Goa State Water Policy, 2000

STATE WATER POLICY

GOVERNMENT OF GOA
DEPARTMENT OF WATER RESOURCES
JUNTA HOUSE (ANNEXE)
PANAJI-GOA

YEAR - 2000

1.0 THE NEED FOR STATE WATER POLICY

1.1 The Govt. of India had adopted the National Water Policy in the year 1987 which was modified in 1998 and the same is under process of adoption. The National Water Policy deals with the river basins all over the Country .The river basins in the Country have been divided into 20 basins.

1.2 Since the above classification of the river basins over the Country deals with the larger rivers in the Country, the smaller river basins have been clubbed together in the particular region.

1.3 There are nine river basins in Goa (geographical area of Goa 3702 sq.Km.) as detailed in the table below and since they are very small compared to the bigger river basins, they have been clubbed together with all the west flowing rivers from Tapi (Gujrat State) to Tadri (Karnataka State). The total basin area of Tapi to Tadri is 55,940 sq.km.

SR. NO.	RIVER BASINS IN GOA	BASIN AREA IN SQKMS.	% OF BASIN AREA OF TAPI TO TADRI
1.	Terekhol	71	0.127%
2.	Chapora	255	0.456%
3.	Baga	50	0.089%
4.	Mandovi	1580	0.127%
5.	Zuari	973	1.739%
6.	Sal	301	0.538%
7.	Saleri	149	0.266%
8.	Talpona	233	0.417%
9.	Galjibag	90	0.161%
	Total	3702.00	6.617%

1.4 Compared with the basin area of Tapi to Tadri (55,940 sq.km) the geographical area of Goa (3702 sq.Km) is only 6.617%. The above table gives the basin areas of the

rivers in Goa (within Goa State) and percentage area compared with the basin area of Tapi to Tadri, which shows that the basin areas of the rivers in Goa is very small compared with the total river basin areas of Tapi to Tadri. Further, if compared with the national river basin(32,27,121 sq. km) the geographical area of the Goa State (3702 sq.km) is negligible i.e. 0.115%.

1.5 Considering the above facts the National Water Policy which has been arrived at keeping in view of the 20 river basins of the Country may not be much helpful for a State like Goa having very small river basin.

1.6 Water is one of the prime natural resources on which the sustenance and economic development of Goa State are largely dependant. Unlike many northen rivers of the Country, none of the rivers is snow -fed, resulting in a sharp imbalance between the water availability in the summer and monsoon months.

1.7 Though the rainfall in the State is higher than the national average, the steep topography, extreme unevenness of rainfall in time and space, very short river lengths, unique physiography, geology, soil, vegetation, salinity intrusion through rivers deep into hinterland resulting in reducing the utilisable yield of the basins, Khazan land protection combined with the problems created by the Mining activities have resulted in low capability for utilisation.

1.8 Out of the nine rivers in the State, six rivers originate and flow exclusively within the State boundaries and do not have any interstate implications. However out of the three other rivers, Terekhol and Chapora originate in Maharashtra State and Mandovi originates in Karnataka State. These have to be harnessed and managed to the best advantage of the State considering, among other things, the necessity to maintain ecologically healthy environment within the State boundaries for the welfare of the State and its environment.

1.9 The Sate being bounded by the Western Ghats on the East and the Arabian Sea on the West, the major ground water basins in the State also do not have any significant inter-state component.

1.10 All these indicate that Goa State may be the only State in the Country which to a large extent may be considered as "Hydrologically land locked".

1.11 Moreover, the cropping pattern, land use, hydrological status and environmental needs of the Goa State are distinctly different from those of the other States.

1.12 In the above context, therefore the need for a State Water Policy(in spite of having a National Water Policy at the Centre). The State Water Policy will be complementary to the National Water Policy.

