



सत्यमेव जयते

Government
of Rajasthan

Mukhyamantri
Jal Swavlamban
Abhiyan



CHANGING WATERSCAPE OF RAJASTHAN

IMPACT ASSESSMENT
MJSA PHASE I



RAJASTHAN AT A GLANCE

Prologue

Rajasthan is a state with extreme diversities, be it geographical or metrological or demographical having just 1.16% surface water and 1.72% ground water availability for 5.5% population engulfing 10.4% geographical area, against national status. Basically, Rajasthan is a water starved State with extremely meager water resources and fewer techno-economically feasible & practically viable avenues of surface water exploitation, henceforth. The prevalent scenario of potable water availability, emphatically the ground water, is in dire straits. Surface water is neither available perennially nor uniformly across the geographical area of the state. Much of the state needs are addressed by the water that flows from the Himalayas that the state receives under interstate agreements.

Geography

Rajasthan is the largest State in the Indian Union, with an area of 3,42,264 Km². It is located in northwest India at 26.57268°N 73.83902°E. The tropic of Cancer traverses through southern Rajasthan, south of Banswara town.

Rajasthan features variety of lands forms. Four major physiography divisions are

- Aravali Hill Ranges.
- Eastern Plains.
- The Thar Desert (61% of State's geographical area).
- The South Eastern Plateau.

Land elevation in the State varies from 30 Mt to 900 Mt above MSL.

Degraded Land Resources

Nearly 61% of the total area of the State is desert "The Thar" and about two-third of this is heavily subjected to wind erosion. Soils in this region have poor water holding capacity and nutrient status, resulting in low productivity. The south-east and eastern part is productive for agriculture but heavily prone to water erosion. About 101 lac ha. (30% of the State's and 18% of country's area) is under wastelands of different categories.

Rainfall

Precipitation occurs predominantly during monsoon, that too is highly erratic, quantum vis-à-vis timing and spread area wise. Magnitude varies from as low as 100 mm to maximum up to 1000 mm on average basis. This has been the chief cause of frequent droughts that State suffers quite often.

Climatic Vagaries

Owing to scorching heat, frequent visit of drought, geographical & climatic adversities and unsusceptible state of water availability, the Rajasthan has landed into vulnerable state. The State is hit, by a drought every three years and by a major drought every five years. The drought is a disaster whose foot prints sustain for quite long period for which tools like MNREGA, famine relief works and other adhoc measures are undertaken as drought disaster impact mitigation interventions but, simultaneously there was express need for initiating long term sustainable and dependable interventions. The launch of MJSA is an integral part of long term sustainable resolve.

Potable Water status

Due to scarcity of surface water, Rajasthan is overwhelmingly dependent on ground water. The annual draft of dynamic ground water is quite more than the quantum of annual recharge and replenishment, causing severe and irreversible/ irreparable in the prevailing context, dent into static reserves. Majority of blocks either rest in vulnerable or over exploited category. The extraction is 137% of the annual recharge. In prevailing context, around 70% to 80% drinking & domestic supplies depend on ground water. Squeezing ground water reserves are further impacted by quality issues viz salinity, fluoride contents etc.

Vulnerabilities of Rajasthan

Acute water scarcity, frequent visit of drought and climatic vagaries intensified by the vast expanses of Thar Desert having saline ground water.





MUKHYAMANTRI JAL SWAVLAMBAN ABHIYAAN (MJSJA)

A wide spread micro level campaign engulfing entire state in phases, to radically transform the water-sector scenario of the state restoring to pragmatic solutions.

Rajasthan is a state with extreme diversities, be it geographical or metrological or demographical. Basically it is a water starved state with just 1.16% surface water & 1.72% ground water availability for 5.5% population engulfing 10.4% geographical area, against national status. Drinking, Livestock and domestic water needs rest on top priority.

In prevailing context, around 70% drinking & domestic supplies depend on ground water. Nevertheless, the ground water scenario too has reached alarming state. The annual draft of dynamic ground water is quite more than the quantum of annual recharge and replenishment besides severe dent into static reserves. Majority of blocks are in vulnerable and over exploited category. Hardly around 10% are in safe category. The primary aquifers have almost exhausted.

Taking cognizance of meagre and restricted surface water resources and extremely grim ground water scenario, to bridge the deficit in basic and bare minimum potable water requirement and to address ever growing future needs, two scientifically designed flagship programmes/campaign which are complimentary to each other, viz:- Mukhya Mantri Jal Swavlamban Abhiyan (MJSJA) and Four waters concept based interventions are launched by the Government of Rajasthan. These two ambitious yet unique micro level programmes target self-reliance in addressing basic minimum water needs of rural Rajasthan.

