

# Drinking Water Quality Analysis and Impact References to Churu District

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**Abstract** – The work introduced in the proposition manages the measurable investigation of drinking water quality boundaries in the chose drinking water tests of Churu tehsil in Churu locale of Rajasthan, India and planning the convey ability of savoring water the examination region. Such an endeavor would help the water experts in taking choices to ensure the nature of water assets and to execute the appropriate water treatment plan.

Water is our life saver that washes and feeds us. In old societies water spoke to the very quintessence of life and it has assumed an imported function throughout the entire existence of nations, „ folklore, workmanship and in numerous religions the spirit purifies through blessed water. Water is a straightforward, scentless, lackluster liquid which shapes the world's streams, lakes, seas and downpour, and is the significant constituent of the liquids of creatures. At standard surrounding temperature and weight, water is a fluid yet it additionally coincides on earth with its strong (ice) and vaporous state (water fume).

The most seasoned content of the world-Rig-Veda, has portrayed the significance of water. Water is one of the five fundamental components of the body which exists in all the three conditions of issue. The rishis and maha rishis have said "Water is nectar and water is life" and have offered bearings to keep up its immaculateness.

In nature it is found as  $[H_2O + X]$  where X is disintegrated material which is quantifiable and controlled. In the event that X is uncontrolled than it cause infections and water become non consumable. Water is framed by the association of two hydrogen particles with one oxygen iota in an asymmetry covalent holding that offers ascend to an uneven electrical charge and confers a polar trademark to the atom. In fluid state water is made out of sub-atomic gatherings with the HOH particles in each gathering held together by hydrogen holding.

**Watchword** – Compactness, Straightforward, Boundaries, Immaculateness, Consumable, Appropriate, Religion, Constituent.

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## THEORY

For the examination study the accompanying speculation has been planned:

- There is spatial-transient variety in the nature of consumable water.
- There is expanding pressure on water assets because of expanding population. Increasing pressure on water resources adversely affects its quality and at the same time human wellbeing.
- The proportions of water preservation patterns to expand the accessibility of consumable water.

## GOALS OF THE STUDY

The current exploration has been figured the accompanying destinations for the investigation on the nature of savoring water the examination zone:-

- To decide the current status of water assets in Churu locale.
- To decide accessibility of Potable water in the examination region.
- To decide the spatial variety in nature of consumable water.
- To build up connection among populace and accessibility of consumable water.

- To recommend measures for maintainable accessibility of consumable water.

## PRESENTATION

Water utilized for the drinking reason for existing is known as consumable water, which must be sparklingly clear, unscented, neither hard nor excessively delicate and liberated from microscopic organisms and contaminations. Pungent water regularly fizzles in extinguishing the thirst, henceforth should fulfill all the physical and concoction amount rules for human utilization. Water then again used to take care of boilers, for washing and numerous other non-homegrown and modern intentions, is called as non-consumable water. Consumable water has the grouping all things considered and particles in the characterized extend. In this manner, consumable water can't hurt the shopper and is liberated from pathogenic operators and destructive synthetic substances and is wonderful in taste and usable for homegrown purposes. On the off chance that any boundary is in boundless fixation in water than it might cause sickness and such water is known as unclean water and it ought not be utilized for drinking reason. Numerous ailments are brought about by sullied water identified with stomach related framework, respiratory framework, blood dissemination framework and so forth. (Meena, 2011).

Amount of water on earth is almost steady and it continues flowing between sea, environment, and land through a cycle that is called hydrological cycle (Freeze, 1969; Chow, 1964)5-6.

The dispersion water regarding quality and amount fluctuates all around and starting with one geographical arrangement then onto the next (Fetter, 1994) . Freeze and Cherry (1979) noticed that there are at any rate three variables on which groundwater event depend are water powered properties of the topographical arrangements, land system and atmosphere. The event, circulation, development and arrangement of ground waters are unpredictably connected to the structure and nature of the land developments (Freeze and Cherry, 1979)3.

The earths water asset known as a hydrosphere is comprising of seas, ice and snow in the polar and different locales, mountain ice sheets, lakes streams, waterways, swamps, water in surface soils and in underground layers. Despite the fact that the two-third of our planet's surface (70.84%) is canvassed by water as sea and ocean (Maidment, 1993) , since the sea and ocean water is saline in nature (97%), just 2.6% is accessible as new water (Szewzyk et al., 2000)9. Out of this 2.6% about 69% is caught in ice sheets and polar icy masses, 30% is happen as groundwater and 1% is accessible as new water in streams, lakes and lakes appropriate for human utilization (Dugan, 1972)

The work presented in the thesis deals with the statistical analysis of drinking water quality parameters in the selected drinking water samples of Churu tehsil in Churu district of Rajasthan, India and mapping the portability of drinking water in the study area. Such an attempt would help the water authorities in taking decisions to protect the quality of water resources and to execute the suitable water treatment design.

