

Action Plan for Reuse of Treated Wastewater



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Directorate of Environment and Climate Change,
Department of Science, Technology and Environment,
Government of Punjab

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Chapter 1 - Introduction

1.1 Water

- 1.1.1** Water is vital for all life forms on earth. Though it is an abundant and renewable natural resource, yet only 2.7% of global water is available as fresh water, and of this, only 30% is available to meet the water demand of mankind and livestock. The era of surplus river basins, high water tables and generously yielding under-exploited aquifers, plentiful dispersed water availability, certainty of supplies and conservative lifestyle is fast transforming into a less certain future with increasing demand, emerging limits of available supplies, infrastructure constraints, competing users contesting the finite resource and consumptive lifestyle.
- 1.1.2** Climate change and global warming are just the latest entrants to a long list of variables that may enhance the temporal and spatial variation in resource availability. All forecasts point towards increasing water stress with exploding demand, especially urban, putting pressure on unevenly distributed, limited and increasingly variable resources. The receding glaciers, adverse effect on river flows, changing rainfall patterns with a trend towards extreme events is a pointer towards emerging challenges requiring deeply considered responses.
- 1.1.3** Additionally, the over-abstraction of water resources is adversely affecting ecosystem functions and resource sustainability. River base flows in lean season and monsoon driven floodwater recharge of floodplain aquifers have declined. River ecological functions have been affected with conditions no longer conducive for aquatic and riverine habitats negatively affecting a host of organisms and consequently their river cleansing function as well as availability of fish resources.

1.2 Punjab – Land of Rivers

- 1.2.1** The word Punjab is a compound of two Persian words, panj (“five”) and āb (“water”), thus signifying the land of five waters. The erstwhile Punjab State had five rivers namely Beas, Chenab, Jhelum, Ravi, and Sutlej. However, after the partition of India in 1947, only two rivers, the Sutlej and the Beas, lie within Punjab’s territory, while the Ravi flows only along part of its western border. The non-perennial river Ghaggar flows from eastern part to south- western part of the state.
- 1.2.2** The perennial rivers in the State with a water potential of about 14.54 Million Acre Feet(MAF) have been used as a source of irrigation, drinking purpose especially in southern Punjab, development of hydro-electric projects to meet the energy requirements in the State and various activities including industrial purposes. The rivers have played a significant role in the socio-economic and industrial development of the State. However, demand of water is growing in agriculture, domestic, industrial and commercial sectors with growing population and their needs, leading to over- exploitation of water resources.

1.3 Rapid Urbanization and Industrialization – Main cause of Pollution

- 1.3.1** The rapid urbanization and industrialization during the last few decades have adversely affected the environment of the State. The quantum of sewage and sullage generated from the habitation areas has significantly increased and finding its way into natural drains, eventually leading to river line system of the State. In the rural areas, due to increase in the population, the capacity of most of the ponds have been exhausted due to which this sewage and sullage has also started flowing into the natural drains and finally becoming a part of river waters.
- 1.3.2** Therefore, the quality of water flowing in the water bodies has deteriorated as these water lack sufficient assimilation capacity for self-purification. This has been not only due to increase in the quantum of discharge of untreated sewage/ sullage, but, also due to decrease in the quantum of water in the water bodies owing to construction of dams & regulatory headworks on the upstream side.
- 1.3.3** The disposal of wastewater generated from cities or from industrial areas is a big challenge not only for Punjab state but also at national and international level. The improper disposal of wastewater into drains & rivers and its percolation to ground water could have adverse implications on public health and aquatic ecosystem.

1.4 Action Plans for Clean Rivers

- 1.4.1** Three comprehensive Action Plans for Clean River Sutlej, Beas and Ghaggar have been prepared by Department of Environment, Punjab in consultation with relevant stakeholder departments in compliance to directions of National Green Tribunal (NGT). The Action Plans aim to restore the river water quality to prescribed standards to ensure ecological balance and socio-economic well-being of the people. The identification of sources of pollution, measures to control pollution within prescribed timelines, integration of departmental plans, regular monitoring and review, etc. are the key components of Action Plans. The Action Plans were reviewed by River Rejuvenation Committee constituted under Chairmanship of Principal Secretary, Department of Environment and approved by the State Level Task Force under Chairmanship of Chief Secretary. The Action Plans had been already submitted to Central Pollution Control Board (CPCB) to review and appraisal of NGT.
- 1.4.2** A separate chapter on reuse of treated wastewater for irrigation purposes giving present status and future projects along with timelines has been included in all the Action Plans.

1.5 Reuse of Treated Wastewater

- 1.5.1** The existing water resources of the State are under high stress due to intensive agricultural practices with cropping intensity of >190% (Highest in India). The alarming decline in groundwater table is one of the major environmental issues assailing the state. Moreover, the volume of wastewater generated by domestic, industrial and commercial sources has increased with population, urbanization, improved living conditions and economic development. The treated wastewater produced by Sewage Treatment Plant

(STPs) can act as additional source of water for utilizing for non-potable purposes to supplement limited fresh water resources available in the State.

- 1.5.2** Therefore, it is imperative to explore option for reusing the available treated wastewater for irrigation, construction purposes, green belts & urban landscaping, industrial use, thermal plants, construction activities, dust suppression, rejuvenation of water bodies and emergency services like fire brigade, etc.

1.6 State's efforts to Reuse of Treated Water

- 1.6.1** The Government of Punjab has notified "The State Treated Waste Water Policy 2017" to promote recycling and reuse of treated sewerage for non-potable applications. Till date, 56 number projects have been completed by Department of Soil & Water Conservation for using 282 MLD treated wastewater of 56 STPs. The projects have been implemented by laying underground pipeline system for irrigation water conveyance covering an area of 8021 hectares.

- 1.6.2** The department further proposes to utilize 1469 MLD of treated wastewater from 133 existing, under progress and proposed STPs for irrigation purposes for an agricultural area of 30755 hectare. Departments of Water Resources, Local Government are also exploring various options to promote utilization of the treated wastewater of STPs for non-potable use such as revival of water bodies & wetlands, domestic use, construction activities, industrial processes, urban landscaping & green belts, etc.

1.7 Directions issued by NGT

- 1.7.1** National Green Tribunal (NGT) in the matter of Original Application No. 148/2016 (M.A. No. 686/2017 dated 27.11.2018) titled as Mahesh Chandra Saxean Vs South Delhi Municipal Corporation & Ors. has directed all the States & Union Territories to prepare and furnish their Action Plans for utilization of treated wastewater in there respective States/UTs within three months. The Action Plans needs to be furnished to CPCB for further review and furnishing a report of compliance to NGT on or before 30th April, 2019.

Chapter 2 - Vision, Mission and Strategy

2.1 Overarching Vision of the State - Mission Tandarust Punjab

The Government of Punjab has launched Mission Tandarust Punjab to make Punjab a healthy State with healthy people by ensuring the quality of air, water, food and a good living Environment.

2.2 Vision for Reuse of Treated Wastewater

To promote reuse of treated sewerage on sustainable basis for non-potable applications, thereby reducing dependence on fresh water resources and enhancing water efficiency.