2.0 WATER RESOURCES DATA BASE

2.1 Planning for any natural resources requires a detailed data base and this is of crucial importance for water resources. Continuous monitoring , recording , processing , analysis and evaluation of hydro-meteorological data like rainfall, discharge, groundwater table fluctuation, temperature, humidity, evaporation, salinity intrusion etc .are essential for scientific and perspective planning for optimum development and utilisation of water resources.

2.2 In Goa sufficient number of rain gauges, stream gauges and any other hydro-meteorological measuring equipments are not established. However some Govt. Departments eg. Irrigation Dept. and Meteorological Dept., Forest Dept., PWD, Revenue Dept. are maintaining some records but there is no proper co-ordination among these agencies for centralised processing and evaluation of these data which is very much essential. An option network of hydro-meteorological stations at the state level and processing and storage of the data, generated from the fairly evenly spread stations at a central place is a pre-requisite for water resources planning in the state. Government

therefore proposes to make necessary arrangements for such Central facilities.

2.3 The processed data so collected will be made available to any agency of the Goa State Government for their project works.

2.4 In future, water development projects in the Sate will be based on the above mentioned extensive data base.

3.0 PLANNING FOR RIVER BASIN DEVELOPMENT AND INTEGRATED WATER SHED MANAGEMENT

For the integrated development of land and water resources of any region, planning must be based on the requirements of the relevant river basins or watersheds. The river basin and its various sub-basins need to be studied in terms of their potential, present utilisation and future requirements. Then only, it will be possible to prepare scientific river basin development plans for drawing definite action plans for implementation. Inter -tributary and inter - basin diversions of river water within the Sate will have to be considered keeping in view the larger interests of various regions of the State. Assessment of utilisable groundwater potential in the different regions of the State needs to be undertaken on priority basis. These data in conjunction with surface water potential data should be utilised for drawing definite action plans for the basin, the region and the State. Keeping in view the total development of the state, the process of data assimilation and preparation of development plans shall adopt the following sequence.

3.1. An integrated master plan for water resources development for the state will be made. It shall consist of, among other things, integrated river basin development plan, basin wise water resources availability (including surface and ground water) and demand estimation. First estimates shall have to be made from updated available data and this will be refined from time to time with availability of future data.

3.2 Master plans for basin development and watershed management shall be prepared for each basin or watershed on scientific lines and with due regard for environmental and socio-economic impacts.

3.3 Suitable provision for drinking water supply must be made in existing and future irrigation and hydel schemes.

3.4 River basin development plans for all the basins of the State shall have to be prepared by appropriate agencies of the Government and these development plans will be implemented subject to the approval of a Water Resources control Board (WRCB) to be established.

3.5 In the case of Inter-state river basins, regional or State level development plans shall be prepared subject to agreements and/or understandings between the concerned States. The State Water Resources Control Board shall be the agency to advise the Government and concerned Departments in the matter of such apportionment, where inter-State agreements /understandings do not exist.

3.6 To prevent adverse environmental impact, like bank instability and associated problems arising out of uncontrolled extraction of sand from river beds, the Government proposes to regulate such extraction. For evolving such regulatory mechanism, consultation with concerned agencies will be made.

3.7 At present there is no uniform law for the State. Therefore the construction of irrigation works and the conservation and distribution of water for purpose of irrigation will be governed by the Irrigation Act, 1973 and the Goa Command Area Development Act, 1997.

3.8 In the area of water Resources Development in the State, drinking water schemes will get topmost priority. Keeping in view the environmental and ecological upkeep of a region, water resource development plan should provide for irrigation, power generation, industrial needs, flood control, navigation and salinity intrusion as may be relevant and necessary for the concerned area.

3.9 As the geographical area of the Goa State (3702 Sqkms.) compared with the river basin area of west- flowing rivers from Tapi to Tadri (55940 sq km) is only 6.1%, the planning of the water resources of the river basins in Goa State has to be dealt with as one consolidated river basin covering the whole geographical are of the Goa State.