Objective of MJSJA (Mukhya Mantri Jal Swalyambhan Abhiyan):

The sole objective is to render villages self reliant in the context of mitigating basic water needs with emphasis on drinking, domestic and live stock water requirements, emphatically the summer demand and preference to at least one Kharif watering to avert drought conditions arising out of erratic monsoon and or delayed precipitation or early culmination of rainy season or prolong intervals in monsoon precipitation.

Area of Implementation:

44,795 villages of entire state, of course in phases, subject to fiscal support. Micro watershed based approach is adhered upon where villages located amidst that specific micro

watershed are encapsulated to make a cluster based programme. This has been the paramount scientific dimension in selection of villages.

Theme:

In past too, somewhat analogous programmes/ campaigns were launched sporadically, but this time, with scientific dimensions and analysis, adhering ridge to valley approach, instead of unilateral approach and manoeuvring from individual stake holder, it was decided to spell/ roll it out with concerted efforts and approach involving all stake holders including ultimate beneficiaries, all line departments, NGOs, social & religious groups, etc. and conceding sole power to Gram Sabha, yet not compromising the scientific approach of planning and manoeuvring so as to make it a mass movement.

Modus Operandi:

1. Astute planning and vigorous scientific multilayer review & examination before ratification of DPRs.
2. Scientific Assessment of quantum of minimum basic water requirement of village.
3. Working out the present status of availability and assessment of deficit quantum.
4. Conducting survey of cluster by joint team of line departments with active involvement from locals. Monitoring of survey on Way point software mobile application.
5. Discriminating/ identifying the probable interventions to bridge deficit.
6. DPRs were prepared conceding cognizance to local parameters and conditions with pragmatic considerations and not on rational basis.
7. At the onset few model DPRs were prepared, one each for 10 agro-climatic zone of the state, to follow suit.
8. Formulation of DPRs and endorsement of Gram Sabha.
9. Geo-tagging of all works proposed for execution.
10. Techno-economic design followed by execution.
11. E- Review and monitoring.

In fact , great use of technology right from preliminary survey stage to accomplishment of task and post execution scenario level.

As far as execution of works is concerned, it is all

conventional approach yet it is a quite unique programme. It is a radical shift from conventional and contemporary approach.

As regards to uniqueness, it is just not a governmental programme rather, a mass movement actively profusely involving and engaging all sections of society. There was utmost concentration and emphasis on watershed development activities in extreme scientific manner. In this specific context, paramount feature of Abhiyan has been the ridge to valley approach, a Four Waters Concept dimension was adhered upon.

Each and every DPR was scrutinised umpteen times to attain maximum degree of perfection. Convergence of all line department's viz. watershed, ground water, water resources, panchayat raj, rural development, forest, public health engineering, agriculture and horticulture etc. all converged their activities at the planning stage during the preparation of DPR.

For the first time in state, Geo-tagging of each work is done. It required extraordinary efforts, yet it was must to establish authenticity / veracity/corroborator of structures vis-a-vis monitoring quality standards. Even it shall be helpful in post abhiyan era to monitor the status and sustainability of structures vis-à-vis the impact i.e. evaluation.

Mobile application was being used to upload day to day physical status of work through photos so as to adjudge the pace of execution, point out deficiencies and anomalies and also corroborating the narrative version with practical site status.

Candidly, these two activities, i.e. Geo-tagging and use of mobile applications shall prove landmark dimensions in the history of state, only to follow suit in conventional ventures, henceforth.

Besides being innovative, scientific and tech-savvy interventions, the abhiyan has transformed into a mass movement. Contrary to practices and approach being adhered upon hitherto, all the stake holders were brought under one umbrella under stewardship of district collector to put in concerted efforts for making it a genuine success and worth. People did shramdaan (labour), and all sections of society that is social, religious, NGOs, corporate (CSR) etc. pitched in cash and kind support.

The first phase was launched on 27th January, 2016.

In the first phase which had been completed on 30th June-2016, 3529 villages were taken with almost uniform distribution over entire state; one cluster in each block was incorporated. Cluster wise DPRs were prepared. Execution of 95,192 works had been completed prior to onset of monsoon, a phenomenal success as far as implementation is concerned. Also, plantation of 28 lakh trees was taken up all around these water harvesting structures. A five year maintenance plan was given out with forest department being the nodal agency for this task.

Given the circumstances and nature of intervention, exact, genuine and perfect impact assessment is a vicious exercise.

Notwithstanding to this, for prima-facie recognition there are few areas and parameters that reflect direct and conceivable impact duly substantiated with statistical data, may be considered for impact assessment, as of now.

