. A simple example is shown below.[1]

The construction plans for all new facilities should include plans for wastewater treatment and municipal engineers or inspectors must monitor construction to ensure that these systems are built, operated, and maintained. Municipalities may choose to waive the requirement for buildings that can be easily connected to an existing functional sewerage system if that is a less expensive option.

In addition to infrastructure, developers should include plans for the use of wastewater. These plans can include the installation of a duel plumbing system, by which wastewater is used to flush toilets, the use of wastewater for landscape irrigation, car washing, clothes washing, or groundwater recharging (where applicable). If a development cannot find uses for all of its own wastewater, it shall make arrangements with either the municipality or nearby agricultural/industrial users to appropriately use the treated wastewater.

These small treatment units should be subject to monthly or annual inspections (as possible) to ensure their proper operation. The treatment facilities cannot exist only for show and developments should be penalized if their wastewater treatment and recycling system remains out of commission for more than two months (an adequate time to repair/fix the system if needed). The inspections shall also include water quality testing to ensure the treated wastewater meets appropriate standards for non-potable treated water.

Applicability

These wastewater recycling regulations should be applicable to all developments

[1] This is not the only technology available, or the best for all situations, but it is the "archetypical" option for wastewater treatment and is shown as an illustration or example.

consuming large amounts of water and producing large amounts of wastewater. These developments include the following:[2]

- Apartment buildings and housing clusters with more than 60 units or a certain amount of built-up areas[3]
- Office buildings
- Shopping malls
- Hotels
- Wedding Halls
- Large restaurants (with special provisions for the large amounts of oil and grease that may flow into the system)
- Schools, both government and private
- Universities, both government and private
- Hospitals (with special provisions for any hazardous wastewater)
- Airports
- Government buildings (Municipal headquarters, police stations, department buildings, etc.)
- Factories

Existing Construction

The status of existing construction is clearly different; in many cases, there may be no room to construct basic greywater treatment infrastructure; if buildings are connected to an existing sewerage system, then there is no need. However, it should not be assumed that *all existing construction* cannot implement wastewater construction. Existing developments should be given two years of time to come into compliance to the wastewater recycling regulations, or seek a waiver based on the logistical impossible of complying. Buildings already connected to functioning sewerage systems need not seek any waiver.

The state or municipal government may choose to utilize escalating penalties and fines over several years to bring all existing developments into compliance; they may also choose to use incentives, such as discounts on water charges or tax exemptions for the development of wastewater treatment and reuse systems.

Demand Profiling

The state and municipalities shall also endeavour to enable the reuse of treated wastewater. There may be cases where an institution produces more wastewater than it can use. The municipality shall ensure that this wastewater can be used either by the municipality itself (for municipal irrigation) or for agricultural, industrial, or groundwater recharge

[2] This list, however, is not exclusive.

[3] These numbers are not intended to be final, but are a starting point for discussion. More research must be conducted before setting final standards as of the creation of this document.

purposes.

A key component of this process is "demand profiling." Demand Profiling at the ULB level shall help in identifying the different reuse contexts that exist in the ULB. Based on this, it will be possible to identify the major and minor demand drivers. The major demand drivers will mostly determine the quality parameters that the treated wastewater needs to conform to. The design of the treatment systems will be influenced by these quality parameters. Such a pro-active approach shall help avoid situations where reuse becomes infeasible because the correct treatment technologies were not chosen resulting in loss of precious water. In cases where the treatment systems are yet to be setup, it will definitely help to locate the treatment systems close to the sources of demand. This will bring down the costs of conveyance, making reuse viable.

As far as local reuse is concerned, the generation and consumption almost always occur within the same boundaries/premises. As a result, the treatment is always done closer to the source of the demand. Thus, the focus is more on being able to identify the right treatment option to be able to generate treated wastewater of the desired quality.

Annexure 9: Wastewater Reuse Framework