2.3 Mission for Reuse of Treated Wastewater

To prepare and implement a comprehensive action plan for reuse of treated wastewater:

- (i) Creating awareness about the adverse impact of water pollution & conservation of water resources
- (ii) Identifying the treated wastewater utilization avenues as per site specific conditions
- (iii) Creating infrastructure for utilization of treated wastewater for various non-potable purposes such as irrigation, industrial use, urban landscaping, rejuvenation of water bodies, construction activities etc.
- (iv) Mitigating adverse impact on health of the people
- (v) Environment restoration & replenishment of surface water

2.4 Strategy for Reuse of Treated Wastewater

The strategy for reuse of treated wastewater includes:

- (i) Identification of Stakeholders
- (ii) Identification of sources of treated wastewater
- (iii) Measures to use treated wastewater and timelines
- (iv) Nodal Department
- (v) Integration of Departmental Plans
- (vi) Monitoring and Review
- (vii) Risk Mitigation Plan

2.5 Identification of the Stakeholders and their roles

The State of Punjab envisages a comprehensive plan for reuse of treated wastewater by involving all the Stakeholders namely:

2.5.1 Department of Science, Technology and Environment

The Directorate of Environment and Climate Change will be responsible for the following:

- (i) Overall coordination of the Action Plan for ensuring its successful implementation
- (ii) Regular review and monitoring

2.5.2 Department of Soil & Water Conservation

Department of Soil & Water Conservation is responsible for creating requisite infrastructure for utilization of treated wastewater of all the existing and proposed STPs/CETPs having discharge upto 50 MLD capacity for irrigation purposes after conducting a detailed feasibility analysis based on the location of the STPs and availability of adequate command area. In addition to this the department also has the following responsibilities:

- (i) Design the project as per the standards
- (ii) Follow up with various funding agencies to arrange funds
- (iii) Executing the schemes as per the timelines provided in the plan
- (iv) Create awareness among farmers on reuse of treated wastewater for irrigation

2.5.3 Department of Water Resource

The Department of Water Resources is responsible for creating requisite infrastructure for utilization of treated wastewater of all the existing and proposed STPs having discharge of >50 MLD capacity for irrigation & other purposes such as rejuvenation of water bodies by constructing open channels after conducting a detailed feasibility analysis based site specific conditions.

2.5.4 Punjab Pollution Control Board

- (i) Regulation of STPs
- (ii) Laying down discharge standards for STP suitable for their appropriate reuse
- (iii) Monitoring of discharge from STPs and other disposal facilities

2.5.5 Department of Local Government

Department of Local Government and Municipal Corporations are responsible for ensuring that the treated wastewater from various STPs setup by them be used appropriately for various non-potable purposes as feasible to reduce reliance on surface and ground water resources. The department is also responsible for proper operation & management of various STPs to ensure regular supply of treated wastewater as per prescribed norms of PPCB.

2.5.6 Department of Housing and Urban Development

The Department and all the Development authorities under its control are responsible for various Urban Estates developed by them. In addition, the Government has entrusted construction and subsequent operation and maintenance of Sewerage Network and STPs in some of the cities to various Urban Development Authorities. In all cases, where the Urban Development Authorities are discharging the functions, they shall have all the responsibilities listed out in clause 2.5.5 for Department of Local Government.

2.5.7 District Administration

District Administration will be responsible for monitoring of activities of the action plan at district level.

2.6 Nodal Department

The Department of Science, Technology and Environment is the nodal department for coordinating and monitoring activities of the plan.

2.7 Monitoring and Governance

- (i) There will be rigorous monitoring of implementation of the comprehensive plan:
 - (a) Monitoring of physical and financial progress of works being executed
 - (b) Monitoring of operations and management of facilities set up

- (ii) The monitoring will be done at the District level, State Level and by the NGT appointed Monitoring Committee as and when required.

Chapter 3 – Current Status of Reuse of Treated Wastewater

3.1 The State Treated Wastewater Utilization Policy

3.1.1 The Department of Local Govt. has notified "The State Treated Waste Policy -2017" to promote the recycling and reuse of treated sewage for non-potable application and to make sewage projects economical and environmentally sustainable.

3.1.2 The policy envisages to tackle the issues pertaining to the provisions of adequate wastewater collection and treatment facilities, consideration of treated effluent as resource for reuse in irrigation/industrial/other fields and thereby improvement of the socio-economic conditions in the areas to served by the proposed systems.

3.2 Standards for treated wastewater

3.2.1 Punjab Pollution Control Board vide Notification Dated 28.03.19 has laid down the following standards/guidelines for discharge of treated domestic effluents at the outlets of STPs in the state of Punjab:

Sr. No.	Parameters	Standards
1	pH	6.5-9.0
2	Biochemical Oxygen Demand (BOD)	30 mg/l
3	Total Suspended Solids(TSS)	<100 mg/l
4	Fecal Coliform (FC)	<1000 MPN/100 ml

Note

1. These standards shall be applicable for discharge into water bodies as well as land disposal/application
2. The standards fro FC shall not apply w.r.t use of treated effluent for industrial purposes
3. Reuse/recycling of treated effluents shall be encouraged and in case where part of treated effluent is reused and recycled involving possibility of human contact, standards as prescribed above shall apply.

3.2.2 Central Pollution Control Board has the following water quality criteria for utilization of wastewater for irrigation, industrial cooling and controlled waste disposal:

Sr. No.	Parameters	Standards
1	pH	6.0-8.5
2	Electrical Conductivity at 25°C micro mhos/cm	≤ 2250
3	Sodium Absorption Ratio mg/l	≤ 26
4	Boron mg/l	≤ 2

3.3 Generation of Treated wastewater

The treated wastewater produced by STPs can act as reliable source of water. Hence, there is need to adopt new perspective to wastewater and its reuse for various purposes as per the local conditions. There are 109 operational STPs in the catchment areas of 3 rivers and other towns of the State having a total capacity of 1473.28 MLD. The details are summarized below:

Catchment	No of STPs	Capacity (MLD)
Satluj	50	997.10
Beas	16	95.10
Ghaggar	20	227.40
Other Towns/Areas	23	153.68
Total	109	1473.28

The agency wise of details of operational STPs is at **Annexue A**. The reuse of treated wastewater from existing STPs for non-potable purposes can play a significant role in meeting the ever increasing demand of water and decrease dependency on ground water.

3.4 Current Status of Reuse of Treated Wastewater

3.4.1 Punjab is ranked first in India for utilizing treated water for irrigation purposes. The Department of Soil & Water Conservation initiated programme for conveyance of treated water from STPs for towns/cities in 2013-14 under Govt. of Punjab's mission for Cleaning of Rivers. Initially, the programme was launched in Nangal, District Ropar and Sultanpur Lodhi, District Kapurthala on pilot basis with the financial support of Local Bodies. The farmers were motivated to use treated water instead of ground water for irrigation purposes. The projects were very well received by farming community.

3.4.2 Department of Soil & Water Conservation, Punjab has till date completed 56 projects for using 282 MLD treated wastewater of 56 commissioned/under progress STPs having discharge upto 50 MLD for irrigation purposes. Besides helping in conservation of underground water, the reuse of treated wastewater for irrigation has also reduced farmers input cost, it being rich in nutrient content. These projects have been implemented by laying underground pipeline system for irrigation water conveyance covering an area of 8021 hectares in the catchment of river Sutlej, Beas, Ghaggar and other towns as per following details:

Catchment	No of STP.s	Reuse of Treated Water (MLD)	Area Covered (hectares)
Satluj	21	135	3414
Beas	9	53	1420
Ghaggar	12	60	2079
Other Towns	14	34	1108

Total	56	282	8021
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The STPs wise details for river Sutlej, Beas, Ghaggar and other towns for irrigation purposes are given in **Annexure B, C, D & E**, respectively. The programme has been a major success story of the Department and readily adopted by the farming community as it assured continued water availability & minimized their dependence on limited electricity supply.

- 3.4.3** Six (6) existing STPs located in Ludhiana (5) and Jalandhar (1) are having discharge of more than 50 MLD. Due to high discharge, open channels are required to be constructed for utilizing 566 MLD of treated wastewater. There are many challenges for reuse of treated wastewater of these STPs as these are located in urbanized areas. The Department of Water Resources is exploring the feasibility for channelization of Lower Budha Nallah to reuse the treated wastewater of Ludhiana city for irrigation.
- 3.4.4** The lack of requisite command areas and interest of farmers due to easy availability of fresh water are also major impediments in case of some STPs for reuse of treated water for irrigation.
- 3.4.5** From the experience of using STP's treated wastewater for irrigation purposes, the following issues emerge, which need to be addressed:
- (i) In case of STPs based on SBR technology, the discharge of treated wastewater is not continuous and for the gap period of about 45 minutes, the pump through which the treated wastewater is pumped for utilization onto land for irrigation is required to be shutdown, which discourages the farmers to utilize the treated wastewater. Therefore, there is a need to provide a storage tank of sufficient capacity for treated wastewater so that without shutting down the pumping station, the wastewater can be made available to the farmers.
 - (ii) The payment of electricity bill is required to be regulated by fixing the responsibility of the concerned department and funds for this purpose need to be made available with the STP operating agency.
 - (iii) The farmers need to be educated and made aware about the advantages of use of treated wastewater for irrigation purpose.