3.10 Other aspects.

3.10.1 *EFFECT OF MINING*

An adequate protective measure against the damage caused by mining will have to be taken up and if required to make it effective, legislation may have to be brought in for prevention of damages due to mining activities outside the mining lease area, since the mining leased area is covered under central act. Using of pits for storing water for ground water recharging needs to be studied and if practicable, it can be put into practice.

3.10.2 *CONTROL OF WATER POLLUTION*

Control of pollution of surface and ground water will also be crucial to WRD. More so, as more and more water resources get abstracted and used. Pollution control legislation and their purposeful and timely enforcement will go a long way towards minimizing the possible pollution. Educating the people and creating awareness about pollution of water will also go a long way. A deliberate effort in this direction is necessary.

While investigating the various surface water resources conservation and regulation schemes concerted efforts have to be made to avoid, as far as possible, any large scale submergence and displacement of human habitations. As already stated earlier, the fragile estuarine river regime, the saline zones, the navigation zones, non- submergence of the middle belt where the major proportion of cultivating population in the State lives have all to be borne in mind while locating water resources storage ptojects. One of the long term future needs is water supply. There are reports stating that the water of the river is polluted both

chemically and bacteriologically below surface. There are also reports of many problems created by mining in the quality of water supply such as the reported choking of filters of Opa water works and Salauli water works.

Bearing in mind all these available data, it is suggested to locate the schemes for water supply for domestic use higher up in the river basin, where there are no mines, industries or large human settlements polluting the sources, so that the supplies can be carried with appropriate purification measures from these unpolluted sources directly by pipe lines to the needy population.

The location of projects suggested involves submergence of forest area. In all development activities the forests do get affected to some extent in a State like Goa. Foe example, the mining activities are permitted in 65,000 ha. of land. However, the water resources are to be developed gradually during the next 50 years. The projects will provide afforestation equivalent to the submerged area. The projects will come up one by one depending upon the need and finances available and there will be enough time to observe the impact of each project on the ecosystem and the river estuary and take corrective steps as needed.

3.10.3 GLOBAL WARMING SCENARIOS:

An aspect that needs to be taken account of in long term planning for water resources development is the scenario of global warming and a potential sea level rise which is predicted to occur gradually over the next country. The present global warming trend as reflected in the rising Arabian sea –surface temperature, soil temperature and atmospheric (daily minimum and maximum) temperature show that if this trend continues along with the present rate of man made deforestation, the Western Ghats region might shift over to semi-rid conditions over the next century. If this does occur, it will upset all rainfall based water budgeting calculations and will seriously affect the hydrological regions. Acquifer potential and recharging capacity will be the determining factors as rivers might have less water to contribute.

Similarly, to prevent further intrusion of salinity on upstream side due to rise of water level, it is necessary to take measures in advance like construction of Vasant Bandharas/ Kolhapur type Bandharas on all important rivers / rivulets at a place upto which presently salinity effect is observed.

3.10.4 *KHAZAN LAND*:

Lands reclaimed from the inundation of the tidal waters through the rivers and creeks by constructing embankments are known as Khazan Lands. In Goa these lands are made of saline alluvial soils. It is estimated that Khazan lands cover an area of about 18,500 ha. The bunds protect the Khazan lands from the onrush of the direct currents in the river. Sluice gates are fixed in these bunds to control the inflow or outflow of water through the farms.

There is a need of building the records of these bunds protecting the Khazan lands such as by numbering each bund , measuring their length by fixing chainages , fixing top elevation of the bund and cross section of the bund at regular intervals, marking location of sluices, catchment area and area protected by each bund.

There is also a need to bring in legislation for Khazan areas protection, conservation, development and management of accounts.

There is also need to change the traditional technique of construction of bunds by using marine clay (as there is a change in forces acting on bunds e.g. barge traffic, navigation etc.) to red-moorum and providing inspection roads over the bunds parallel to the bank of the streams.

