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**GOVERNMENT OF PUNJAB
(DEPARTMENT OF IRRIGATION)
STATE WATER POLICY -2008
(DRAFT)**

NEED FOR A STATE WATER POLICY

Water is the most essential natural resource for life, next to air, a basic human need, the most important input for all development activities and a precious State natural resource. Efforts need to be made to develop, plan, conserve, utilize and manage this important resource, both surface and ground water, in a judicious, equitable sustainable and sound economic manner. This should be guided by the State and national perspective, to support the growth of State's economy and well being of the population in response to growing demand for drinking water, agricultural production, industrial production and generation of electricity.

2. Water, as a resource is indivisible - rainwater, river water, surface ponds and lakes and ground water are all part of a system. In Punjab, availability of water from rainfall is highly uneven and is variable in both space and time. Precipitation is confined only to three to four months in a year and it varies from about 250 mm in South-West parts of the State to about 1000 mm in northern region of the State near Shivalik Hills. The rainfall in winter months is rather scanty. However, heavy rainfalls (70-80%) during the monsoon season from mid June to late September make a major contribution to the water resources of the State. Snow melting in the catchment areas of the rivers during summer months is the second major contributor to our water resources. The average annual rainfall of the State has declined from 739 mm in the year 1980 to 418 mm¹ in the year 2006. The decrease in rainfall has adversely affected the flow of water in three major rivers of the State, namely Ravi, Beas and Sutlej and natural recharge to the ground water resources and it has reduced the availability of Water Resources in the State.

3. Punjab, the major riparian State, has a limited share in its three perennial rivers (Sutlej, Ravi and Beas). It has been allocated only 1.795 Million HaM (14.54

MAF) out of a total average availability of 4.24 Million HaM (34.34 MAF)². Its replenishable ground water resources are estimated at about 2.144 Million HaM (17.37 MAF)². The total available water resources are 31.91 MAF against an estimated demand of 50 MAF³, showing a deficit of 38% for a major riparian State. Continuous Growth in population, sowing of high-water consuming and high yielding cash crops as also expansion of economic activities has led to increasing demands of water for diverse purposes, causing a great stress on available water resources in the State.

4. The major consumptive use of water has been for irrigation with priority allocation for drinking water purposes. As per GEC - 1997 Methodology, 10% of the available water resources of the State are kept reserved for drinking and industrial purposes. With the continuous growth of population, urbanization and industrialization, the demand for water is increasing day by day. The national norms of 60-150 litre per day per person for rural & urban domestic supplies, are being difficult to be maintained in some of the areas of the state. State's population in small pockets does not have access to potable drinking water. The quality of drinking water, particularly in South-West Punjab, where ground water is saline and not fit for drinking/irrigation, is also a major concern of the State.

5. Agriculture has been the prominent occupation of the area since centuries and has been the major source of food and fiber for the population. **The marginal, small and medium holdings, upto 4 hectares, constitute more than 65% of the total holdings⁴.** The State economy is dependent upon agriculture production. Irrigation facility is regarded as the key element of irrigated agriculture. The modern agriculture and irrigation practices play a key role in alleviating rural poverty.

6. The net area irrigated¹ is estimated to have increased from 2.02 Mha (54%) in the year 1960-61 to about **4.078 Mha** (97.5%) by the end of the Year 2006-07. Hence development of a substantial order is necessary if the food and fiber needs of our growing population are to be met. The State's population¹ which is over 24.35 million (2001) at present is expected to be around 30 million by 2011 while the country's population is expected to reach 1250 million in 2011. The production of food grains¹ in Punjab has increased from about 3 million tons in 1961 to 25.2 million tons in the year

2005-06. Punjab is the major contributor to the National food grains pool. It accounts for 21% of wheat and 11% of rice produced in the country¹.

7. The demand for water in rural areas is expected to increase sharply as the economic condition of the rural masses improves. Demand for water for hydro and thermal power generation and for other industrial uses is also increasing substantially, causing a greater pressure on our depleting and scarce water resource. This underscores the need for efficient and effective use and conservation of water.

8. Punjab has about 14500-km-long canal network and about 1 lakh km of watercourses, providing irrigation to 1.19 million hectare, which is 28.8%¹ of total culturable area of the State (Year 2006-07 P). However, the network of canals, which is more than 150 years old, is unable to take its full discharge, as it requires major rehabilitation and rejuvenation. As a result of reduced carrying capacity of the system and decreased availability of surface water, the net-area irrigated by canals has gone down from 55% in 1960-61 to 29% in 2006-07¹. While greater emphasis needs to be given on efficient conveyance and distribution system for optimal utilization of available surface water, Punjab needs to be given greater share in its river waters to decrease stress on ground water resources and power consumption.