Chapter 4- Various Measures for Reuse of Treated Wastewater & Timelines

4.1 Recycling and reuse of wastewater

4.1.1 Recycling and reuse of wastewater is an important aspect of water management providing a way to increase water availability. Nearly 90% of the wastewater generated in Israel is re-used, making it the leading nation in water recycling. Through water conservation and reuse, Israel has been able not only to survive drought and periods of water scarcity, it has been able to thrive and use reclaimed water as a fulcrum for creating new businesses and economic opportunities. The treated wastewater in Israel is predominantly used for irrigation and remaining for environmental purposes such as increasing river flow volume and for fire suppressions. Recycled water can satisfy most water demands, as long as it is adequately treated to ensure water quality appropriate for the use.

4.2 Various Measures

4.2.1 In order to promote reuse of treated wastewater of STPs & CETPs, following measures have been chalked out:

- (i) Setting up of facilities for reuse of treated wastewater for Irrigation
- (ii) Utilization of treated wastewater for rejuvenation of water bodies such as wetlands and drains
- (iii) Promotion for reuse for other non-potable purposes
 - (a) Industrial processes
 - (b) Aquaculture
 - (c) Urban landscaping & green belts
 - (d) Construction activities & concrete mixing
 - (e) Domestic reuse (Flushing, cleaning, lawns, etc.)
 - (f) Thermal Power Plants (Cooling purposes)
 - (g) Sprinkling for dust control
 - (h) Washing of railway tracks
 - (i) Fire brigades /hydrants
- (iv) Capacity building & awareness campaign on reuse of water

4.2.2 Each major project will have timelines for various stages of the project. Following stages have been identified to monitor the progress:

Name of the Project			
Brief Scope of the Project			
S. no.	Stage	Start Date	Completion Date
1	Preparation of DPR		
2	Financial Closure		
3	Tendering of the Work including allotment		
4	Commencement of Work		
5	Quarterly Milestones during the		

	construction Stage		
6	Completion and Commissioning		

4.3 Reuse of Treated Wastewater for Irrigation

4.3.1 Based on success of its commissioned project, Department of Soil and Water Conservation has prepared an Action Plan to utilize 1469 MLD of treated wastewater from 133 existing, under progress and proposed STPs in the catchment of rivers and other towns for irrigation purposes for an agricultural area of 30755 hectares for further augmentation of programme on massive scale all across the state. The ultimate aim of the Action Plan is to reduce the stress on fresh water resources of the state by creating an alternate source of irrigation. The nutrient value of treated wastewater is also as important as the water itself.

4.3.2 The proposed physical targets & financial targets of Action Plan are as under:

STP Status		No of STP's	Treated Wastewater (MLD)	Area to be benefitted (ha)	Funds Required (In Cr)
Sutlej					
1	Existing/Under construction	34	885	10868	128.88
2	Proposed	28	144	4896	50.20
Beas					
1	Existing/Under construction	7	42	1428	11.57
2	Proposed	15	37	1258	11.15
Ghaggar					
1	Existing/Under construction	15	125	4267	54.88
2	Proposed	16	59	2011	19.95
Other Towns					
1	Existing/Under Construction	7	97	3307	38.15
2	Proposed	11	80	2720	26.02
Total		133	1469	30755	340.80

The STPs wise details for river Sutlej, Beas, Ghaggar and other towns along with timelines and fund requirement are given in **Annexure F, G, H & I**, respectively.

4.3.3 Department has submitted project of Rs. 269 crores to Government of India under Pradhan Mantri Krishi Sanchai Yojna (PMKSY) for re-using the treated sewage of 52 STPs for irrigation in 2018. Another, project of Rs. 95 crores for 25 STPs for irrigation as approved by Government of Punjab has been also submitted to NABARD in December

2018 for funding under RIDF-25. The funds against these proposals are expected to be received during current Financial Year.

4.4 Reuse of Treated Wastewater for Rejuvenation of Water Bodies

4.4.1 Treated wastewater of STPs can be used for rejuvenation of defunct waterbodies and for maintaining Environmental Flow of rivers by mixing with good quality water. World over, many natural waterbodies have been revived by using treated wastewater.

4.4.2 The Lower Budha Nallah can be revived to use the treated wastewater from STPs of Ludhiana City carried by Buddha Nallah (presently being discharged into River Sutlej) for irrigation purposes. The State Level Steering Committee in its meeting held on 30.11.2018 has decided that Department of Water Resources shall prepare a detailed action plan for this purpose in a period of 2 months in consultation with Commissioner, Municipal Corporation, Ludhiana and Punjab Pollution Control Board.

4.4.3 Department of Water Resources and Local Government also need to explore ways to utilize the wastewater of others STPs for rejuvenating water bodies or recharging of groundwater after carry out scientific analysis.

4.5 Reuse of Treated Wastewater for Other Non-potable purposes

4.5.1 The reuse of treated wastewater for various non-potable purposes such as domestic reuse (flushing, cleaning, carwashes, lawns, etc.), watering of green belts & parks, sports grounds, golf courses, institutional use, offices, shopping malls, housing societies, sprinkling for dust control in urban areas need to be promoted by Department of Local Government and Department of Housing & Urban Planning on priority basis. Treated wastewater should be made available for non-potable uses in urban areas by levying user charges. This will also incentivise the Department of Local Govt. MCs to improve their sewage treatment facilities. Awareness programmes also needs to be conducted to sensitize citizens to reuse and conserve water.

4.5.2 Timelines for all the activities needs to be worked out in consultation with all the stakeholders.

4.6 Reuse of Treated Wastewater for industrial Use

4.6.1 Reusing water in industry has the potential to reduce the costs of water supply and wastewater treatment by industries and reduces pressure on water resources. It also helps in increasing productivity per water input, lowering wastewater discharges and their pollutant load, reducing energy consumption and potentially processing cost. However, the reuse of wastewater in industries mainly depend upon the type of industry, specific industrial processes, available treatment technology as well as their efficiency targets. Some of the potential reuses are washing, cooling, steam generation, Ph adjustment, fire protection, etc.