An integrated estuarine and Khazan area development plan should be formulated for their integrated management and development and to effectively co-ordinate the same, an apex body for management of the Khazan areas is to be constituted. This body may be called "Khazan Lands Management Board." This Board should have a planning body, technical and administrative staff and members from

user Government Departments like Revenue, Agriculture, Fisheries, Irrigation etc. The technical staff will discharge its duties on par with Khar land Development Officers in Maharashtra.

3.10.5 *GROUND WATER:*

The Central Ground Water Board, Ministry of Water resources, Government of India, has prepared a " Master Plan for Development of Ground Water in Goa State" in March, 1997. In it's report taking into account only the safe dynamic recharge, it has been stated that the ground water potential that can be exploited in the entire Goa State is 150 mm^3 . Break up of this potential is not available Basin wise. The present use is 9 mm^3 . Therefore the balance left for further safe exploitation is 141 mm^3 in the entire Goa State.

In comparison to the long term water resources needs of the Goa State this 150 mm^3 is a small quantity and could be safely reserved as stand-by in times of acute distress and also for meeting the small individual needs. It could also be used in conjunction with surface water resources.

There are also the problems of mines pumping out water and abandoning pits. Water level going even below the sea level in mining areas has created adverse effect on ground water regime, drying of springs, open wells, dwindling storage in ponds and reducing flow in streams.

In the future over exploitation of ground water in this narrow coastal belt may lead to the problems of salt water intrusion.

In view of the above it may be prudent to depend on the surface water resources in the state than take a risk with ground water exploitation on a larger scale. Ground water exploitation has to be with caution and resorted to only where it is inevitable such as individual or isolated pockets of small areas or population where a large surface development project may not be able to cater to the needs due to engineering and economic reasons.

The ground water use can also be planned as a conjunctive use in the individual surface water resources conservation projects to the extent possible and thus enhance the benefits of such projects to large areas.

For effective control over extraction and management of ground water, there is need of a ground water regulation act.

4.0 MAXIMISING WATER AVAILABILITY AND REDUCING DROUGHT IMPACT

In Goa, inspite of a heavy annual rainfall, rivers have hardly any water for six months in a year resulting in very severe potable water scarcity for half of the year. Moreover, the narrow width of the State, steep slope, porous substratum, deforestation tendencies in the high ranges, non-uniform distribution of rainfall, complete absence of snow in the Western Ghats (originating point of all the rivers) are contributing factors for such severe temporal imbalance of water availability in the Sate. This also explains the paradox of the Goa State, which is situated in one of the highest annual rainfall zones of the country, having lowest per capita freshwater availability in the country. The factors mentioned above are also reasons for dry beds in almost all rivers of the Sate for substantial periods of the year when the ground water level also declines.

The clue to solve the water crisis in the midst of rainfall in plenty, is to arrest and conserve as much rain water as possible, at places wherever it is feasible. For this, the State shall have both short and long term specific water management strategies.

4.1 *LONG TERM WATER MANAGEMENT STRATEGY FOR THE STATE*

Considering the unique feature of Goa State, long term water management strategies will be as follows;

1. Maximum use must be made of available and utilisable storage spaces. All possible storage sites will be developed for maximising storage of rain water.

2. Massive insitu soil and water conservation measures through contour trenching, check dams and other watershed management practices, will be taken up. Conversion of agricultural lands for non-agricultural use will be minimised.
3. Deforestation will be avoided as far as possible and afforestation programmes in river catchment areas with browsable indigenous species will be encouraged.
4. Irrigation and hydel reservoirs will be linked up with urban and rural water supply schemes. Steps will be taken to maintain water quality of fresh water lakes and they will be integrated with drinking water supply schemes, wherever possible.
5. Attempts will be made to use all the non-conventional fresh water resources like tanks, springs etc. for domestic water supply and minor irrigation schemes. Preservation of the existing fresh water bodies will be ensured. Conversion of marshy lands and waterlogged areas into sweet water lakes will be encouraged wherever feasible. Land reclamation by filling up of sweet water bodies will be discouraged.
6. Selective and judicious ground water development through bore and tube wells without causing salinity incursions in coastal belts and drying up of neighbouring household wells will be undertaken. Ground water extraction in the Sate will be regulated through legislation.
7. Areas frequently affected by drought and drinking water scarcity will be identified and programmes or schemes for permanent solution will be evolved and implemented.