9. Punjab needs 50 MAF water², whereas allocation of State's surface water resources from its main rivers are limited to 14.54 MAF only. As a result, groundwater has become a major source of irrigation in the State. There has been intensive groundwater extraction in the last four decades through installation of shallow tube-wells by individual farmers, showing an increase of 521% during last 35 years¹. The over exploitation of groundwater for agriculture has resulted in continuous decline of water table in most parts of the State. The water table is declining in 79% of the area of the State where ground water is sweet.

10. According to GEC-1997 and the ground water data for the period 1998-2002, out of the total 137 Blocks of the State taken for study 103 Blocks are over exploited where stage of ground water development is more than 100%, 5 Blocks are critical (90-100%), 4 Blocks are semi-critical (70-90% development) and 25 Blocks are

in safe category (<70% development). The net annual ground water availability is 21,44,292 Ham (17.37 MAF) and total draft is 3116152 Ham (25.24 MAF)². The net ground water availability for future irrigation development in the state is negative i.e. - 988926 Ham (-8.01 MAF). If the rate of exploitation of our ground water resources continues in this manner, the entire ground water reserves may soon get exhausted, leading to a total break-down of the State's economy.

11. As per statistics there were about 1.92 lacs tubewells in the state during the year 1970-71, which increased to 6.00 lacs in 1980-81 and this number has further risen to 12.32 lacs during the year 2006-07¹. This has resulted in over-exploitation of ground water resources and led to replacement of centrifugal pumps by submersible pumps by farmers to draw water from deeper aquifers which results in high initial investment, increased operation and maintenance cost and more power consumption.

12. This has further adversely affected marginal farmers due to drying of shallow tubewells and leading to deterioration of socio-economic condition of small farmers. Common policies and strategies for conjunctive use of surface and ground water resources and for fixing water allowances of areas for canal supplies having excessive tubewells need to be formulated to sustain agriculture production with less load on power consumption and encouraging modern techniques of irrigation and for uplifting the socio-economic condition of small and marginal farmers.

13. Contrary to the problem of depletion of water table in 128 blocks, 3 blocks² in South-West Punjab are facing acute problem of water logging. ***A number of other adjoining blocks will also be facing very serious problems of water logging in the near future due to rising water level trends in the area.*** In the Nineteen Fifties, the sub-soil water level in the South Western districts, mainly in the Muktsar, Malout and Abohar tracts, was about 33 metres below ground level. After the construction of twin canals i.e. Rajasthan Feeder and Sirhind Feeder, in addition to Abohar Branch and Bikaner Canal, the sub-soil water level started rising at the rate of 0.2 metre to 1.0 metre annually. The area has witnessed a rise in water level upto 22 metre in the last 25 years. The problem has further aggravated as topography of this area, which is of saucer shape, impedes surface drainage system, both natural and artificial.

14. The net impact of water logging in this area is that about 1.04 lac hectare area out of 2.16 lac hectare area of Muktsar has become critically water logged, making the land unfit for any worth while purpose. In low lying areas, the land stands submerged and totally unfit for cultivation, as a result not only agriculture production of this area has declined over the last few years, soil quality has deteriorated quite substantially.

15. Another important aspect is water quality, which is impacted by untreated or inadequately treated industrial effluents **and sewage flowing into nallahs and rivers. The problem is further compounded by the mixing of storm water and sewage in various municipal towns as these carry solid waste, bio-medical waste and hazardous waste from city roads into the water bodies.** The pollution and contamination of water resources due to industrial waste, sewage and excessive use of chemical/pesticides in agriculture has led to high pH, BoD, DO, fecal coliform & concentrations of Arsenic etc. At some places, it has become toxic due to high concentration of heavy metals, such as, mercury, copper, chromium, lead, iron, nickel, cyanides and pesticides like DOT, BHC, endosulfan and aldrin. This can adversely affect the health of the populace and may cause diseases like cancer, skin diseases and miscarriage cases etc. Toxic water may even enter the food chain and alter genotoxicity or damage DNA, causing irreparable loss to both human beings and wildlife. **The chemical quality of groundwater is also getting deteriorated due to natural release of selenium and fluorides at some places.** As such, special attention would have to be given to these aspects to provide safe water. Improvements in existing strategies, innovation of new cost effective techniques resting on a strong science and technology base are needed to eliminate the pollution of surface and ground water resources. Technology and training have to play important roles in the development of water resources and their management.