Water is our lifeline that bathes and feeds us. In ancient cultures water represented the very essence of life and it has played an imported role in the history of countries, ,, mythology, art and in many religions the soul cleanses through holy water. Water is a transparent, odorless, colorless fluid which forms the world's streams, lakes, oceans and rain, and is the major constituent of the fluids of organisms. At standard ambient temperature and pressure, water is a liquid but it also co-exists on earth with its solid (ice) and gaseous state (water vapor).

The oldest text of the world-Rig-Veda, has narrated the importance of water. Water is one of the five basic elements of the body which exists in all the three states of matter. The rishis and maha rishis have said "Water is nectar and water is life" and have given directions to maintain its purity.

In nature it is found as  $[H_2O + X]$  where X is dissolved material which is measurable and controlled. If X is uncontrolled than it cause diseases and water become non potable. Water is formed by the union of two hydrogen atoms with one oxygen atom in an asymmetry covalent bonding that gives rise to an unbalanced electrical charge and imparts a polar characteristic to the molecule. In liquid state water is composed of molecular groups with the HOH molecules in each group held together by hydrogen bonding.

## HYPOTHESIS

For the research study the following hypothesis has been formulated:

- There is spatial-temporal variation in the quality of potable water.
- There is increasing pressure on water resources due to increasing population Increasing pressures on water resources adversely affects its quality and simultaneously human health.
- The measures of water conservation trends to increase the availability of potable water.

## OBJECTIVES OF THE STUDY

The present research has been formulated the following objectives for the study on the quality of drinking water in the study area:-

- To determine the present status of water resources in Churu district.
- To determine availability of Potable water in the study area.
- To determine the spatial variation in quality of potable water.
- To establish relationship between population and availability of potable water.
- To suggest measures for sustainable availability of potable water.

## INTRODUCTION

Water used for the drinking purpose is known as potable water, which must be sparklingly clear, odourless, neither hard nor too soft and free from bacteria and impurities. Salty water often fails in quenching the thirst, hence must satisfy all the physical and chemical quantity criteria for human consumption. Water on the other hand used to feed boilers, for washing and many other non-domestic and industrial purposes, is called as non-potable water. Potable water has the concentration of all elements and ions in the defined range. Thus, potable water cannot harm the consumer and is free from pathogenic agents and harmful chemical substances and is pleasant in taste and usable for domestic purposes. If any parameter is in unlimited concentration in water than it may cause disease and such water is known as impure water and it should not be used for drinking purpose. Many diseases are caused by impure water related to digestive system, respiratory system, blood circulation system etc. (Meena, 2011)4.

Quantity of water on earth is nearly constant and it keeps circulating between ocean, atmosphere, and land through a cycle that is called hydrological cycle (Freeze, 1969; Chow, 1964)5-6.

The distribution water in terms of quality and quantity varies from place to place and from one geological formation to another (Fetter, 1994). Freeze & Cherry (1979) noted that there are at least three factors on which groundwater occurrence depend are hydraulic properties of the geological formations, geological framework and climate. The occurrence, distribution, movement and composition of ground waters are intricately linked to the structure and nature of the geological formations (Freeze & Cherry, 1979)3.

The earth's water resource known as a hydrosphere is consisting of oceans, ice and snow in the polar

and other regions, mountain glaciers, lakes streams, rivers, swamps, water in surface soils and in underground strata. Although the two-third of our planet's surface (70.84%) is covered by water in the form of ocean and sea (Maidment, 1993), since the ocean and sea water is saline in nature (97%), only 2.6% is available as fresh water (Szewzyk et al., 2000)9. Out of this 2.6% about 69% is trapped in glaciers and polar icebergs, 30% is occur as groundwater and 1% is available in the form of fresh water in rivers, lakes and ponds suitable for human consumption (Dugan, 1972)

