

CHAPTER - 6

CONCLUSIONS AND RECOMMENDATIONS

In India despite people in general being exposed to water shortages, in frequent availability of same , experiencing lowering of under ground water level in personal/common hand pumps and deep wells giving reduced yields or becoming defunct and lurking fears in the minds of water expert based on their professional exposure backed by scientific studies and analysis, the preventive and remedial water management related programmes have not been able to engage their attention to desired levels. The effective ness of simple methods of recharging under ground water strata is recognized world over by water experts as it is felt that this method itself mitigates drinking water problems to a very large extent in almost all areas including villages, in hills, coastal areas and in plains ,with high to medium rain fall.

The situation is almost similar on Northern Railways. Though it is seen that railways are taking actions as required to comply with policy guidelines on rain water harvesting, but the gravity of water problem in general and convincing oneself about his role in mitigating such problem, is lacking.

It can be concluded that Railways are aware of scarcity of water resources in world over and that same is affecting them also, as is confirmed by lowering of water table in almost all areas covered under this study, the dwindling yields from the existing tubewells and other sources requiring fresh tubewells with progressively

greater depths reinforces this conclusion. accordingly NRly has been prompt in taking action on directions and guidelines issued by ministry of Water resources, Central ground water board and other local bodies like Delhi Jal Board way back in 2001 itself, in its area of jurisdiction .Required and adequate actions have been followed and govt. policies are being adhered to both in words and actions as RWH has been started in year 2001 itself and till 2007 180 stations have been covered .

Unfortunately the exercise has been reduced to administrative compliance only, lacking the basic understanding regarding requirement of schemes, the final desired results of such implementation, as there seems to be lack of proper monitoring the effective functioning of such schemes. There seems to be no data recording periodically as in some cases it is noted that water table continues to deplete despite providing RWH schemes it only indicates that either the RWH scheme is not functioning properly or that may not be the most suitable scheme for that locality. A check list issued by CGWB for Planning artificial recharge project is available as 'Appendix D' and guideline available for suitability of artificial recharge methods is available as 'Appendix E'.

It is also noted that Railway has taken positive step by having its own ranney well in bed of river Jamuna and getting about 80 lac liters of water per day for its requirements primarily at new delhi thus off loading over stressed municipal water supply system but it practically does not provide any relief to requirement of sub soil water in locality for which the study undertaken by Teri for recycling of waste water available from rake washing seems to be more effective way of mitigating the problem as this technique and scheme envisages recovery of such waste water containing little impurities and is available for same use of washing in same area

thus reducing the requirement of fresh water for this purpose however the project has not been executed yet for technical conditions.

During discussions it is also concluded that Rly are taking technical measures to minimize the wastage of water through public supply points and other public water points in toilets by replacing bib cocks with spring loaded or gravity push cocks.

Rlys have also taken action to provide waterless urinals at few locations like in Hq office toilets however keeping in view the performance of such installations and advantages these should be used progressively at more places.

Water pollution is a big problem which reduces the availability of water creates health related problems also and NRly is taking effective steps however such measures have to be well understood by concerned people creating and tackling pollution for such measures to be more effective.

The area of reducing requirement and dependence of water based coach cleaning is not getting any attention as alternative suitable techniques can drastically reduce demand of water and such spare quantity can be used for drinking and other essential purposes.

Though Rly does not require large quantities of water for irrigation purposes however this type of watering is based on concept of spread irrigation here also Rlys need to use more water efficient techniques to save upon even small quantities of this precious commodity.

Railways are having their independent water supply systems with lot of water losses in distribution. This area needs to be given serious attention as at present the attention to such wastage is basically complaint based as there is no scientific recording and surveys to detect invisible and small leaks. The system of attending

such leakages needs to be more effective and use of latest materials and technology along with required competent man power need to be encouraged.

Recommendations

Awareness Campaign and sensitization

From the data available lot of work has been taken up and completed in area of Rain Water Harvesting to tackle the problem of water shortages. This achievement of having completed 180 nos works till 2007 is quite significant achievement as far as compliance of policy guidelines is concerned or for achieving laid down targets .However on discussions with field level staff it becomes evident that the spirit of taking up such works has not been engrained which obviously leads to lack of commitment and spontaneous involvement for a cause of properly managing our water resources which are under stress globally rather than locally, as is normally perceived and tackled by concerned staff and officers.