16. Planning and implementation of water resources projects involve a number of socio-economic issues such as environmental sustainability, appropriate resettlement and rehabilitation of project affected people and livestock, public health concerns of water impoundment, dam safety etc. There have also been substantial

time and cost overruns on projects. Common approaches, guidelines and effective implementation strategies are necessary on these matters.

17. Despite the infrastructure of Dams and large Head Works on all major rivers and Low Dams on excessive discharging rivulets of the State, occasional excessive flood waters, which cannot be impounded upstream of the dams, have to be passed downstream keeping in view the regulation norms based on the safety of dams. Some times even water has to be released in the interest of power generation when there are no irrigation requirements. Also, non-perennial River Ghaggar is a flashy river causing huge devastation during monsoon season. To counter floods, a number of River Training Works are to be annually constructed on the river. The rivers, Ravi and Sutlej near international border have to be paid special attention to counter the floods menace due to counter protective works constructed by neighboring country and shifting of course of rivers.

18. There is a need to adopt coordinated management approach to minimize the floods in the state, to have suitable drainage policy for annual maintenance of drains and to ensure optimum utilization of created hydropower and irrigation potential.

19. Clearly, over the years, a number of issues and challenges have emerged in the development and management of the water resources. The shortage of surface water availability, development and over-exploitation of ground water resources and deteriorating water quality of water resources of State have raised the concern and need for judicious and scientific resource management and conservation. **All these concerns need to be addressed on the basis of common policies and strategies with a vision of a new considered approach by adopting emerging research in science and technology.** This makes it imperative for the State to formulate a Water Policy for the State.

STATE WATER POLICY

20. State Water Policy was first adopted in May 1997 on the lines of National Water Policy-1987 (NWP-1987). NWP-1987 was updated in 2002 as a number of

issues and challenges had emerged during last two decades in the development and management of the water resources. Since Punjab has also been facing serious challenges in management of utilization of its water resources, it has reviewed and updated its existing water policy.

21. The State Water Policy envisions that available water resources should be utilized efficiently and judiciously to meet drinking water needs and irrigation requirements in a manner that also promotes its conservation and engenders community participation. It seeks to make water everybody's business and to catch rainwater where it falls or where it can be used optimally. Besides, the harnessing of water for commercial, industrial and hydro-power generation, its usage must take place in a sustainable manner ensuring desired quality of water. The policy also seeks to ensure that water, which is an essential requirement for sustaining all forms of life, is given due importance as a part of a larger ecological system.

22. Within the overall vision, the State Water Policy-2008 as enunciated hereinafter aims to achieve the following objectives:-

- (i) to ensure need based protected and safe drinking water supplies for humans and livestock;
- (ii) to ensure a judicious and equitable distribution and efficient use of available water resources in a most sustainable and sound economic manner by different sectors i.e. Domestic/Drinking Water, Agriculture, Industry, Power etc;
- (iii) to develop all utilizable water resources to the maximum possible extent, including surface water (both internal and external), groundwater and waste water for equitable economic development and social well-being after properly identifying the suitable source of water and the quality of water required for different sectors;
- (iv) to initiate corrective measures to control, regulate, manage, conserve and augment the declining over-exploited ground water resources for its development on long term basis with the involvement of all stake holders;
- (v) to treat the problems of rising water table/water logging and salinity/quality of water resources, which deserve special treatment

with appropriate technology based on the local conditions, soil texture, structure and topography;

- (vi) to promote and encourage participation of beneficiaries, Panchyati Raj Institutions (PRIs), Municipal Bodies, NGOs and the private sector in all areas of water development, planning, operation and management;
- (vii) to ensure sharing of costs of public investments in irrigation, water supply, sanitation and environmental control works at micro level with beneficiaries, Panchayati Raj Institutions, Municipal Bodies, NGOs and private organizations/agencies;
- (viii) to initiate measures to mitigate water pollution and safeguard the environment and ecological balance;
- (ix) to promote the safe use and disposal of water and optimize the reuse of water by re-cycling the treated industrial effluent and sewage waste (water) for irrigation, industry and other permissible uses;
- (x) to encourage investment in technology, research and development and promote efficient and cost effective uses of water to ensure maximum yield and return per unit of water;
- (xi) to promote awareness about the need for conservation of water;
- (xii) to introduce systematic irrigation reforms for its improvement and efficient management so as to ensure proper functioning of existing structures, conveyance systems and other assets through adequate design, planning, maintenance and operation without any adverse ecological impact;
- (xiii) to encourage application of Improved Modern Irrigation Technologies, particularly sprinkler and drip irrigation instead of traditional irrigation technologies (furrow, border & flood irrigation which result in substantial water losses & limited uniformity in water distribution), on-farm management practices & proper technology transfer at various levels to increase water use efficiency & crop production;
- (xiv) to encourage and adopt integrated planning and water management practices for preventing and alleviating drainage problems and to provide flood protection and ensure minimal supplies during drought;
- (xv) to make provisions for adequate relief and rehabilitation of persons displaced or adversely affected by irrigation projects; and