Table: 1, Distribution of water on the earth

| S. No. | Source Quality                | Cubic KM   | Percentage |
|--------|-------------------------------|------------|------------|
| 1      | Plants and animals            | 700        | 0.000049   |
| 2      | Rivers                        | 1700       | 0.0001     |
| 3      | Atmosphere                    | 13000      | 0.0009     |
| 4      | Soils                         | 65000      | 0.0046     |
| 5      | Ponds,Reservoirs and Wetlands | 125000     | 0.008      |
| 6      | Groundwater                   | 7000000    | 0.498      |
| 7      | Ice and Glaciers              | 26000000   | 1.8529     |
| 8      | Ocean                         | 1370000000 | 97.633     |

Source : (Nayak, 1994; Defence lab., 1995)

## IMPORTANCE OF WATER

Water is the Elixir, image of life and a basic special general dissolvable required living creature without it life is unimaginable on this planet. It goes about as a media for synthetic and natural metabolic responses and furthermore goes about as an inside and outer mode for a few life forms. It is the most well-known, fundamental and the most valuable asset on earth that giving extravagances and solace notwithstanding full fill all the essential needs of individual without it neither life nor any improvement is conceivable. Great drinking quality water is of fundamental significance to human physiology and presence of life relies especially upon its accessibility (Lamikanra, 1999; FAO, 1997)19-20. As a wellspring of life for person, plants and different types of life, it can't be supplanted by some other dissolvable. The hunt of life in universe starts with the inquiry of water. Drinking water is certifiably not a solitary compound yet it is a weaken arrangement in which number of synthetics are disintegrated and basic for keeping up a harmony in biochemical responses occurring in all living beings so as to keep up the physiology. It comprises the two-third of human body weight and it is the coordinated arrangement of natural metabolic responses in a fluid arrangement that is basic for the support of life. All the cells and organs works that make up our whole life systems and physiology rely upon water for their working. Indeed, the birthplace and advancement of life on earth is most personally connected with water.

## GROUND WATER

Groundwater part of the world's water cycle that streams underground happens in various topographical developments, Water in the immersed zone is called Groundwater. It takes into account 80% of the all out drinking water necessity and half of the rural prerequisite in country India.

Every year, whatever amount of water got as precipitation from an enormous amount of water drenches and penetrates in to the ground and follows the way of least safe through air pockets among soil and rock particles. Ground water is all the water underneath the water table put away in subsurface void spaces.

It is assessed that around 33% of the total populace use groundwater for drinking. Ground water is revived from downpour water and snowmelt or from water that spills through the base of lakes and waterways (UNEP, 1999).

## GROUND WATER QUALITY

Water quality communicates the reasonableness of water for different uses and cycles and it contains the physical, compound and natural characteristics and the quality can be portrayed as far as fixation and condition of a few or the entirety of the natural or inorganic material present in the water, along with certain physical attributes of the water.

Groundwater in its characteristic state is by and large of good quality since rocks and their subordinates, for example, soils go about as channels. In any case, the normal waters are not unadulterated and contain a few measures of disintegrated gases, solids, and suspended materials (Fetter, 1994).

The nature of groundwater relies upon the sythesis of the energized water, the associations between the water and the dirt, broken down gases, geographical conditions, the living arrangement time and responses that occur inside the spring. Thusly, significant varieties might be found, consequently it is important to screen all perspectives identified with arrangement of reasonable nature of water for different purposes and a unique consideration should be made on recognizing different physical, synthetic, bacteriological and radiological boundaries impacting water quality and for legitimate checking of boundaries it is expected to set up suitable components start to finish level in nation.

The characteristics temperature, shading, smell, taste and electrical conductance decide the physical quality, the vast majority of the ground waters are dry, unscented and without explicit taste. The concoction arrangement is gotten mostly from the disintegration of minerals in the dirt and rocks with which it is or has been in contact. Furthermore, the

compound trademark relies upon cooperation with strong stages, habitation season of groundwater, leakage of dirtied spillover water, blending of groundwater with pockets of saline water and anthropogenic effects (Umar et al., 2006). The sort and degree of substance sullying of the groundwater is generally reliant on the geochemistry of the dirt through which the water streams preceding arriving at the Aquifers (Zuane, 1990).

As water moves through the ground the disintegration of minerals proceeds and the convergence of broke down constituents will in general increment with the length of the stream way. At incredible profundities, where the pace of stream is amazingly moderate, groundwater is saline, with fixations running up to multiple times the saltiness of the ocean. Groundwater can get unpotable on the off chance that it gets dirtied and is not, at this point safe to drink. In zones where the material over the spring is penetrable, contaminations can saturate groundwater.