- 4.6.2** In house water reuse in industries has been practised throughout the world in the oil and gas, textile, automobile, paper & pulp and energy production industries and more recently in the electronic and food industries.
- 4.6.3** The use of ground water in excess of recharge is leading to fall in water table. Based on the ground water development, out of total 137 Administrative Blocks of Punjab, 110 Blocks have been categorized by Central Ground Water Board as Over Exploited/Red category Blocks. It implies that 80% of the total geographical area of the State is over exploited in terms of stage of ground water development as exploitation in these blocks is >100%. Central Ground Water Authority has already prohibited the extraction of groundwater through any energized means for any other purposes other than drinking water in 45 notified Blocks/Areas of Punjab without prior approval. The complete list at **Annexure J**.
- 4.6.4** Punjab Pollution Control Board and the various agencies responsible for setting up & maintaining of STPs such as PWSSB, Local Bodies, DWSS, GAMADA, etc. needs to explore the feasibility of providing the treated water of nearby STPs to heavy water user industries to meet their water demand. The feasibility of making STP Treated Water available to various industries located in 45 notified blocks/areas of the State for various uses will also be explored. Timelines will be worked out in consultation with all the stakeholders.
- 4.6.5** Reuse of Treated Wastewater for Construction Activities & Thermal Plants
- 4.6.6** All the stakeholder department and organization needs to explore the possibility of using the treated wastewater of STPs for construction activities based on the scientific analysis and BIS prescribed standards. All the existing models may be reviewed by Department of Local Govt. to frame suitable guidelines and enabling infrastructure to promote reuse of treated water in construction activities.
- 4.6.7** Ministry of Power, Govt. of India has already made it mandatory for Thermal Power Plants(TPP) which are located within a 50km radius of a STP to use treated water of STP for cooling purposes. The direction has been issued vide Tariff Policy notified by Govt. of India on 28th January, 2016 under para 6.2(5) as under:
- "The thermal power plant(s) including the existing plants located within 50 km radius of sewage treatment plant of Municipality/local bodies/similar organization shall in the order of their closeness to the sewage treatment plant, mandatorily use treated sewage water produced by these bodies and the associated cost on this account be allowed as a pass through in the tariff. Such thermal plants may also ensure back-up source of water to meet their requirement in the event of shortage of supply by the sewage treatment plant. The associated cost on this account shall be factored into the fixed cost so as not to disturb the merit order of such thermal plant. The shutdown of the sewage treatment plant will be taken in consultation with the developer of the power plant.*
- 4.6.8** There are 24 STPs with a total operational capacity of 340 MLD located within the 50 Kms radius (approx) of 4 TPPs located at Goindwal Sahib, Tarn Taran; Rajpura, Patiala; Lehra Mohabat, Bathinda and Talwandi Sabo, Mansa. The details are at **Annexure K**. The total requirement water of 4 TPP is 250 MLD approximately.

4.6.9 MC and respective management of TPPs to involve expert agencies to study the feasibility of utilization of treated wastewater of STPs located within a 50 of thermal plants for cooling purposes. The timelines are being worked out by TPPs.

Chapter 5 – Monitoring & Governance

5.1 Key components of monitoring of reuse of treated wastewater

There are following key components of monitoring

- (i) Progress for setting up of irrigation projects
- (ii) Progress of rejuvenation of water bodies
- (iii) Progress for other non-potable domestic use
- (iv) Progress for industrial, construction and thermal plant use
- (v) Awareness and capacity building exercises

5.2 Monitoring of progress

The progress of projects for reuse of treated for various non-potable purposes will be monitored on regular basis. In order to ensure that all the stakeholder departments adheres to the timelines given for various activities, the department shall submit progress of the project on monthly basis.

5.3 Three Tier Monitoring

Monitoring will be done by the concerned Departments/ Agencies, which are executing or responsible for particular activities and it will be their primary responsibility to ensure compliance of the Action Plan.

5.3.1 In addition, there will be three level of Committees to review and monitor the status:

- (i) District Level Task Force: Department of Science Technology & Environment, Government of Punjab vide order dated 19.11.2018 has constituted Special Environment Surveillance Task Force (SESTF) in view of NGT orders dated 20.09.2018 in O.A. No. 673/2018 consisting of Deputy Commissioner of concerned district, Senior Superintendent of Police of concerned district, Regional Officer of PPCB not below the rank of Environmental Engineer having jurisdiction over the district, person nominated in every District by District Judge of the concerned District in his capacity as Head of the Legal Service Authority as members. The SESTF will function under the over all supervision & coordination of Principal Secretary to Government of Punjab, Department of Science, Technology & Environment. It shall monitor the timelines for implementation of action plan pertaining to respective districts.
- (ii) River Rejuvenation Committee (RRC) - Department of Science Technology & Environment, Government of Punjab vide order dated 19.11.2018 has constituted RRC in view of NGT orders dated 20.09.2018 in O.A. No. 673/2018 consisting of Director Environment, Director, Urban Development, Director, Industries and Member Secretary, Punjab Pollution Control Board as members. The RRC will function under the over all supervision & coordination of Principal Secretary to Government of Punjab, Department of Science, Technology & Environment.
- (iii) State Level Task Force / Monitoring Committee

5.3.2 Department of Science, Technology and Environment and PPCB will set up a dedicated team for supporting coordination and monitoring of the Action Plan. The team will collate

and analyse data from all the concerned agencies and escalate the issues and challenges to the appropriate level for resolution.

5.4 Monitoring Committee by NGT

As per directions of NGT vide order dated 24-7-2018, CPCB has accordingly vide office order dated 06-08-2018 constituted a monitoring committee. NGT vide order dated 28/02/2019 in OA No. 916/2018 titled "Sobha Singh & Others Vs State of Punjab & Others" ordered that Monitoring Committee will now be headed by Justice Pritam Pal, former judge of Punjab & Haryana High Court. In addition, Shri Subodh Agarwal, former Chief Secretary of Punjab will be a senior member. NGT further suggested that the Committee may seek, wherever viable, the guidance of Justice Kuldeep Singh, former Judge, Hon'ble Supreme Court. The Committee may consider the involvement of Shri Satish Chandra and Shri Sanjay Kumar, IAS Officers in the State of Punjab in a suitable manner. Shri Babu Ram, former Member Secretary, Punjab State Pollution Control Board (State PCB) will also be a member of the Committee.

The Monitoring Committee will also monitor the implementation of Action Plan

5.5 Key Performance Indicators (KPI) for Key Functionaries

NGT in its various orders has directed the State Governments to ensure timely and speedy execution of various measures outlined in the Action Plans. It has also directed to take disciplinary and penal action against erring officers/officials.

The performance of key functionaries of Govt. involved in the execution of various activities of action plan is proposed to be evaluated vis-a viz prescribed timelines/targets, wherever applicable and certain weightage of KPI as deemed appropriate by the concerned departments to be included in their overall ACRs. The KPI Performs will developed for key functionaries of all the stakeholder departments.

Chapter 6 – Training & Capacity Building

6.1 Importance

Training and capacity building of all the personnel of concerned department on various environmental, pollution and sanitation issues and related control measures with the active involvement of NGOs and communities are key to concerted actions for clean environment. Therefore, it is imperative to enhance the capability and skills of the officers of stakeholder departments for effective implementation of Action Plan on Reuse of Treated Wastewater. National Green Tribunal (NGT) in its various orders has also emphasised on training & capacity building of the all the concerned for improving the environment in urban as well rural areas.

6.2 Objectives

- i) Raising awareness and changing the mindset.
- ii) Capacity building on various Environment Protection Plans, environmental concerns, issues, roles and responsibilities of different stakeholders.
- iii) Capacity building on existing policies, legal provisions, rules & regulations and NGT orders
- iv) Improving skills regarding existing technical practices, procedures and methodologies.
- v) Promoting an integrated and holistic approach for addressing the concerns.
- vi) Enhancing core competencies of concerned stakeholders in relevant areas of wastewater treatment and reuse .
- vii) Strengthening institutional arrangements
- viii) Reinforcing accountabilities and identifying aspects that require improvement
- ix) Understanding new challenges and requirements
- x) Fostering inter-departmental collaborations to achieve high performances

6.3 Need Assessment

The assessment of training needs of nodal and other responsible officers of various stakeholder departments involved in implementation of Action Plan will be made for development of specific training modules for different functionaries of relevant departments & organizations at various levels of hierarchies.

6.4 Involvement of Institutions and Experts

Organizations of national & international repute having expertise in the area of environment in general and wastewater reuse in particular shall be involved for conducting need specific trainings & capacity building programmes for various target groups and officials of stakeholder departments. Experts would also be involved in developing knowledge products and information material on various issues & technologies

for creating mass awareness to build a responsible society with an aim to promote reuse and recycling of water.

6.5 Comprehensive Training and Capacity Building Campaign

A comprehensive training and capacity building campaign will be launched on all aspects of reuse of treated wastewater including relevant technical and legal matters in a phased manner for Senior, Middle and Junior Level Officers of all departments. The infrastructure, expertise and resources available with the key departments such as Local Govt., Training & Personnel, Department of Public Relations, PPCB, etc. will be pooled together for carrying out such capacity building activities.