- (xvi) to ensure need based training of personnel of State's Water Resources Administration to equip them with knowledge and information about most modern and scientific methods of development, management and conservation of water resources;
- (xvii) to improve and upgrade the existing hydrology infrastructure and develop a scientific hydrological information system for compilation, collation and analysis of all water related validated data to ensure proper planning and management of water resources.

THE POLICY 2008

23. In its endeavour to achieve the above aims and objectives, the Government of Punjab (Department of Irrigation) resolves to pursue the State Water Policy 2008 as following: -

(i) WATER ALLOCATION PRIORITIES

(a) The water allocation priorities in planning and operation of systems shall be as follows:-

- Drinking water
- Ecology
- Irrigation
- Hydro-power
- Thermal power
- Agro-Industry
- Other Industries and other uses.

(b) Except for drinking water, these priorities may be modified, if warranted for any area or region specific considerations keeping in view the ecology of that area or region after scientifically studying the requirements of water for various purposes i.e. drinking water, irrigation, power generation, industrial and other uses.

(ii) DRINKING WATER

(a) Efforts shall be made to provide adequate safe drinking water on top priority to the entire population including livestock, both in urban and rural areas. Provision for safe drinking water shall be an integral component of

all water resources projects with special emphasis on areas where there is no alternative source of drinking water.

- (b) Efforts shall be made to make systems of drinking water supplies sustainable with effective participation of community, NGOs, Local Government Agencies, PRIs and private organizations.

(iii) WATER CONSERVATION AND EFFICIENCY OF UTILIZATION

- (a) Effective steps shall be taken to improve/optimize the efficiency of utilization of water for all diverse purposes and to create awareness about the scarcity of water and encourage its conservation through regulation, incentives and disincentives.
- (b) Efforts shall be made to enhance production per unit of water in agriculture and industry by promoting measures like conjunctive use of surface & ground water, renovation of existing ***and drained out wetlands/*** ponds, construction of new ponds, development of command area by selective lining of the conveyance system, laying underground pipe lines, modernization and rehabilitation of existing systems including tanks, adoption of improved water management practices like recycling and re-use of treated effluents and adoption of traditional techniques like mulching or pitcher irrigation and new techniques like drip and sprinkler irrigation, wherever feasible.
- (c) On-farm water management techniques and dual water supply means to conserve water in an effective manner shall be promoted.
- (d) ***Necessary directions shall be issued, wherever required, to implement the measures for proper planning and monitoring.***

(iv) WATER POLLUTION AND WATER QUALITY

- (a) The quality of surface water and ground water as well as soil shall be monitored for improvement to bring it up to the standards fixed by State Pollution Control Board and Unified Protocol issued by the Government of India.
- (b) Steps shall be taken to check the quality of water in drains and municipal water supplies and to ensure proper disposal of sewage, placement of

water supply pipes away from sewage system so as to avoid contamination and to fix responsibility to ensure treatment of industrial effluent to acceptable levels and standards before discharging them into the water bodies and natural streams or on land.

- (c) Minimum flow of water shall be maintained in the perennial streams for maintaining ecological balance and natural recharge of ground water.
- (d) Principle of 'polluter pays' shall be adopted for management of polluted water by identifying the polluting industries and developing separate industrial area for these industries with strict monitoring and penalties to prevent pollution and degradation of water quality.
- (e) Legislative measures shall be taken for preservation of existing water bodies and prevention of encroachments thereon and deterioration of their water quality.

(v) IRRIGATION

- (a) Cost-effective irrigation options and appropriate irrigation techniques shall be encouraged in planning of Irrigation Projects for optimizing water use efficiency and for extending the benefits of irrigation to as large a number of farm families as possible to maximize productivity of culturable lands with proper irrigation intensity.
- (b) Water use and land-use policies shall be effectively integrated and coordinated *and steps shall be taken to introduce demand oriented approach for water use.***
- (c) Water allocation in an irrigation system shall be made with due regard to equity and social justice by adopting a rotational water distribution system and supply of water on a volumetric basis with an objective to avoid disparities in the availability of water between head-reach and tail-end farms and between large and small farms by fixing certain ceilings and rational pricing.
- (d) Command area development approach shall be encouraged in all irrigation projects to ensure that the irrigation potential created is fully utilized.