It is to be appreciated by one and all that this is a global problem as such its causes and remedial measures are to be conceived and appreciated at sufficiently broader level and preferably a unified approach may be needed by more than one concerned agencies dealing with water supply schemes in particular region .It is felt that all concerned from different agencies/departments dealing with this problem should have a common coordinated blue print with technical inputs from experts and CGWB with area of responsibility being clearly defined for each user department jurisdiction, to avoid duplication, overlapping or in worst cases opposite results for other user departments after having such a blue print works can be taken up by concerned department as and when need arise .

Sensitization of staff can be made more effective by involvement of railway users in such endeavour so that they also become active partners in judicious use of water, contribute in water demands being reduced by way of avoiding indiscriminate uses, reusing used water from one activity in other activity where such water can be used without further treatment , using water efficient gadgets and techniques and being very sensitive to wastage of water even by children. They can educate children from very beginning regarding this problem and also how they can contribute in mitigating the problem.

For this Railways should have regular awareness campaigns both in offices, work and station areas ,directed both towards staff and public users of railway facilities, railway colonies .Railway labour unions can also actively be associated in such campaigns, railway women organization can always play an effective and leading role. Individual offices, colony maintenance unit, house holds may be judged on different facets of water management and suitably honored in recognition of their best efforts in this area. Workshops, essay ,slogan writing competition etc can also help in bringing out new ideas in this field in addition to encouraging active participation and awareness.

Use of suitable Techniques and up-keep

There are different water conservation techniques suitable in different conditions ,even rain water harvesting can be done in different ways suitability of same have to be decided on dependent factors for each techniques .Non discriminate adoption of water conservation or rain water harvesting schemes may not lead to desired results or sub optimal results and in few cases this may produce problematic results of inundation of top soil, raising the salt levels ,local flooding etc.

the suitability of different methods of water conservation and the detailed guidelines issued by CGWB available as 'appendix D & E'.

On perusal of results made available for SSE /EAST /AMV /LKO using abandoned tubewell no 31 for harvesting rain water from 8295sqm shows gradual decline of water table from 30.5 m in 2001 to 35.10 m in 2007. Where as similar RWH work in loco - east in LKO itself shows gradual increment in water table from 34.8m in 2001 to 32.75m in 2007, thus the in-effective results of AMV Colony need to be analyzed in details for such erratic behavior & for taking remedial measures to make the scheme effective.

In addition to adoption of unsuitable scheme, the other important factor affecting the efficiency of such schemes over the period is lack of proper care and required maintenance to ensure that scheme remains functional .As already mentioned in fore paras lack of involvement after commissioning of schemes just like completing other infrastructure works, is leading to such neglect of RWH works which are to be cared and maintained to ensure their functioning. For this if required separate cell manned by trained staff for maintaining such works and knowledge with respect to technical suitability of such schemes in that area be created .A separate register of all RWH works in jurisdiction of in charge maintenance be made which should contain all the details of such schemes from inception, lay out of such schemes with all dimensions and approved drawings. Annual records of water table as result of implementing such scheme should be kept and analysed to ensure that it is functioning effectively. Rainfall records should be recorded for analysis along with laid down planned maintenance activities to be under taken annually or at other intervals specific to each scheme. The details of such maintenance activities should be recorded after undertaking the same. This will help as a guide in future also with respect to performance of such schemes.

It is also recommended that suitable best practices for execution and maintenance of such works as being followed in other units may be compiled and issued as handbook to concerned officials. Feed back from field staff should be highly valued, their suggestions considered and adopted after modifications if any. All productive ideas should be encouraged and suitably rewarded to encourage involvement of field level staff finally responsible for maintaining such works.

Recycling of used water

Railways do not require entire quantity of water for drinking or domestic use. A large portion of this requirement for railways is required for washing purposes. The washing area is restricted in few major yards having washing lines and rake maintenance, this washing area is limited and is almost isolated from public area and likely contamination due to pollutants linked with public use. Any waste water after washing can be easily collected and directed to desired destination. This type of water requirement is termed as non consumptive requirement, meaning there by that almost entire quantity is generated on real time basis as waste water at same location.

These quantities at washing station are quite substantial to justify special treatment separately. In New Delhi such non consumptive needs constitute about 33% of total water requirements including consumptive requirements of basically potable water. each BG coach requires 3600 liters water for washing as per laid down norms, but presently about 2400 It per coach is being used ,in addition potable water is also required in washing line area for coach filling .The waste water after washing is presently led to nearest sewer system and constitutes normal sewerage there after containing all pathological, chemical, & physical impurities of any sewerage generated and can only be reused after elaborate treatments.