Groundwater is more mineralized in alluvial springs than in the endured storm cellar springs (Kundell, 2008)<sup>26</sup>. The significance of drinking water quality has been improved over the most recent couple of years by the expanded mindfulness and specialist exposure stood to the contamination of water courses. Around the world, the UN proclaimed an International Drinking water gracefully and Sanitation Decade somewhere in the range of 1981 and 1991 from harmful substances.

## WATER QUALITY PROBLEMS IN RAJASTHAN

The main logical investigation of groundwater in Rajasthan happened in 1921 by G.H. Tipper who examined the water flexibly for the Jodhpur-Bikaner Railways. Rajasthan with a region of 3.42 lakh squares k.m. is the biggest condition of the nation having 10.41 % of the nation's region and 5.5% of country's populaces yet has water assets are only 1% of the nation's assets.

Aravali mountain go partitions the state into two unmistakable geographies for example Eastern and Western Rajasthan. The territory West of Aravali fundamentally shapes part of the Great Thar Desert with normal precipitation of 318.7 mm. This region doesn't deplete in any waterway as whatever precipitation happens it permeates. The Eastern aspect of the State is nearly muggy and precipitation ranges between 400 to 1000 mm (normal 688.7 mm). 2/3rd aspect of the state is an aspect of the Great Thar Desert which is greater than th region of the majority of the states aside from MP, UP, AP and Maharashtra. Out of the complete 142 desert blocks in the nation, 85 blocks are in Rajasthan. Out of 237 water blocks in the state, just 32 squares are in safe class and just 2

bowls (Chambal and Mahi) are enduring out of 15 characterized bowls which further bother the water emergency. The state has outrageous climatic and geological conditions since the vast majority of the piece of state (94%) falls under parched and semi-dry conditions with low and flighty precipitation examples and western part is secured with sand and rises while the eastern, southern and southeastern parts are rough and sloping with not many alluvial fields.

About 95% populace of state is needy upon ground water assets (Varadarajan et al, 2011) , as Rajasthan has restricted pool of surface water because of sparse precipitation averaging 55 cm for every annum. Abundance utilization of ground water for water system and different objects is declining the ground water and changing the characteristic geo science of ground water. As consequence of this common contaminants viz. fluoride, nitrate, arsenic, iron and salts have been expanding in ground water which make it unsuitable for drinking and even posture danger to wellbeing.

As indicated by 1991 review Rajasthan establishes the significant portion of towns having ground water of abundance saltiness and fluoride, out of the 33552 towns experiencing overabundance saltiness, 14415 towns are in Rajasthan which is 42.9% of the all outall-out Indian towns (Mining Department, 2001)94.

The area of Churu, Bharatpur, Barmer, Jhunjhunu, Nagaur, Jalore and Ajmer are the most influenced having enormous number of towns with unnecessary saltiness. High nitrate fixation is likewise a forthcoming issue in Rajasthan. 20659 towns/homes are having nitrates focus in excess of 45 mg/L and 7675 towns/homes are having nitrate in fixation in excess of 100 mg/L.

Nitrate issues in state are generally because of overabundance utilization of manures in development (Choudary et al., 2010)95 and geologic cause, particularly the stone fossils and nitrate stores; and the nitrate fixation in water expanded with all out hardness, calcium and magnesium while diminished with profundity of the water table expanded (Ozha et al., 1993)96.

22% villalges/residences in state are influenced with overabundance nitrate issue. Jaipur, Barmer, Nagaur, Udaipur, Jodhpur, Tonk, Churn and Alwar occupiers are most exceedingly terrible influenced. In 152 towns of Jaipur, Jodhpur, Kota, Baran and Bhilwara regions have hefty metals

focus (sps. Iron) more than 1.0 mg/L. Up until now, arsenic has not been recognized past passable breaking point in any of the towns. Most recent 25 years information produced by CGWB/RGWD uncovered that Nagaur has the most elevated normal EC esteem followed by Barmer, Churu, Pali, Hanumangarh, Ganganagar, Jodhpur, Jaisalmer,

Jalore, Bikaner, Bharatpur and Ajmer. This shows that the groundwater in the majority of these locale is saline.

Consequently significant water quality issues of Rajasthan are identified with saltiness, fluoride, nitrate TDS, hardness and follow metals. These toxins are both anthropogenic and geogenic and lion's share of groundwater quality related issues emerge because of its sullying and over-misuse. Subsequently, the state has water issue of amount and quality both.