- (e) Steps shall be taken to encourage scientific water management, farm practices and sprinkler and drip system of irrigation to get optimal productivity per unit of water, as irrigation is the largest consumer of fresh water.
 - (f) Appropriate scientific and cost effective methods shall be adopted in all command area development projects to ensure reclamation of water logged/saline affected land.
 - (g) Steps shall be taken to encourage conjunctive use of ground water and surface water to arrest water logging and soil salinity in south-western parts of the state.
 - (h) Quality assurance and close monitoring shall be ensured as a part of the project planning and execution to check time and cost overruns.
 - (i) Longitudinal studies shall be carried out after completion to monitor and evaluate the performance and socio-economic impact of every project.
- (vi) GROUND WATER DEVELOPMENT**
- (a) In view of the increased stress on ground water in the State, it shall be endeavour of the State Government to have a periodic reassessment of the Ground-water potential on a scientific basis.
 - (b) The utilization of ground water shall be regulated in such a way that the recharging possibilities are not exceeded and social equity is ensured. Efforts shall be made to improve both the quality and availability of ground water resource by evolving and implementing Ground Water Recharge Projects and appropriate administrative and legal measures so that detrimental consequences of over-exploitation of ground water are effectively prevented.
 - (c) Steps shall be taken to investigate and explore the aquifers for new fresh ground water resources on sustainable basis, especially in the flood plains of Ravi, Beas and Sutlej.
 - (d) Steps shall be taken to promote and encourage integrated and coordinated development of surface water and ground water resources and their conjunctive use right from the planning stage. Suitable water

governance policies using participatory water management with participation of Panchayati Raj Institutions shall be followed. Economic policy incentives shall be encouraged to conserve and ensure optimal utilization of water for diverse purposes, especially for agriculture, on long term sustainable basis .

- (e) Steps shall be taken to install desalination plants, using reverse osmosis or electro dialysis or flash distillation techniques and such other technological options as may be available for drinking water supply schemes especially in areas suffering from acute water scarcity due to saline ground water.

(vii) AGRO CLIMATIC ZONES

- (a) For proper planning and harmonious agricultural development in the State, the problems and potential of the following six agro-climatic regions of the State shall be studied in keeping with variations in physiography, ground water quality & quantity, soil type and amount of rainfall, of these regions:-
 - i. Sub-mountain undulating region
 - ii. Undulating plains region
 - iii. Central Plains Region
 - iv. Western Plains Region
 - v. Western Region
 - vi. Flood Plains Region
- (b) With due regard to the constraints of configuration of water availability, agro climatology and ecology, water zoning of the State shall be done as under to guide, plan and regulate the future economic development: -
 - i. Drinking water zones
 - ii. Groundwater depletion zones.
 - iii. Flood-affected zones.
 - iv. Waterlogged zones
 - v. Salt affected zones
 - vi. Water quality deterioration area zones.
 - vii. Drought-prone zones.

- viii. Watershed protection zone.
 - ix. Environmental conservation zones.
- (c) Efforts shall be made to ensure availability of water for diverse purposes in different agro climatic zones from the appropriate source of water for that zone.
- (d) Efforts shall be made to identify and adopt appropriate technological methods (keeping in view the economic feasibility) to improve the quality of water in various zones with a view to maximize availability of utilizable water.

(viii) WATER RESOURCES PLANNING

- (a) Steps shall be taken to identify and bring available water resources within the category of utilizable resources to the maximum possible extent for sustainable development of the State.
- (b) Efforts shall be made to ensure availability of adequate water for deficit areas after taking into account the present uses and future needs of different areas of the State.
- (c) Steps shall be taken to encourage the non-conventional methods for utilization of water, such as, artificial recharge of ground water and desalination of brackish or saline water as well as traditional water conservation practices like rain water harvesting including roof top rain water harvesting, construction of new ponds and renovation of old ponds to increase the utilizable water resources in the State. Promotion and adoption of frontier research and development with latest and cost effective techniques in these areas shall be encouraged to prevent further degradation of water resources.
- (d) Water Development and Management Projects shall be prepared and planned in a holistic manner for the state as a whole or for a hydrological unit (such as sub-drainage basin or for a specific area with uniform topography and hydrology like Kandi area) by taking into account all qualitative and quantitative aspects as well as environmental considerations.