Based on prima-facie /preliminary impact assessment, following have been the paramount achievements:-

Direct Impact:

1. Enhanced monsoon water interception (quantum).
2. Increase in storage capacity.
3. Improvement in potable water availability for drinking, domestic and live stock use, emphatically during summer season.
4. Rejuvenation of defunct hand pumps, tube wells and open wells owing to MJSJA impact.
5. Increase in ICA i.e. enhancement in crop area during lean season and its impact thereof, in hectares.
6. Increase in area of orchards in hectares.
7. Increase in sowing/crop area on account of improvisation of water distribution system, in hectares.

Indirect Impact:

1. Increase in green cover, in hectares.
2. Improvement in status of flora & fauna, a generic assessment.
3. Enrichment in ground water coffers.
4. Enhancement in soil moisture/ soil water contents.
5. Reduction in turbidity level, a gauge of soil erosion. Albeit, no primary data would be available yet, local and visual observations and comparison with pre MJSJA status would indicate improvement.
6. Help mitigating menace/abuses of drought disaster.
7. Conservation of water owing to renovation and improvisation of distribution system.
8. Conservation of water attributed to switch over to pressure irrigation.

The second phase which was analogous to phase-I, 4213 villages were encapsulated, too has been completed. The MJSJA phase-II was launched on 9th December, 2016. Around 1, 28, 991 water conservation works are completed including plantation of 60 Lakhs plants.

The primary impact assessment of phase-II is yet to be conducted.

The first leg of MJSJA phase-three engulfing 4239 villages has been started on December 9, 2017. By the mid of January, 2018 the final configuration of activities will emerge and the second leg is slated to commence on 30th January, 2018.

Phase IV & V: - To accord impetus to planning process, it is contemplated to conduct preliminary survey work deploying drones and it is targeted to complete drone survey of 200 blocks of non desert districts latest by 30th

June, 2018, thereby clearing the deck for planning of phase-IV & V.

Hon'ble Prime Minister has exhorted umpteen times to seriously indulge into water conservation drives. Initiatives taken by the state government are truly, sincerely and

religiously consistent with what Hon'ble Prime Minister intends and what actually & expressly warranted for a state like Rajasthan. In his 'Man Ki Baat' program on AIR, twice, the PM congratulated the MJSA abhiyan and the plantation program taken up by the Rajasthan state and also opined that other states should follow suit.

IMPACT ASSESSMENT OF MJSA PHASE 1

APPROACH TO IMPACT ASSESSMENT

Rajasthan River Basin and Water Resource Planning Authority formulated the required technical guidelines and accordingly impact assessment was performed by the concerned line departments. Assessments reported by the line departments were also scrutinized by the committees of eminent experts and subject matter specialists emphatically constituted in the respective fields who are outside the Government so as to ensure that the impact assessments stand the scrutiny of independent and neutral experts.

Owing to varied geography, precipitation variation and demography across the state, none of the activities imbibed in MJSA or their potential impacts were uniform. This is because it is dependent on many variables, uncertainties, primary data and observations which are seldom available in context of ground water.

Given the circumstances and nature of intervention, a genuine and perfect impact assessment is a difficult exercise. However, the few areas and parameters considered for impact assessment of MJSA - Phase 1 program of the State were covered in the following categories:

1) Supply-side Indicators

1. Increase in Ground Water Level
2. Surface Water Enrichment

2) Demand-side Indicators

1. Reduction in Water Supply through tankers
2. Rejuvenation of defunct Hand Pumps
3. Revival of tube wells
4. Revival of open wells
5. Increase in cropping area
6. Increase in Green Cover

3) Socio-Economic & Demographic Indicators

1. Mitigating the plight of tribal populace
2. Sustaining live stock

IMPACT AT A GLANCE

Direct Impact:

1. Enhanced monsoon water interception (quantum)
2. Increase in storage capacity
3. Improvement in potable water availability for domestic and livestock use, during summer season
4. Rejuvenation of defunct hand pumps, tube wells and open wells
5. Increase in ICA i.e. enhancement in crop area during lean season and its impact
6. Increase in area of orchards
7. Increase in sowing area

Indirect Impact:

1. Increase in green cover, in hectares
2. Improvement in flora & fauna, a generic assessment
3. Enrichment in ground water coffer
4. Enhancement in soil moisture
5. Reduction in turbidity level (a gauge of soil erosion)
6. Help mitigating menace of drought disaster
7. Conservation of water owing to renovation and improvisation of distribution system
8. Conservation of water attributed to switch over to pressure irrigation.

3529
VILLAGES COVERED

95,192
WATER CONSERVATION
WORKS COMPLETED





EXCERPT OF IMPACT ASSESSMENT

The impact of MJSA can be gauged through a three dimensional assessment process. First dimension being the supply side, second the demand side and third the socio-economic factor. All the three factors are complimentary to each other. The first one assuages the second and outcomes of second are exhibited in third dimension which is the prime objective.