Chapter 7 – Information Technology Enabled Management Information System

7.1 Introduction

In order to keep track of the progress made by various stakeholders on various projects, activities, initiatives, the Action plan have also given monitoring and governance mechanism. It is proposed to develop dedicated IT platform namely Environment Protection Monitoring System (EPMS) to monitor the implementation of Actions Plan. It is envisaged that the entire data from stakeholder departments and project sites will be captured online and all reports and analysis for monitoring of the Action plan at various levels will be done online through the web portal.

7.2 Existing system

As of now, there is no IT system for monitoring various activities carried out as a part of Action Plan under the State of Punjab for providing ready reference to the various monitoring authorities in the State.

7.3 Limitations of existing system

- i) Inherent delay in processing and retrieval of information.
- ii) Lack of accuracy and consistency in reporting.
- iii) Loss of efforts and time in serving queries of repetitive nature.
- iv) Lack of transparency in working.
- v) Significant delay in traditional methods of communication.
- vi) Maintenance of record is cumbersome and tedious.
- vii) Generation of reports is time consuming and collection of data is tedious.
- viii) Under different Action Plan various reports are to be provided to GoP, Govt. of India, NGT on Monthly and Quarterly basis
- ix) Submission of this data needs to be web based for timely submission of these reports.
- x) There is no provision for submission & generation of online reports.
- xi) Getting data from external Stakeholders department/agencies is a tedious and cumbersome job.

7.4 Proposed system

7.4.1 Keeping in mind the issues identified in existing manual system and compulsion of providing a good e-governance monitoring environment, the Department of Science, Technology and Environment Punjab envisioned & proposed a web portal that shall be designed and implemented. The system shall provide a single point of access & provide provision for various stakeholders to add their inputs which would enable the Authorities to monitor the various activities / projects etc from a single point.

7.4.2 The Management Information System(MIS) will be supported by Dash Board at Primary and Secondary level for monitoring purpose with Graphical and Analytical data on a time series

basis. The system should be able to generate alerts in the form of SMS and Email to the concerned department as well as the owner department in the event of a default.

Chapter 8 - Risk Mitigation Plan

8.1 Identification of Major Risks in the Action Plan

The Action Plan for reuse of treated wastewater is a complex multi sectoral and multi agency action plan. Successful implementation would face many challenges. Following major risks have been identified

- i) Risk associated with reuse of treated wastewater
- ii) Accuracy and completeness of Baseline Data
- iii) Accuracy and completeness of Project timelines
- iv) Financial closure and timely releases of funds
- v) Resolution of Administrative and Technical Issues

8.2 Risk associated with reuse of treated wastewater for various puposes

- i) **Irrigation:** The underlying principle of water reuse for agricultural purposes is the need for the appropriate treatment of municipal wastewater to achieve a specific quality for a given use. Besides the well-known benefits, using recycled water for irrigation purposes may have negative impacts on public health and the environment and which depend on the level of treatment, local conditions and irrigation practices. While dissolved salts present in sewage provide nutrients to plants, but when found in heavy concentrations they may enter the food chain and pose health hazards to the consumers of such farm produce. Periodic monitoring is required to ensure that the treated wastewater used for irrigation does not have toxic elements or heavy metals in high concentrations. In all cases, existing scientific knowledge, operational feedback and best practices allow risks to be reduced through the implementation of efficient planning, the selection of appropriate technology, monitoring of effective operation & management of STPs.
- ii) **Industries:** Reuse of treated water by industries requires proper implementation. One prerequisite for initiating industrial use of treated water is the construction of a distribution network to transport treated sewage to industries. It is also important to ensure that the quality of the treated sewage confirms to the minimum desired need of industries. While the MoEF/CPCB/PPCB has prescribed the treatment standards, most of the municipal STPs treat sewage up to secondary treatment. Water of this quality can be used only for lowend industrial purposes like gardening or as service water.
- iii) **Non potable domestic use:** Tertiary treatment (Chemical Coagulation, Filtration, Disinfection) is supplementary to primary and secondary treatment for the purpose of removing the residual organic and inorganic substances and in some cases the refractory and dissolved substances to the degree necessary. It is imperative to carry out the tertiary treatment of wastewater for non-potable domestic use to avoid any health hazard to people and deterioration of ground water quality.

- iv) **Construction:** It has been reported that high amounts of suspended solids in the water can increase dry shrinkage and can cause excessive leaching of salts which increases porosity and decreases strength. Certain dissolved salts can cause slower setting and hardening times, reduce the strength, and increase the risk of corrosion of reinforcing bars. Certain organic materials even in very small quantities may retard hydration and entrain excessive amounts of air into the concrete. Therefore, the use of water in construction activities requires due deliberation with the involvement of Expert Agencies.
- v) Since the sources of treated wastewater are STPs, therefore it needs to be ensured that existing STPs function as per designed criteria qualitatively and quantitatively. This can be facilitated through effective supervision & management of operations of STPs by concerned Agencies

8.3 Accuracy and completeness of Baseline Data

In order to ensure accuracy and completeness of baseline data, validation of the same would be done through the respective Administrative Departments and Action plan will be updated accordingly.

8.4 Accuracy and completeness of Project timelines

In order to ensure accuracy and completeness of Project timelines, each Administrative Department would be asked to validate the project timelines carefully after taking into account all the relevant factors and Action plan will be updated accordingly.

8.5 Financial closure and timely releases of funds

Availability of funds for completing the projects on time is a major risk. Some of the projects have still not achieved financial closure. It has also been observed that the release of funds is often not regular even though the project had appropriate financial approval. In case of operation and maintenance of the facilities, substantial blame has been apportioned to lack of regular release of funds for maintenance, which resulted in failure of STPs to treat the wastewater and as a result untreated water has been discharged in the drain. In order to overcome the challenges, efforts will be made towards:

- (i) Seeking a firm commitment of Department of Finance to release the funds for the projects on priority.
- (ii) In case of operation and maintenance, seeking firm commitment of ULBs/ Department of Local Government to treat this as committed expenditure according to its highest priority and release the funds regularly. Further, arrangement may be worked out with the Administrative Department and Department of Finance that in case of default of ULB to pay to the operator, funds will be deducted from the grant to be released to ULB and paid directly to the Operator.

8.6 Resolution of Administrative and Technical Issues

Some of the issues such as acquisition of land, design parameters, treatment technologies, discharge standards can hold up the progress of the implementation of the Action Plan. The Nodal Department team will continuously track and identify such issues and escalate to the appropriate level. The three tier monitoring and review system will help in resolving the issues.

Annexure A - Existing STPs in Punjab

Sr. No.	Agency	Number of STPs	Total Capacity (MLD)
1	Punjab Water Supply & Sewerage Board (PWSSB)	60	592
2	Municipal Corporations (MCs)	18	798
3	Department of Water Supply & Sanitation (DWSS)	6	7.93
4	Greater Mohali Area Development Authority (GMADA)	2	6.5
5	Greater Ludhiana Area Development Authority (GLADA)	6	9.75
6	Military Engineer Services (MES)	10	19.4
7	Punjab State Industrial Export Corporation (PSIEC)	4	12
8	Punjab Urban Development Authority (PUDA)	1	13
9	Bhakra Beas Management Board (BBMB)	2	14.7
	Total	109	1473.28

**Annexure B- Commissioned/Under Progress Irrigation Projects for Reuse of Treated Wastewater
of STPs in the Catchment Area of River Sutlej**