- (e) Watershed management shall encompass innovative schemes, extensive soil conservation, catchments area treatment, preservation and proliferation of forests and construction of check dams to ensure conservation of water in the catchment area.
- (f) Wherever feasible, supplementary sources of water supplies through canal water shall be developed for such urban areas, where the ever-increasing demand for domestic and industrial uses has resulted in formation of ground water troughs due to over exploitation.

(ix) INSTITUTIONAL MECHANISM

- (a) Institutional Infrastructure for development of water resources in the State shall be strengthened and upgraded.
- (b) Planning, Development, *Regulation* and Management of water resources in the State shall be done on the basis of a multi-sectoral, multi-disciplinary and participatory approach.
- (c) Functional and Financial Autonomy of Institutes of Water Resources Development and Management shall be ensured and prescribed.
- (d) An appropriate Regulatory Authority shall be established with representation of key stake holders for the planned development and management of water resources in the State.
- (e) For equitable distribution and utilization of water in agriculture, Participatory Irrigation Management Schemes (PIMS) shall be further encouraged.

(x) INFORMATION SYSTEM

- (a) Steps shall be taken to establish a standardized, integrated and comprehensive State Information System with a network of data banks & databases. The existing state level agencies shall be integrated and strengthened for improving the quality of data and its processing capabilities.
- (b) Appropriate standards shall be adopted for coding, classification, processing of data and methods/procedures for its collection. Free

exchange of data among various agencies shall be encouraged using latest methods of Information Technology.

- (c) Modern Information Technology tools shall be adopted for comprehensive and reliable projection of future demands of water for diverse purposes alongwith its availability and actual use in different geographical areas of the State.

(xi) PROJECT PLANNING & MONITORING

- (a) The projects and schemes of development of water resources shall provide for adequate compensatory measures to offset adverse socio-economic and environmental impact, if any, caused by such projects and schemes.
- (b) An integrated and multi-disciplinary approach shall be adopted in planning, formulation, clearance and implementation of projects to address various concerns regarding catchment treatment and management, environmental and ecological imbalance, rehabilitation of affected people and command area development.
- (c) For effective, comprehensive and pragmatic project planning and implementation, it shall be essential to carry out socio-economic impact assessment and identify bottlenecks, if any, for timely remedial action to obviate time and cost overruns.
- (d) Special efforts shall be made to investigate, plan and formulate projects either in or for the benefit of areas inhabited by specially disadvantaged groups such as Scheduled Castes and Backward Classes.
- (e) Steps shall be taken to encourage involvement and participation of beneficiaries and other stakeholders right from the project planning stage.

(xii) SAFETY OF STRUCTURES

- (a) For safety of storage dams and other water related structures, the State Irrigation Department shall evolve, formulate and enforce appropriate guidelines. These shall be periodically updated through proper institutional

arrangements involving subject matter specialists in investigation, design, construction, hydrology, geology, etc.

(xiii) WATER AUDIT

- (a) Periodical audit of the working of systems shall be carried out in accordance with the guidelines for water audit and water conservation. Rectification measures shall be initiated, where necessary, by taking into account the fact that substantial losses of raw and treated water take place between the bulk storage, distribution and usage points, thereby reducing availability to the ultimate users and financial losses to the supplying agencies.

(xiv) RESETTLEMENT AND REHABILITATION

- (a) The State Government shall evolve and follow up effective Relief and Rehabilitation Policy for the persons adversely affected as a result of projects aimed at optimal use and conservation of water resources. Such a policy shall be implemented simultaneously and smoothly in letter and spirit to ensure timely completion of the Projects with minimal discomfort, if any, to the displaced persons.

(xv) FINANCIAL AND PHYSICAL SUSTAINABILITY

- (a) For physical and financial sustainability of existing facilities and also to create facilities for additional water resources, water charges for various uses may be fixed in such a way that they cover at least the operation and maintenance costs of providing the service. Such Charges shall be linked directly to the quality of service provided.
- (b) The subsidy on water user charges shall be limited to the disadvantaged and economically weaker sections of the society and these shall be well targeted and transparent.

(xvi) PARTICIPATORY APPROACH TO WATER RESOURCES MANAGEMENT

- (a) The participatory approach to management of the water resources in the State shall be encouraged by involving not only the various governmental

agencies but also the stakeholders, Water Users Associations, NGOs and the local bodies such as Municipalities, Notified Area Committees and Gram Panchayats in an effective and decisive manner, in various aspects of planning, design, development, operation, maintenance and management of the water resources schemes/infrastructures to eventually transfer the management of such facilities to the user groups/ local bodies after imparting them required training for the purpose.