Supply-side Indicators

1. Increase in Ground Water Level

It is already known that phenomenal impact cannot be seen after one monsoon season. Although, to assess the impact on ground water improvement, following parameters were considered:

Recharge of ground water is one of the thrust areas of MJSA. However, the present scenario does not facilitate exact assessment because of the following reasons:

- (i) Uncontrolled ground water extraction: More than 85% extraction is attributed to agriculture
- (ii) Impact of rainfall: Total magnitude, intensity & duration, spread area and so on.
- (iii) Geophysics and hydrogeology of area
 - (a) Aquifer Status: Its depth below NSL and its gradient
 - (b) Geological formations between NSL and aquifer
- (iv) Saturation status of penetration medium
- (v) Siltation ethics
- (vi) Data and observations recording

Undoubtedly, increase in interception and storage of monsoon precipitation has added to ground water recharge but the penetration of surface water in ground happens in three stages, which are

- (i) Saturation status of underlying strata
- (ii) Shallow penetration followed by resurrection in valley and depressions – Four Waters Concept
- (iii) Penetration up to aquifer - the genuine ground water recharge

Unless artificial mechanism and relevant infrastructure are provided, the recharge of ground water on average basis is 7 to 8 % of surface water.

To achieve cognizable impact, laying network of artificial recharge structures is an important requirement.

Referring to afore mentioned facts, the genuine impact assessment of ground water recharge is an extremely cumbersome & time consuming exercise. However, any work done for catchment area treatment and watershed development is bound to enrich ground and soil water status.

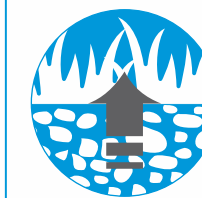
Nevertheless, MJSA is slated to cover entire rural Rajasthan in phases. Once all the villages are covered, it would be possible to gauge and quantify the overall impact on ground water.

GWD Assessment: Assessment, resorting to prevalent state of GWD's monitoring & evaluation.

Analysis conducted by expert committee on ground water recharge suggests that, of 21 non desert districts, 16 districts recorded rise in ground water level. The average rise was 4.66 Ft. However, in rest 5 districts, there had been no rise in ground water level yet, decline in the rate of ground water depletion was recorded which indicates positive impact in these five districts too.

AQUIFER
ENRICHMENT

628.6 MCFT
(17.80 MCUM)



GROUND WATER LEVEL STATUS
IN 21 NON-DESERT DISTRICTS

AVG INCREASE
4.66 FT

Owing to MJSA phase-I, the interception of monsoon water due to watershed development activities was 6653 Mcft (188 Mcum). Generally, water intercepted through watershed development activities involving first and second order streams, farm pond, etc. are considered exclusively for ground water recharge. Besides this, a fraction of water stored in water bodies is also considered for ground water recharge. Additional surface water storage creation attributed to 1725 Mcft (49 Mcum).

Considering these two parameters of additional interception (8378 Mcft or 237 Mcum), genuine ground water enrichment is just 7.6%. And the expert group considered around 15% of total interception against evaporation, which sums upto 22.6%. Rest 77.4% water, intercepted in watershed development and analogous activities which account to 5150 Mcft (146 Mcum) is still questionable. There is no scientific measure for quantifying this yet, however, the phenomena of absorption of this quantum may be explained as under.