S.No	Town	Capacity (MLD)	Tech.	Status	Command Area (ha)	Remarks
1	Phagwara	20	UASB	Commissioned	419	
2	Phagwara	8	MBBR	Commissioned		
3	Phillaur	2.6	WSP	Commissioned	75	
4	Nakodar	6	SBR	Commissioned	180	
5	Nurmahal	2.5	SBR	Commissioned	105	
6	Nangal-BBMB	8	ASP	Commissioned	200	
7	Nangal-NFL	5	ASP	Commissioned	120	
8	Machhaiwara	4	SBR	Commissioned	40	
9	Ropar	10	SBR	Commissioned	105	
10	Ropar	2.5	SBR	Commissioned	72	
11	Ropar	2	SBR	Commissioned	80	
12	Goniana	3	WSP	Commissioned	102	
13	Malout	10	MBBR	Commissioned	160	
14	Dharamkot	4	SBR	Commissioned	162	
15	Jalalabad	8	MBBR	Under progress	200	
16	Fazilka	8	MBBR	Commissioned	350	
17	Sh.Muksar Sahib	8.7	MBBR	Commissioned	480	
18	Sh.Muksar Sahib	5.7	MBBR	Commissioned	185	
19	Chamkaur Sahib	4	WSP	Completed	99	The Pump Room is to be shifted due to high tension wires
20	Anandpur sahib	8	MBBR	Commissioned	150	The project worked for 6 years, Railway has changed pipe crossing point, work underway
21	Kurali	5	SBR	Commissioned	130	
Total		135			3414	

Anneuxre C-Commissioned Projects for Reuse of Treated Wastewater of STPs in the Catchment Area of River Beas

S.No	Town	Capacity (MLD)	Command Area (ha)	Remarks
Local Bodies				
1	Bhulath	4	200	
2	Dasuya	4	120	
3	Talwara	8	70	
4	Begowal	2.5	140	Irrigation Project Commissioned, Extension of project underway, Funds available with Deptt
5	Kapurthala	25	484	Irrigation Project Commissioned, Extension of Pipeline underway, Funds available with Deptt
6	Mukerian	5	100	
7	Sham Churasi	1	90	
8	Sri Hargobindpur	1	50	
9	Sultanpur Lodhi	2.6	166	Irrigation Project Commissioned, Extension of Pipeline underway, Funds available with Deptt
Total		53.1	1420	

**Annexure D- Commissioned /Under Progress Irrigation Projects for Reuse of Treated Wastewater
of STPs in the Catchment Area of River Ghaggar**

Sr. no.	Town	Capacity (MLD)	Tech.	Status	Command Area (ha)
1	Banur	4	MBBR	Commissioned	120
2	Baretta	3	WSP	Commissioned	150
3	Bhikhi	3	WSP	Commissioned	145
4	Moonak	3	SBR	Commissioned	88
5	Pattran	4	SBR	Commissioned	120
6	Samana	10	SBR	Commissioned	325
7	Rajpura	7	SBR	Under Progress	225
8	Mansa	6.5	SBR	Commissioned	350
9	Sardulgarh	4	WSP	Commissioned	128
10	Khanauri	3	SBR	Under Progress	125
11	Lehragaga	4	SBR	Commissioned	138
12	Sunam	8	MBBR	Commissioned	165
	Total	59.5			2079

Annexure E-Commissioned /Under Progress Irrigation Projects for Reuse of Treated Wastewater of STPs in Other Towns

Sr. No.	Town	Capacity (MLD)	Tech	Status	Command Area (ha)
1	Dera Baba Nanak	1.5	WSP	Commissioned	43
2	Baba Bakala	1	WSP	Commissioned	25
3	Bhucho	3	WSP	Commissioned	128
4	Maur	5	MBBR	Commissioned	150
5	Kotfatta	1.5	WSP	Commissioned	108
6	Maloud (GLADA)	1	MBBR	Commissioned	52
7	Begowal	1.15	WSP	Commissioned	45
8	Arrechan	2.75	SBR	Commissioned	55
9	Doraha	1	-	Commissioned	42
10	Payal (GLADA)	1	MBBR	Commissioned	45
11	Talwandi Sabo (DWSS)	3	WSP	Commissioned	150
12	Sangat	1.5	WSP	Under Progress	55
13	Rampura Phul	7.5	MBBR	Under Progress	145
14	Rama Mandi	3	SBR	Under Progress	65
Total		33.9			1108

Annexure F - Timelines for providing Irrigation Schemes to utilize the Treated Sewage in catchment Area of River Sutlej

(i) Action Plan/Fund Requirement where STP's Constructed/under progress

Sr No	Town	Cap. (MLD)	Tech.	Irrigation Scheme Details			
				Timeline	Funds (Lakhs)	Comm Area (ha)	Remarks
MC, Ludhiana							
1	Jamalpur	48	UASB	-	-		Farmer not willing to use water because of easy availability of ground water. Discharge is high, open channel required.
2	Bhattian	111	UASB	-	-		
3	Baloke	152	UASB	-	-		
4	Bhattian	105	SBR	-	-		Discharge is high, open channel required
5	Baloke	50	SBR	-	-		
MC, Jalandhar							
6	Pholriwal	100	UASB	-	-		Discharge is high, open channel required.
7	Pholriwal	25	SBR	T+24	910.00	850	Funds to be tied up
8	Pholriwal	25	SBR	T+24	875.00	850	Funds to be tied up
9	Basti Peer Dad	50	SBR	T+ 30	3200.00	1700	Funds to be tied up, Feasibility Study of Irrigation Project underway
10	Bambian Wali Cantt	10	SBR	T+20	425.00	340	Funds to be tied up
11	Jaitawali, Hsr. Road	25	SBR	T+24	890.00	850	Funds to be tied up
PWSBB							
12	Phagwara	8	MBBR	T+20	315.00	272	Farmers not willing to use treated water
13	Phillaur	3	MBBR	T+20	83.00	102	Funds to be tied up
14	Nawanshah ar	6	SBR	T+20	204.00	204	Funds to be tied up
15	Banga	3	SBR	T+20	125.00	102	Farmers not willing to use treated water
16	Hoshiarpur	30	MBBR	T+30	925.00	1020	Funds to be tied up

Sr No	Town	Cap. (MLD)	Tech.	Irrigation Scheme Details			
				Timeline	Funds (Lakhs)	Comm Area (ha)	Remarks
17	Baghapurana	4	SBR	T+20	145.00	136	Funds to be tied up
18	Nangal	5	ASP	T+20	225.00	170	Funds to be tied up
19	Sahnewal	7	SBR	T+20	227.00	238	Funds to be tied up
20	Jagraon	12	SBR	T+20	470.00	408	Funds to be tied up
21	Jagraon	16	SBR	T+20	625.00	544	Funds to be tied up
22	Moga	27	SBR	T+30	1293.00	918	Funds to be tied up
23	Abohar	25	SBR	T+30	685.00	850	Funds to be tied up
24	Malout	3	WSP	T+20	105.00	102	Funds to be tied up
25	Makhu	4	SBR	T+20	135.00	136	Funds to be tied up
26	Talwandi Bhai	4	SBR	T+20	165.00	136	Funds to be tied up
27	Zira	8	MBBR	T+20	306.00	272	Funds to be tied up
BBMB							
28	Nangal	6.75	-	T+20	135.00	230	Funds to be tied up
DWSS							
29	Sh.Muktsar Sahib	3.5	MBBR	T+20	125.00	119	Funds to be tied up
MES							
30	East Jalandhar Cantt.	3	MBBR	T+20	90.00	102	Funds to be tied up
31	East Jalandhar Cantt.	3	MBBR	T+20	85.00	102	Funds to be tied up
32	East Jalandhar Cantt.	0.4	MBBR	T+20	15.00	14	Funds to be tied up
33	West Jalandhar Cantt.	1.5	MBBR	T+20	60.00	51	Funds to be tied up
34	West Jalandhar Cantt.	1.5	MBBR	T+20	45.00	51	Funds to be tied up
Total		885.65			12888.0	10868	