- (b) Efforts shall be made to create awareness about the participatory approaches to management of water resources amongst various stakeholders. Wherever considered necessary, appropriate training shall be imparted to these groups to build their capabilities/capacity.

(xvii) PRIVATE SECTOR PARTICIPATION

- (a) For encouraging innovative interventions and initiatives, generating additional financial resources, introducing professional management and improving service efficiency and accountability, steps shall be taken to solicit cooperation and participation of appropriate private sector organizations in planning and development of water resources.

(xviii) FLOOD CONTROL AND MANAGEMENT

- (a) A master plan shall be prepared for flood control and management for each flood prone basin with due regard to sound watershed management through extensive soil conservation, catchment area treatment, preservation of forests, increasing the forest area, artificial recharging and construction of check dams/low dams. Efforts shall be made to reduce the intensity of floods and provide proper drainage to build up capabilities to tackle additional water logging and salinity problems.
- (b) Adequate flood-cushion shall be provided in water storage projects, wherever feasible, to facilitate better flood management.
- (c) The Reservoir Regulation Policy shall be modified to give overriding consideration to flood control in highly flood prone areas, even at the cost of sacrificing some irrigation or power benefits.

- (d) Greater emphasis shall be laid on non-structural measures, such as flood forecasting and warning, flood plain zoning and flood proofing for the minimization of losses. Recurring expenditure on flood relief shall be contained through physical flood protection works like embankments and dykes, as may be necessary.
- (e) The settlements and economic activity in the flood plain zones shall be effectively regulated to minimize the loss of life and property on account of floods.
- (f) Flood forecasting capabilities shall be upgraded and extended to all flood prone areas for effective regulation of floods in the State.
- (g) Efforts shall be made to utilize surplus water available during monsoon, wherever feasible, by diverting it to the ground water aquifers having potential for recharging to augment declining ground water resources and decreasing the intensity of floods.

(xix) DROUGHT MANAGEMENT

- (a) Effective measures such as rejuvenation of traditional water sources and wetlands / water bodies shall be taken to make drought prone areas less vulnerable to drought associated problems.
- (b) Drought prone areas shall be given priority in planning water resource development projects.
- (c) Efforts shall be made to provide employment to drought stricken populations for relief works.

(xx) LAND EROSION BY RIVERS

- (a) Erosion of land by river / choe waters and occurrence of flash floods shall be minimized by encouraging suitable cost effective measures like low cost earthen dams, vegetative works and mechanical structures etc. Indiscriminate occupation and exploitation of the riverbeds and land near the riverbanks shall be effectively discouraged and prevented.

(xxi) KANDI AREA DEVELOPMENT

- (a) Steps shall be taken to construct suitable low dams over major choes, wherever feasible, for attenuation of floods and for development of irrigation facilities in the sub-mountainous Kandi area along Shiwaliks foothills, which is economically backward area of the State.

(xxii) MAINTENANCE AND MODERNISATION OF INFRASTRUCTURE

- (a) Appropriate necessary budgetary support shall be provided on priority to properly maintain the structures and systems created through massive investments.
- (b) Structures and systems of water resources shall be regularly monitored to identify their requirement for proper up-keep and maintenance and appropriate rehabilitation and modernization programmes and schemes shall be evolved and implemented, wherever necessary.

(xxiii) WATER RATES

- (a) Water rates (water user charges) shall be designed to convey the scarcity value of water and foster motivation for economy in its use. The water rates shall be fixed and revised from time to time with a view to recover at least the annual maintenance and operational costs to ensure uninterrupted and timely supply of water.
- (b) As far as possible, a distinction shall be maintained in pricing and cross subsidization of water for drinking, irrigation, industrial and commercial purposes. The subsidy on water user charges shall be limited to disadvantaged and economically weaker sections of the society.
- (c) As far as possible, water rates shall be based on volumetric measurement of water consumption in all sectors with due regard to the interests of small and marginal farmers and disadvantaged and economically weaker sections of State's population.

(xxiv) PERFORMANCE IMPROVEMENT

- (a) Greater emphasis shall be placed on the improvement of performance of the existing facilities of water resources for better management and optimal utilization and conservation of water.