Major part of surface water penetrates into the ground. With

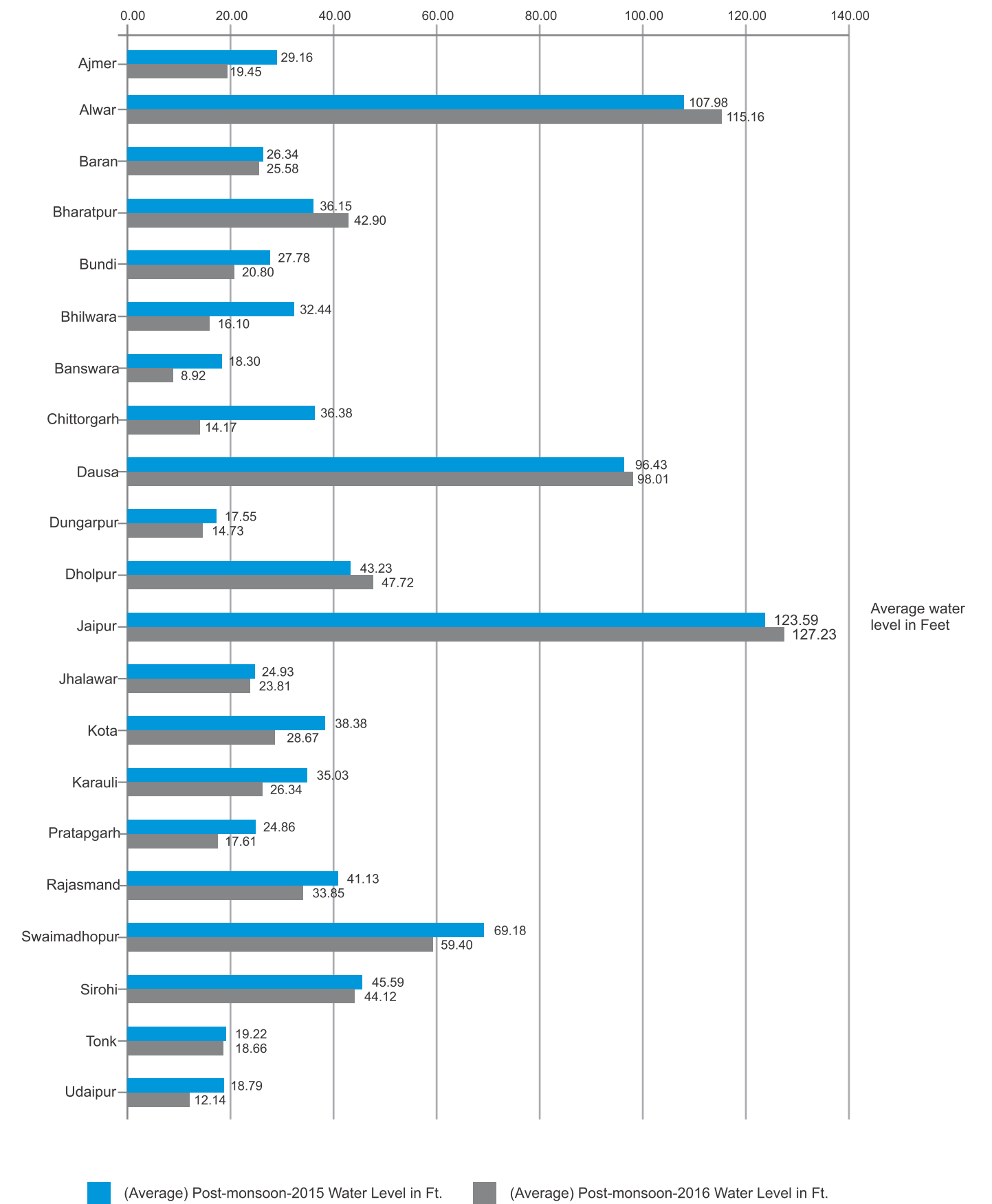
penetration, prior to joining the aquifer, water first saturates the underlying soil mass, then accumulates into voids of rock masses. In case of impermeable layers, water accumulates as shallow ground water in the space between soil mass and impermeable rock levels. Lastly, considerable part of penetrated water resurrects as spring flow in valley,

depressions and slopes through lateral movement beneath Natural Surface Level (NSL).

To have more genuine ground water recharge i.e. aquifer replenishment, we have to resort to the same techniques that are adopted for ground water extraction i.e. penetration through shafts to ensure unabated access up to aquifer.



DISTRICT-WISE CHANGE IN AVERAGE WATER LEVEL DUE TO MJSA-I INTERVENTION



In five districts, namely Alwar, Bharatpur, Dausa, Dholpur and Jaipur, extraction of water was more than water recharge

2. Surface Water Enrichment:

INCREMENT IN STORAGE AVENUES
4516 MCFT
(128 MCUM)

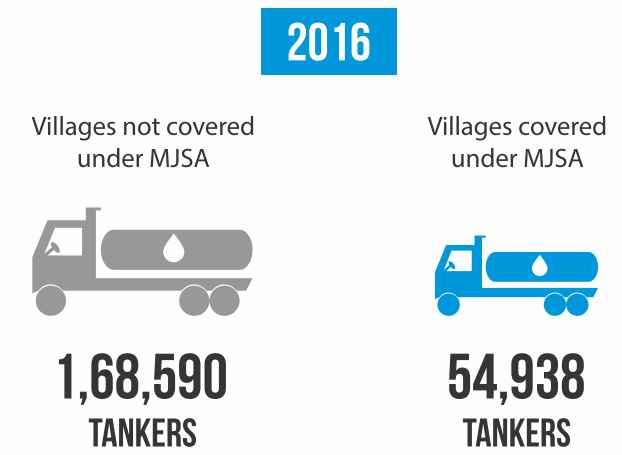
INCREASE IN INTERCEPTION OF MONSOON PRECIPITATION
11170 MCFT
(316 MCUM)

Of 316 Mcum that was intercepted, 128 Mcum (4516 Mcft) was stored in mini & micro storage structures e.g. tanks, anicuts, check dams, Khadins, Johads, etc. and rest 188 Mcum (6653 Mcft) was collected in various watershed development works. The data considered for assessing ground water recharge does not include the quantum of spring flow in valley and depressions as there is no scientific mechanism to gauge their impact.