ii) **Action Plan/Fund Requirement where STP's proposed to be Constructed**

Sr.No	Town	Capacity (MLD)	Irrigation Scheme Details			
			Time	Funds (Lakhs)	Comm. Area (ha)	Remarks
	PWSSB					
1.	Ferozepur	18	T+20	825.00	612	Funds to be tied up
2.	Guru Har Sahai	1	T+20	38.00	34	Funds to be tied up
3.	Guru Har Sahai	4	T+20	106.00	136	Funds to be tied up
4.	Jaito	6	T+20	196.00	204	Funds to be tied up
5.	Kotakpura	8	T+20	304.00	272	Funds to be tied up
6.	Kotakpura	6	T+20	265.00	204	Funds to be tied up
7.	Morinda	5.5	T+20	185.00	187	Funds to be tied up
8.	Gidderbaha	7	T+20	225.00	238	Funds to be tied up
9.	Balachaur	4	T+20	113.00	136	Funds to be tied up
10.	Garshankar	3	T+20	94.00	102	Funds to be tied up
11.	Maluka	1	T+20	32.00	34	Funds to be tied up
12.	Rahon	3	T+20	95.00	102	Funds to be tied up
13.	Kiratpur Sahib	2	T+20	65.00	68	Funds to be tied up
14.	Faridkot	14	T+20	410.00	476	Funds to be tied up
15.	Patti	8	T+20	200.00	272	Funds to be tied up
16.	Arniwala	2	T+20	56.00	68	Funds to be tied up
17.	Barriwala	2.5	T+20	74.00	85	Funds to be tied up
18.	Bhagta Bhaike	3	T+20	104.00	102	Funds to be tied up
19.	Bhai Roopa	3	T+20	105.00	102	Funds to be tied up
20.	Kotha Guru	2	T+20	67.00	68	Funds to be tied up
21.	Mahilpur	3	T+20	97.00	102	Funds to be tied up
22.	Mallanwala	3	T+20	110.00	102	Funds to be tied up
23.	Mamdot	2	T+20	60.00	68	Funds to be tied up
24.	Mudki	2	T+20	68.00	68	Funds to be tied up
25.	Nihal Singh Wala	2	T+20	66.00	68	Funds to be tied up

26.	Raikot	5	T+20	225.00	170	Funds to be tied up
27.	Moga	23	T+20	795.00	782	Funds to be tied up
	PSIEC					
28.	FP, Jalandhar	1	T+20	40.00	34	Funds to be tied up
Total		144		5020.00	4896	

**Annexure G- Timelines for providing Irrigation Schemes to utilize the Treated Sewage in
catchment Area of River Beas**

(i) Action Plan/Fund Requirement where STP's Constructed/under progress

Sr.No	Town	Capacity (MLD)	Irrigation Scheme Details			
			Timeline	Funds (Lakhs)	Command Area (ha)	Remarks
Local Bodies						
1	Pathankot	27	T + 30	675.00	918	Funds to be tied up
2	Tanda	4	T + 20	145.00	136	Funds to be tied up
MES , Pathankot						
3	GE, Air Force	3	T + 20	90.00	102	Funds to be tied up
4	GE, South	2	T + 20	60.00	68	Funds to be tied up
5	GE, West	2	T + 20	60.00	68	Funds to be tied up
6	GE , Mammon	2	T + 20	62.00	68	Funds to be tied up
7	GE , North	2	T + 20	65.00	68	Funds to be tied up
Total		42		1157.00	1428	

ii) Action Plan/Fund Requirement where STP's proposed to be Constructed

Sr.No	Name of Town	Cap. (MLD)	Irrigation Scheme Details			
			Time	Funds (Lacs)	Command Area (ha)	Remarks
Local Bodies						
1	SultanpurLodhi	4	T + 20	117.00	136	Funds to be tied up
2	SultanpurLodhi	1	T + 20	34.00	34	Funds to be tied up
3	Kartarpur	4	T + 20	109.00	136	Funds to be tied up
4	Dhilwan	2.5	T + 20	62.50	85	Funds to be tied up
5	Kothi Pandita, Pathankot	2	T + 20	75.00	68	Funds to be tied up
6	Adarash Nagar, Pathankot	1.2	T + 20	38.00	41	Funds to be tied up
7	Haryana	2	T + 20	58.00	68	Funds to be tied up
8	Sujanpur	5.5	T + 20	135.00	187	Funds to be tied up
9	Talwara Town	4	T + 20	95.00	136	Funds to be tied up
10	Rayya	3.5	T + 20	95.00	119	

Sr.No	Name of Town	Cap. (MLD)	Irrigation Scheme Details			
			Time	Funds (Lacs)	Command Area (ha)	Remarks
11	Goindwal Sahib	1.3	T + 20	65.00	44	Funds to be tied up
12	Jalandhar Dev. Authority	1	T + 20	65.00	34	Funds to be tied up
	PSIEC				0	
13	Industrial Growth Centre Pathankot	2	T + 20	67.00	68	Funds to be tied up
14	Industrial Focal Point Goindwal Sahib	2	T + 20	65.00	68	Funds to be tied up
	MES					
15	GE, Kapurthala	1	T + 20	35.00	34	Funds to be tied up
Total		37		1115.50	1258	

**Annexure H- Timelines for providing Irrigation Schemes to utilize the Treated Sewage in catchment
Area of River Ghaggar**

(I) Action Plan/Fund Requirement where STP's Constructed/under progress

Sr. No.	Town	Cap. (MLD)	Tech	Irrigation Scheme Details			
				Timeline	Funds (Lakhs)	Com m. Area (ha)	Remarks
Local Bodies							
1	Mandi Gobindgarh	25	SBR	T+30	673.00	850	Funds to be tied up
2	Patiala	46	SBR	T+36	2800.00	1564	Funds to be tied up
3	Patiala	10	SBR	T+20	345.00	340	Funds to be tied up
4	Rajpura	10	SBR	T+20	390.00	340	Funds to be tied up
5	Boha	2	SBR	T+20	65.00	68	Funds to be tied up
6	Dhuri	5	SBR	T+20	175.00	170	Funds to be tied up
7	Sangrur	4	SBR	T+20	150.00	136	Funds to be tied up
8	Bassi Pathana	3	SBR	T+20	115.00	102	Funds to be tied up
9	Sirhind- 1	2	SBR	T+20	90.00	68	Funds to be tied up
10	Sirhind- 1	4	SBR	T+20	185.00	136	Funds to be tied up
11	Sirhind- 1	5	SBR	T+20	225.00	170	Funds to be tied up
	PSIEC						Funds to be tied up
12	Ind. Focal Point, Mandi Gobindgarh	3	MBBR	T+20	82.00	102	Funds to be tied up
13	Ind. Focal Point, Nabha	3	-	-	-		Funds to be tied up
	GMADA						Funds to be tied up
14	Lalru	3	WSP	T+20	85.00	102	Funds to be tied up
15	Derabassi	3.5	SBR	T+20	108.00	119	Funds to be tied up
Total		125.5			5488.00	4267	

(II) Action Plan/Fund Requirement where STP's proposed to be constructed

Sr. No.	Town	Cap. (MLD)	Tech	Irrigation Schemes			
				Timeline	Funds (Lakhs)	Comm. Area (ha)	Remarks
PWSSB							
1	Cheema	2	SBR	T+20	70.00	68	Funds to be tied up
2	Bhadson	3	SBR	T+20	85.00	102	Funds to be tied up
3	Nabha	12	SBR	T+20	325.00	408	Funds to be tied up
4	Dhuri	6	SBR	T+20	225.00	204	Funds to be tied up
5	Sangur	11	SBR	T+20	385.00	374	Funds to be tied up
6	Longowal	3	SBR	T+20	105.00	102	Funds to be tied up
7	Amlon	3	SBR	T+20	115.00	102	Funds to be tied up
8	Issapur, Derabassi	2	SBR	T+20	95.00	68	Funds to be tied up
9	Amirpur, Derabassi	2	SBR	T+20	101.00	70	
10	Dappar, Lalru	1	SBR	T+20	25.00	34	Funds to be tied up
11	Lalru, Mandi	1.5	SBR	T+20	60.00	51	Funds to be tied up
12	Sanour	4	SBR	T+20	125.00	136	Funds to be tied up
13	Ghanour	2	SBR	T+20	74.00	68	Funds to be tied up
14	Gholu Majra	0.3	SBR	T+20	10.00	10	Funds to be tied up
15	Chaundheri & Samlheri	0.3	SBR	T+20	10.00	10	Funds to be tied up
MES, Patiala							
16	Patiala	6	(MBBR)	T+20	185.00	204	Funds to be tied up
Total		59			1995.00	2011	