This Waste water at time of generation basically contains impurities on account of oil, grease, detergent etc in addition to some non organic impurities like dust particles, turbidity etc having potential of affecting BOD ,COD, PH, TSS, TDS, Nitrogen & Nitrates .During analysis of such water by TERI for "Designing a model for water recycling and reuse-A pilot project at new Delhi Railway station" critical parameters arrived at for treatment before recycling were BOD, COD, TSS, Oil and Grease.

The treatment options available for required treatment were

Biological treatment-ASP(Activated Sludge Process)

Membrane Bioreactor and

Physio Chemical treatment

TERI has done cost benefit analysis for 0.36 MLD plant and 2.5 MLD treatment plant where per liter cost works out to Rs 11 and Rs 7/ KL as compared to cost of Rs 10/KL from Ranney well and Rs 50/ KL cost of DJB water. This however does not include in direct benefits of reducing load on sewer system for carrying this quantity from source to treatment plant and reduction in load on treatment plant itself. Also the Ranney well is likely to loose yield with time and with likely lowering of water table with time ,the cost of pumping is sure to go up.

For all the advantages discussed above recycling of waste water from washing may be adhered to in the overall interest of society. It is also recommended that alternate washing technology either more efficient or not entirely based on water washing, using vacuum or air pressure etc may be explored, if required in consultation with research institutes of repute to save upon water requirements.

Use of technology to reduce Consumption and wastages

Though some technological measures like waterless urinals, Chemical toilets on trains ,push cocks etc have already been planned & adopted on railways, but such successful measures need to be introduced extensively. Further other measures leading to saving requirement of water need to be considered for evaluating their efficacy in railway system and adopted, like :

Extreme low-flush toilets. Toilets using as little as 0.5 GPF are available As against normal cistern capacity of about 10 liters per flush. Some use special bowl coatings and vacuum withdrawal to insure effective flushing.

Waterless toilets: New waterless toilet designs are being developed in Europe that use a 2-part bowl to separate urine and feces. Keeping these forms of human waste apart greatly facilitates their subsequent management.

Hot water recirculation systems. These plumbing add-ons provide for instant hot water at the tap, saving the water that is wasted when users let water flow whilewaiting a few seconds, for cold water in the lines to be cleared. Point-of-use water heaters achieve the same result.

Waterless urinal—Waterless urinal have been installed in some restrooms. They are a now well-proven .

Electronic faucet—For public restrooms, electronic sensors that automatically turn water on and off when hands are present in the sink have improved to a level of reliability worthy of widespread implementation. Such faucets save water over standard faucets .

Direct use of waste water from Kitchens ,and bathrooms for irrigation requirements in Rly area can also save overdrawng of subsurface water and

appended costs. Further efficiency of irrigation water can be improved by adopting other suitable techniques like :

Surface lawn watering is currently by far the most common technique used by Railways. However, irrigation water at field level is by large still used with low efficiency . Improvement of irrigation efficiency at field level is technically possible, including: sprinkler irrigation, drip irrigation and modernized surface irrigation.

Using Low-water plants and xeriscape—Native plants tend to use much less water and tolerate drought better than non-native species, and their use should be encouraged.

Xeriscaping is a suite of techniques for producing pleasing landscapes that require no or very little irrigation to supplement natural precipitation.

Controlling Water wastage due to leakages is one more area which can go long way in reducing the water requirement at source. At present it is seen that this aspect is not getting serious attention for its overall consequences, as the small leakages in any system are very large, but individual is either un concerned or feels that small leakages are not worth diverting his/her attention and money required to get them attended, as these do not immediately cause appreciable damages. In addition there are large leakages/wastages in supply system and through public taps. A check in this area can result in reduction of water requirements. for this using suitable detection system is required to be installed .It is also seen that Railway water supply is not metered though lump sum charges are levied .Charging for metered use can bring in better awareness against reckless consumption in addition to offering due incentives to those decide to save water. As a bye product consumers will be more demanding in getting any leakages attended to at earliest.

Use of quality material proper workmanship and trained manpower can substantially reduce the maintenance efforts required. Availability of adequate devoted manpower with best available tools in working order and use of latest leak proof compounds/materials in lieu of old dated materials and practices can lead to better results. Exposure of field staff to latest techniques tools etc on regular basis can improve their efficiency. The present maintenance system which is complaint based needs to be changed with detection and inspection based in proactive way. Advanced meters and associated devices can detect constant low-level flows that indicate leaks. End-users can then be notified of leaks .