4.2 ***SHORT TERM WATER MANAGEMENT STRATEGIES FOR STATE***

Realising the immediate necessity to improve the deteriorating water scenario in the State , the following short term strategies will be adopted.

1. Drip irrigation and other water saving irrigation technology will be encouraged and wherever feasible, they will be integrated with household compound wells/ existing overhead tanks.
2. Desilting of tanks and ponds, deepening of community wells and construction of contour trenches and check dams at appropriate places shall be done. This will help to

conserve fresh water resources of the Sate and generate employment.

3. Training programme for the public on the maintenance and upkeep of the household compound wells and installation of hand pumps for bore wells shall be undertaken.

4. Leakages in the existing distribution pipes will be plugged and non- functional pumps in the bore and tube wells already installed will be repaired.

5.0 *WATER QUALITY MAINTENANCE AND UPGRADATION*

Water ceases to be a resource if its quality in relation to its use deteriorates. Hence, it is extremely important that not only quality of natural water bodies has to be kept within specified standards of acceptance, but also, regular quality upgradation programmes have to be undertaken for those water bodies which are in perpetual danger of getting polluted. There shall be a regular programme of continuos monitoring of our fresh water bodies for their health and ecology. The data so generated shall be processed and used for design and development of water resources projects. Apart from rivers, important fresh water lakes and back-water bodies shall receive special attention under this programme.

6.0 *INLAND WATER WAYS , INLAND FISHERIES AND AQUATIC RECREATION FACILITIES.*

Goa has a good network of inland waterways. With increasing price of fuel and ever increasing congestion on our roadways, it has become imperative to open up and increase waterway facilities in the State. Appropriate steps will be taken in this direction.

Goa has large number of man made and natural freshwater lakes, reservoirs, tanks, ponds and backwater bodies. All of them have great potential for inland fisheries and for creating aquatic sports facilities. Department of Fisheries and Department of Tourism shall jointly develop these sectors which will have a great positive impact on the State's economy.

7.0 HYDROPOWER GENERATION IN THE STATE

There is a very limited scope for hydel power generation in the Goa State. However there is a potential of generating about 60 Mw. power in the Mandovi river basin and also possibility of establishing micro power generation Stations at Anjunem Dam and on Tillari Canal in Goa State.

The requirement of the Sate in 1999-2000 was estimated to be 260 M.W. and is expected to rise considerably in the coming years. The allocation of power in Goa State through NTPC is 379 Mw.

Therefore the Sate will have to develop its hydel potential to the maximum extent with minimum disturbance to the environmental scenario in the State. So also share the power projects under the joint venture of Tillari Irrigation Project where generation of 10 Mw.at Konal Power House and 0.5 Mw. at the Irrigation cum power outlet are planned. The power house at pickup weir at Teranmeddhe is planned by the Govt. of Maharashtra.

8. SHORE EROSION AND PREVENTIVE MEASURES

Compared to the geographical area of 3702.00 sqkms., the Goa State has a long coastline of about 105 kms., where one of its important economic life lines is concentrated and where population density is more. A major part of the coastline is prone to moderate to severe shore erosion and this results in loss of precious land and threaten a large part of population and tourist places along the coast. Effective and economic shore protection measures will be taken at the coastal areas which are prone to erosion.

9.0 SCIENCE AND TECHNOLOGY INPUT FOR THE STATES WATER SECTOR

Nothing can be achieved economically and efficiently without appropriate science and technology input at the proper level. Therefore the service Departments like Irrigation, Agriculture will earmark half to one percent of their annual budget for Science and Technology works

pertaining to water resources development, management and related works.