Annexure I- Timelines for providing Irrigation Schemes to utilize the Treated Sewage in Other Towns

(I) Action Plan/Fund Requirement where STP's Constructed/under progress

Sr. No.	Town	Cap. (MLD)	Tech	Irrigation Scheme Details			
				Timeline	Funds Req (lakh)	Comm Area (ha)	Remarks
1	Doraha (GLADA)	4.75	MBBR	T+20	165.00	162	Funds to be Tied up
2	Mullanpur (GLADA)	3	MBBR	T+20	105.00	102	Funds to be Tied up
3	Amritsar -III	27.5	SBR	T+30	1050.00	935	Funds to be Tied up
4	Barnala	20	SBR	T+20	860.00	680	Funds to be Tied up
5	Khanna	29	SBR	T+30	1140.00	986	Funds to be Tied up
6	Tarn Taran -I	9	SBR	T+20	310.00	306	Funds to be Tied up
7	Tarn Taran -II	4	SBR	T+20	185.00	136	Funds to be Tied up
Total		97.25			3815.00	3307	

(II) Action Plan/Fund Requirement where STP's proposed to be Constructed

Sr. No.	Town	Cap (MLD)	Tech	Irrigation Scheme Details			
				Timeline	Funds Req (lakh)	Comm Area (ha)	Remarks
1	Batala	28	SBR	T+30	825.00	952	Funds to be Tied up
2	Malerkotla	22	SBR	T+20	675.00	748	Funds to be Tied up
3	Khem Karan	2	SBR	T+20	70.00	68	Funds to be Tied up
4	Ajnala	4	SBR	T+20	155.00	136	Funds to be Tied up
5	Raman	3	SBR	T+20	124.00	102	Funds to be Tied up
6	Bathinda	4.5	SBR	T+20	170.00	153	Funds to be Tied up
7	Dhanaula	3	SBR	T+20	105.00	102	Funds to be Tied up
8	Jandiala Guru	5	SBR	T+20	165.00	170	Funds to be Tied up
9	Fatehgarh Churrian	3.5	SBR	T+20	145.00	119	Funds to be Tied up
10	Handiaya	2	SBR	T+20	65.00	68	Funds to be Tied up
11	Tappa	3	SBR	T+20	104.00	102	Funds to be Tied up
Total		80			2603.00	2720	

Annexure J- List of 45 Blocks/Areas of Punjab notified by Central Ground Water Authority

Sr. No.	Block/Area	District	Date of Notification
1	Ludhiana City	Ludhiana	11.12.1998
2	Moga-I	Moga	02.12.2006
3	Moga-II	Moga	02.12.2006
4	Sangrur	Sangrur	02.12.2006
5	Mahal Kalan	Barnala	02.12.2006
6	Ahmedgarh	Sangrur	02.12.2006
7	Nakodar	Jalandhar	13.08.2011
8	Shahkot	Jalandhar	13.08.2011
9	Lohian	Jalandhar	13.08.2011
10	Pattran	Patiala	13.08.2011
11	Phagwara	Kapurthala	13.08.2011
12	Nihalsinghwala	Moga	13.08.2011
13	Dhuri	Sangrur	13.08.2011
14	Sunam	Sangrur	13.08.2011
15	Barnala	Barnala	13.08.2011
16	Sherpur	Sangrur	13.08.2011
17	Malerkotla	Sangrur	13.08.2011
18	Khanna	Ludhiana	13.08.2011
19	Ajnala	Amritsar	27.11.2012
20	Patti	Tarn Taran	27.12.2012
21	Tarn Taran	Tarn Taran	27.12.2012
22	Amloh	Fatehgarh	27.11.2012
23	Khamnao	Fatehgarh	27.11.2012
24	Khera	Fatehgarh	27.11.2012
25	Tanda	Hoshiarpur	27.11.2012
26	Bhogpur	Jalandhar	27.11.2012
27	Goraya/Rurka Kalan	Jalandhar	27.11.2012
28	Jalandhar East	Jalandhar	27.11.2012
29	Jalandhar West	Jalandhar	27.11.2012
30	Nurmahal	Jalandhar	27.11.2012
31	Phillaur	Jalandhar	27.11.2012
32	Nadala	Kapurthala	27.11.2012
33	Dhilwan	Kapurthala	27.11.2012
34	Kapurthala	Kapurthala	27.11.2012
35	Sultanpur	Kapurthala	27.11.2012
36	Pakhowal	Ludhiana	27.11.2012
37	Bhikhi	Mansa	27.11.2012
38	Budhlada	Mansa	27.11.2012
39	Sardulgarh	Mansa	27.11.2012
40	Aur	Nawanshahr	27.11.2012
41	Banga	Nawanshahr	27.11.2012
42	Patiala	Patiala	27.11.2012
43	Sanaur	Patiala	27.11.2012
44	Morinda	Ropar	27.11.2012
45	Bhawaniagarh	Sangrur	27.11.2012

Annexure K- STPs within the 50 km radius of Thermal Power Plants

Sr. No	Concerned ULB	Location of STP	Distance of STP from TPP (Km)	Design Capacity (MLD)	Current operational capacity (MLD)
Thermal Power Plant (TPP) Goindwal Sahib, Tarn Taran					
1	Jalandhar	Pholriwal, Jalandhar	52	100	100
2	Jalandhar	Pholriwal, Jalandhar	52	25	25
3	Jalandhar	Pholriwal, Jalandhar	52	25	25
4	Jalandhar	Jaitewali, Jalandhar	54	25	25
5	Jalandhar	Basti Peerdad, Jalandhar	42	50	50
6	Jalandhar	Bambianwali, Jalandhar	61	10	10
7	Kapurthala	Kapurthala	28	25	22
8	Sultanpur Lodhi	Sultanpur Lodhi	24	2.6	3.25
9	Kapurthala	Bholath	47	4	1
10	MC Amritsar	Khapperkheri	52 km.	95 MLD	104 MLD
Thermal Power Plant, Rajpura, Patiala					
11	Municipal Council, Rajpura	Behind Kanwal Resort, Ambala Road, Rajpura	16.3	7	3
12	Municipal Council, Rajpura	Behind Mehfil Resort, Patiala Road, Rajpura	14	10	7
13	Municipal Council, Banur	At Hulka Road, Banur	33	4	3
14	Municipal Corporation, Patiala	Shermajra	49	46	46
15	Municipal Corporation, Patiala	Ablowal	38.6	10	7

Sr. No	Concerned ULB	Location of STP	Distance of STP from TPP (Km)	Design Capacity (MLD)	Current operational capacity
16	Municipal Council, Zirakpur	Near GBP Athens Housing, Singhpura, Zirakpur	48	17.3	13
Thermal Power Plant, Lehra Mohabbat, Bathinda					
17	Bathinda	Mansa Road Bathinda	24 km	52 MLD	52 MLD
18	Maur Mandi	Cattle Fair Ground, Maur Mandi	33 km	5 MLD	5 MLD
Thermal Power Plant, Talwandi Sabo, Mansa					
19	Talwandi Sabo	Near Dashmesh School, Bathinda-Talwandi Sabo Road	25 km	3 MLD	3 MLD
20	Mansa	Sirsa Road Near Anaj Road, Mansa	20 km	14 MLD	14 MLD
21	Budhlada	Near over bridge, Budhlada	37 km	6.50 MLD	6.50 MLD
22	Baretta	On Jalwera road Baretta	55 km	3 MLD	3 MLD
23	Bhikhi	On Dhalemen Road, Bhikhi	37 km	3 MLD	3 MLD
24	Sardulgarh	Rurki Road, Sardulgarh	38 km	4 MLD	4 MLD