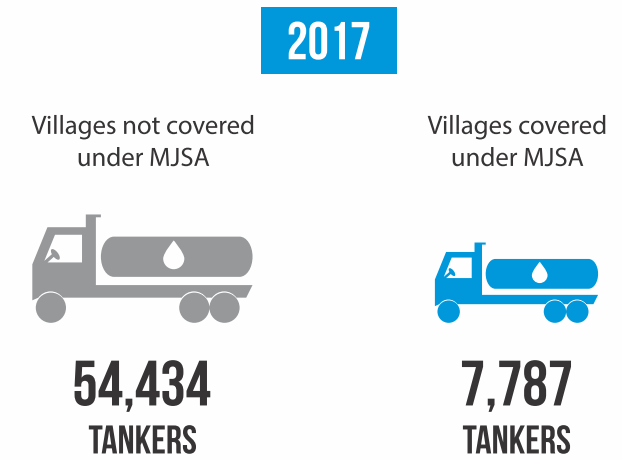


2) Demand-side Indicators

1. Reduction in Water Supply through Tankers



Comparison of Transportation of Water (ToW) in MJSA villages Vs Non-MJSA villages in 2016= $(54938/168590) \times 100 = 32.6\%$



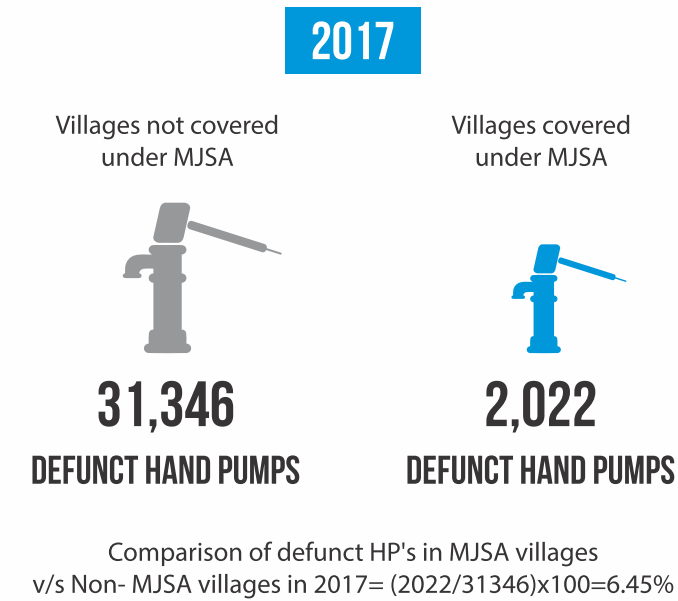
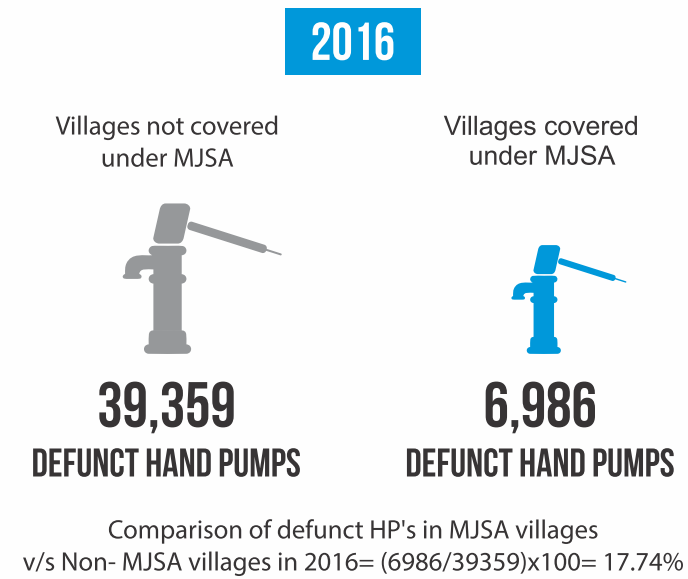
Comparison of Transportation of Water (ToW) in MJSA villages Vs Non-MJSA villages in 2017= $(7787/54434) \times 100 = 14.3\%$

Net achievement i.e. percentage reduction in Transportation of Water (ToW) supply during summer 2017 against, 2016 in MJSA Phase-I area attributed to MJSA activities = $(32.6-14.3/32.6) \times 100 = 56.13\%$

Rajasthan is a water starved state. Main source of drinking water in the rural areas of state are Tube Wells, Open Wells and Hand-Pumps. Due to depletion of water table, most of these sources dry up during summers. Thus, the state deploys water tankers to meet the drinking water needs. The

impact of MJSA-I was assessed with comparing the reduction in number of tankers deployed in MJSA area and Non-MJSA area during 2015-16 and 2016-17. It was observed that there is reduction of 56.13% in deployment of Tankers in MJSA-I area.