- (b) Priority allocation of funds for the water resources sector shall be made to ensure proper maintenance and up-keep of the existing facilities of water resources to achieve their desired performance.
 - (c) ***Losses/wastage in water supplies, especially in irrigation and domestic, needs to be reduced with new techniques and innovative strict measures.***
- (xxv) **WATER SHARING / DISTRIBUTION AMONGST THE BASIN STATES.**
- (a) ***The State shall endeavour to develop and manage its river systems in accordance with the internationally accepted riparian principles. The needs of riparian/basin states should be the basis for sharing/distribution of river waters.***
 - (b) ***Inter-basin transfer of water should in no case be permissible from a deficit basin to a surplus basin.***
 - (c) ***Large scale trans-basin diversion of river water from Punjab to other States has adversely affected the irrigation requirements of the State, besides causing adverse impact on its hydrology, ecology and environment. The State shall carry out an assessment of these effects and work for their removal.***
- (xxvi) **TRAINING**
- (a) Training needs analysis of all categories of personnel involved in the management and development of water resources shall be carried out to evolve an appropriate training policy.
 - (b) Within the framework of the training policy based on proper training needs' analysis, a perspective plan shall be evolved for standardized training to be an integral part of water resource development. Training shall be imparted at induction as well as during service. Specialized training shall also be given in subjects such as information systems, sectoral planning, project planning and formulation, project management, operation of projects and their physical structures and systems and the management of the water distribution systems.

- (c) The training needs shall be reviewed periodically to update and upgrade the skills to suit the changing requirements.
- (d) Wherever possible, NGOs participation shall be encouraged in building capacity and improving HR skills and quality of water resource management and administration.

(xxvii) AWARENESS BUILDING

- (a) Realizing that water is 'scarce' and precious, efforts should be made to create greater awareness on its optimal utilization and conservation and use of quality water.
- (b) The process of awareness building shall be broad based, involving various governmental and non-governmental agencies to reach out to unreached areas and populations of the State.

(xxviii) SCIENCE AND TECHNOLOGY

- (a) Efforts shall be intensified for research in various areas for effective management of our water resources. These shall include the following areas: -
 - hydrometeorology
 - snow and lake hydrology;
 - surface and ground water hydrology,
 - river morphology and hydraulics,
 - assessment of water resources;
 - water harvesting and ground water recharge;
 - water quality;
 - water conservation;
 - evaporation and seepage losses;
 - recycling and re-use;
 - better water management practices and improvements in operational technology;
 - crops and cropping systems;
 - soils and material research;

- new construction materials and technology (with particular reference to roller compacted concrete, fiber reinforced concrete, new methodologies in tunneling technologies, instrumentation, advanced numerical analysis in structures and back analysis);
- seismology and seismic design of structures;
- the safety and longevity of water-related structures;
- economical designs for water resource projects;
- risk analysis and disaster management;
- use of remote sensing, GIS & GPS techniques in development and management;
- use of static ground water resource as a crisis management measure;
- sedimentation of reservoirs;
- use of saline water;
- prevention of salinity ingress;
- prevention of water logging and soil salinity;
- reclamation of water logged and saline lands;
- environmental impact;
- participatory approaches
- Such other emerging areas as may be necessary.

(xxix) LEGISLATION AND REGULATION

- (a) It shall be the endeavour of the State to formulate a new comprehensive and unified legislation on management and administration of canals and drains in the State. Such a legislation shall encompass provisions not only relating to day-to-day administration and management of Canal and Drainage systems of the State but also development and utilization of surface and ground water, levy and assessment of water user charges, participation of users in improving management and efficiency of water resources infrastructure, to facilitate and ensure judicious, equitable and sustainable management, allocation and utilization of water and all other matters in connection therewith.

- (b) Efforts shall be made to set up an appropriate Regulatory mechanism to control, manage and regulate water resources, both ground water and surface water, within the State of Punjab for its judicious and equitable utilization for various purposes.

(xxx) CONCLUSION

The State Water Policy 2008 as elaborated in aforesaid paragraphs, underlines the need to realize that 'Water' is 'scarce' and 'precious'. It needs to be utilized optimally and developed and conserved sensibly. The Management and Administration of Water Resources should realize complexities as emerging in ensuring adequate availability of quality water to all its consumers. Declining availability of surface water to basin areas of a major riparian State and undesirable extremely high stress on ground water caused as a result of its over exploitation to sustain food grain production for National Food Security, cannot be ignored for too long and water rights of people of Punjab in its rivers, would be respected and restored.

This policy would be reviewed periodically in view of changing environment and changing needs of the state.

REFERENCES

¹ - Statistical Abstract of Punjab 1978, 2007.

² - Report on Dynamic Ground Water Resources of Punjab State (as on March 2004).

³ - Expert Group Report constituted by WRC.

⁴ - Punjab Human Development Report 2004.