It is also suggested that in view of the latest development in area of information technology and remote sensing, in using computer based photo interpretation and water management system, Irrigation Department need upgrading of its technological capabilities by acquisition of these and such modern technology which may be useful in the long term for implementation of water utilisation projects in Goa.

10. PRIORITY AREAS OF ACTIVITY IN THE STATE WHERE SCIENCE AND TECHNOLOGY INPUT IS ESSENTIAL ARE:

I. Drought and flash flood management.
II. Salinity prevention measures to coastal wells and rivers.
III. Estuary and backwater management.
IV. Water harvesting techniques at the levels of river basin, small watersheds, house compounds and roof tops.
V. Land use –erosion–sedimentation-infiltration–evaporation relationships.
VI. Modern irrigation technology like drip and sprinkler
VII. Water management in irrigation.
VIII. Hydro power generation through mini and micro hydel projects
IX. Khazan land management.
X. Management of population and damage from mining activities.

11. INSTITUTIONAL ARRANGEMENTS TO IMPLEMENT THE STATE WATER POLICY

To implement the various programmes and provisions mentioned in this State Water Policy Document, the following institutional and administrative measures will be taken up:

11.1 A Water Resources Control Board (WRCB) will be formed to oversee and co-ordinate all the activities to implement the State Water Policy . The functions and compositions of the Water Resources Control Board will be as given in Appendix-I.

11.2 A centralilsied Hydrological Data Bank and Data Processing Center will be established under the Irrigation Department. A consultative body consisting of Irrigation Department, shall provide necessary advice and guidance to this Unit.

11.3 A separate cell in the Irrigation Department will be formed to look after and co-ordinate all programmes related to non-conventional fresh water resources in the State viz. tanks, ponds , springs natural fresh water lakes and turangams.

11.4 Specialized training and research on water resources development and management and related subjects will be implemented.

11.5 In order to optimally develop State Inland Water Ways, appropriate organisational structure will be built up.

12 ***CONCLUDING REMARKS***

With all-round greenery and high rainfall, it was always presumed that Goa does not have any water related problems but this myth has broken down owing to water scarcities faced in the past.

Goa's lands, water and environmental features are unique in the Country.

Absence of snow in the high ranges, steep topography, highly uneven rainfall, mining activities, Khazan land problems, effect of Global warming and the predicted rise in the sea level the state and river basins, low per capita water availability and the fact that the majority of the State's rivers do not have any interstate context have made it imperative that the State has its own Water Policy. Planning and proper management of its vital resources is of utmost importance for the general economy of the State and welfare of the people .

The State Government is committed to implement the policies as enunciated in this Document by developing implementation strategies.

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APPENDIX-I
FUNCTIONS AND COMPOSITIONS OF WATER RESOURCES CONTROL BOARD
(WRCB).

FUNCTIONS:

1. To help concerned agencies to implement the programmes laid down in the State Water Policy and monitor necessary follow up action.
2. To examine and approve major water development plans prepared by various agencies.
3. To advise Government on Inter State Water matters.

COMPOSITION of WRCB :

The WRCB shall have a Governing Body (GB) for overseeing the activities and an Executive Committee (EC) for developing specific activities as laid down in the State Water Policy.

The composition of the 'GB' and 'EC' shall be as follows :

1.	Irrigation Minister	... Chairman
2.	Irrigation Secretary	... Vice-Chairman
3.	Chief Engineer(Irrigation)	... Member Secretary
4.	Secretary ,Agriculture	... Member
5.	Secretary, Planning	... Member
6.	Secretary , Forestry	... Member
7.	Secretary , Science & Technology	... Member
8.	Two eminent scientist/ Engineers In the field of Water Resources Management	... Member

EXECUTIVE COMMITTEE :

1.	Chief Engineer-	Irrigation Department
2.	Superintending Engineer-	Central Planning Organi-sation, (I.D.)
3.	Director, Agriculture-	Member
4.	Director, Science & - Technology	Member
5.	Two eminent water specialist- nominated by Governing Body	Member