2. Rejuvenation of defunct Hand Pumps

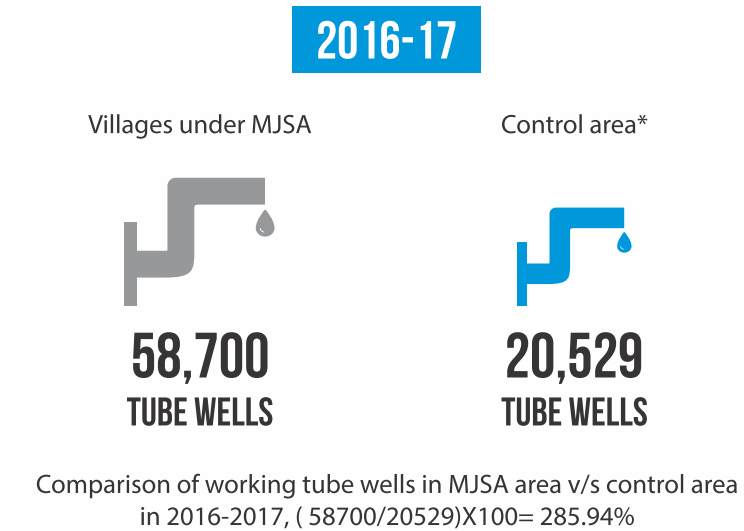
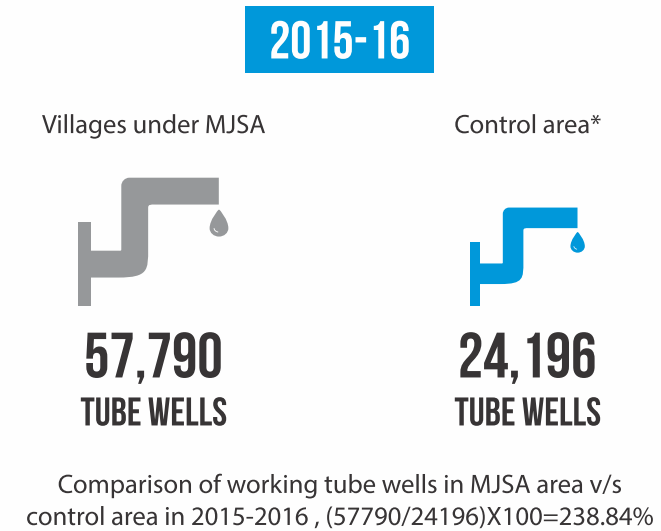


Net achievement i.e. percentage rejuvenation of defunct hand pumps/ tube wells during 2017 against, 2016 in MJSA Phase-I area attributed to MJSA activities = $(17.74-6.45/17.74) \times 100 = 63.64\%$

In Rajasthan, many hand-pumps dry up every year due to depletion of ground water. Because of scarcity of rains, ground water is scarcely recharged. But in summers of 2016, in MJSA area, 6986 number of hand-pumps were found

dried/defunct, whereas, in the same area, in 2017 the figure touched down to 2022 that is 23% of previous year. However, in Non-MJSA villages the not-so-significant changes were observed.

3. Revival of Tube Wells

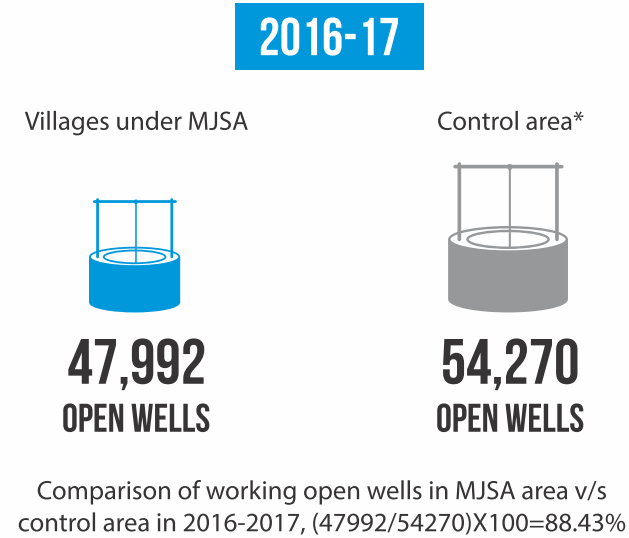
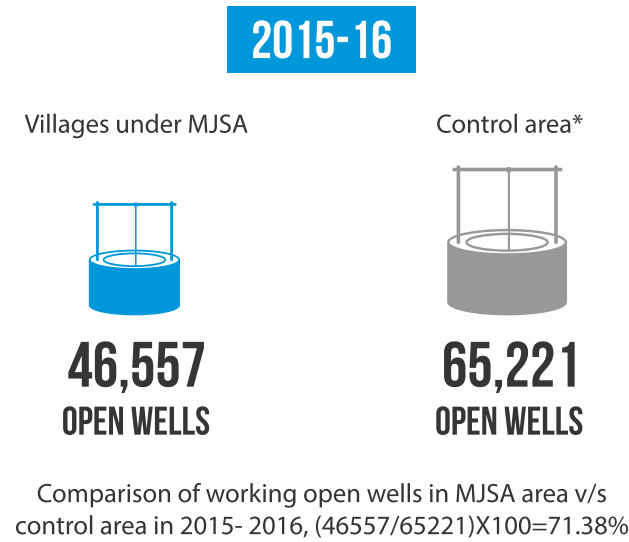


Net achievement i.e. percentage increase in working tube wells during 2016-2017 against, 2015-2016 in MJSA Phase-I area attributed to MJSA activities, $(285.94-238.84) \times 100 / (238.84) = 19.72\%$

Tube wells are the lifeline for agriculture and drinking water needs. MJSA has improved the working condition of these tube wells. Number of working tube-wells in MJSA area in the year 2015-16 were 57790 but in the year 2016-17 the figure rose to 58700, whereas, in Non-MJSA/control area the figure came down from 24196 to 20529.

*Untreated area in the extreme vicinity of MJSA areas.

4. Revival of Open Wells



Net achievement i.e. percentage increase in working open wells during 2016-2017 against, 2015-2016 in MJSA Phase-I area attributed to MJSA activities, $(88.43-71.38) \times 100 / (71.38) = 23.88\%$

Prior to MJSA, in the year 2014-15, 3% increase in number of dried wells was observed, whereas, after MJSA in the year 2015-16, 2% decrease in number of dried wells was observed and in the year 2016-17, 8% decrease in number of dried wells was observed.

In MJSA area, in the year 2015-16, number of working wells was 46557 which rose to 47992 in the year 2016-17, which shows increase of 1435 working wells in MJSA area. But, comparison of same period data in Non-MJSA area shows that number of working wells reduced by 10951 in the year 2016-17.

- Besides above improvement, there has been enhancement in yield of sources for which there is no authentic mechanism to measure.
- Above figures do not include new/fresh open and tube wells constructed/ installed during 2016-17.

*Untreated area in the extreme vicinity of MJSA areas.

5. Increase in cropping area

- (I) Increase in ICA i.e. enhancement in crop area during lean season (Rabi & Zaid Rabi) and its impact thereof:
- (a) Rabi - 41881 Ha
 - (b) Zaid - 2528 Ha
 - (c) Sub Total - 44409 Ha
- (ii) Increase in crop area attributed to improvisation of water distribution system - 2470 Ha

**TOTAL INCREASE
IN CROP AREA
46879 HA**




6. Increase in Green Cover

Planting of around 28 lakh plants in the vicinity of micro water bodies created under MJSA helped enhancing green cover by 3678 Ha. Further, owing to catchment area treatment resorting to watershed development activities coupled with creation of micro storage structures helped in developing and sustaining flora & fauna. Due to catchment area treatment, there was visible reduction and control over soil erosion that also helped preventing uprooting of trees on slopes.

**PLANTATION OF AROUND
28 LAKH PLANTS**

**GREEN COVER ENHANCEMENT
BY PLANTATION 3678 HA**

About 3678 Ha. area has been added under green cover with plantation of more than 28 Lakh saplings with 5 years maintenance plan through NREGS. For the first time, cluster of plants have been geo-tagged so their survival monitoring can be ensured. Such huge plantation drive in the state has also been appreciated by Hon'ble Prime Minister in **"Man Ki Baat"**.



3. Socio-Economic & Demographic Indicators

1. Helped preventing or scaling down plight of tribal populace to neighbouring states to earn livelihood.
2. Animal husbandry is a prominent occupation in desert districts to earn livelihood. Under MJSA Phase-I, micro storage structures including 20729 tankas were constructed in desert districts accommodating 2792 Mcft (79 Mcum) water that helped maintaining and sustaining livestock.





COMMISSIONERATE OF WATERSHED DEVELOPMENT AND SOIL CONSERVATION,
RURAL DEVELOPMENT AND PANCHAYATI RAJ DEPARTMENT
PANT KRISHI BHAWAN, RAJASTHAN, JAIPUR
MJSA.WATER.RAJASTHAN.GOV.IN