Considering major issues of ground water quality in the state as clear from the abovementioned, the executives and sustainance of ground water assets is a basic test in Rajasthan. Numerous pieces of Bhilwara area is likewise influenced with issues of abundance fluoride, nitrate, saltiness, hardness and so on that is the reason it has been chosen for the current examination concentrate with the wide targetsWater is the Elixir, symbol of life and an essential unique universal solvent needed living organism without it life is not possible on this planet. It acts as a media for chemical and biological metabolic reactions and also acts as an internal and external medium for several organisms. It is the most common, vital and the most precious resource on earth that providing luxuries and comfort in addition to full fill all the basic needs of human being without it neither life nor any development is possible. Good drinking quality water is of basic importance to human physiology and existence of life depends very much on its availability (Lamikanra, 1999; FAO, 1997)19-20. As a source of life for human being, plants and other forms of life, it cannot be replaced by any other solvent. The search of life in universe begins with the search of water. Drinking water is not a single compound but it is a very dilute solution in which number of chemicals are dissolved and essential for maintaining an equilibrium in biochemical reactions taking place in all living organisms in order to maintain the physiology. It constitutes the two-third of human body weight and it is the integrated system of biological metabolic reactions in an aqueous solution that is essential for the maintenance of life. All the cells and organs functions that make up our entire anatomy and physiology depend on water for their functioning. In fact, the origin and evolution of life on earth is most intimately linked with water.

## **GROUND WATER**

Groundwater part of the earth's water cycle that flows underground occurs in many different geological formations, Water in the saturated zone is called Groundwater. It caters to 80% of the total drinking water requirement and 50% of the agricultural requirement in rural India.

Annually, whatever quantity of water received as rainfall from a large quantity of water soaks and infiltrates in to the ground and follows the path of least resistant through air pockets between soil and rock particles. Ground water is all the water below the water table stored in subsurface void spaces.

It is estimated that approximately one-third of the world's population use groundwater for drinking. Ground water is recharged from rain water and snowmelt or from water that leaks through the bottom of lakes and rivers (UNEP, 1999).

## GROUND WATER QUALITY

Water quality expresses the suitability of water for various uses and processes and it comprises the physical, chemical and biological qualities and the quality can be described in terms of concentration and state of some or all of the organic or inorganic material present in the water, together with certain physical characteristics of the water.

Groundwater in its natural state is generally of good quality because rocks and their derivatives such as soils act as filters. However, the natural waters are not pure and contain some amounts of dissolved gases, solids, and suspended materials (Fetter, 1994).

The quality of groundwater depends on the composition of the recharged water, the interactions between the water and the soil, dissolved gases, geological conditions, the residence time and reactions that take place within the aquifer. Therefore, considerable variations may be found, hence it is necessary to monitor all aspects related to provision of suitable quality of water for various purposes and a special attention needs to be made on identifying various physical, chemical, bacteriological and radiological parameters influencing water quality and for proper monitoring of parameters it is needed to set up appropriate mechanisms from top to bottom level in country.

The characteristics temperature, colour, odour, taste and electrical conductance determine the physical quality, most of the ground waters are colorless, odorless and without specific taste. The chemical composition is derived mainly from the dissolution of minerals in the soil and rocks with which it is or has been in contact. And the chemical characteristic depends on interaction with solid phases, residence time of groundwater, seepage of polluted runoff water, mixing of groundwater with pockets of saline water and anthropogenic impacts (Umar et al., 2006). The type and extent of chemical contamination of the groundwater is largely dependent on the geochemistry of the soil through which the water flows prior to reaching the Aquifers (Zuane, 1990).

As water flows through the ground the dissolution of minerals continues and the concentration of dissolved constituents tends to increase with the length of the flow path. At great depths, where the rate of flow is extremely slow, groundwater is saline, with concentrations ranging up to ten times the salinity of the sea. Groundwater can become unpotable if it becomes polluted and is no longer safe to drink. In areas where the material above the aquifer is permeable, pollutants can seep into groundwater.

Groundwater is more mineralized in alluvial aquifers than in the weathered basement aquifers (Kundell, 2008)<sup>26</sup>. The importance of drinking water quality has been enhanced in the last few years by the increased awareness and attendant publicity afforded to the pollution of water courses. Globally, the UN declared an International Drinking water supply and Sanitation Decade between 1981 and 1991 from toxic substances.

## WATER QUALITY PROBLEMS IN RAJASTHAN

The first scientific exploration of groundwater in Rajasthan occurred in 1921 by G.H. Tipper who investigated the water supply for the Jodhpur-Bikaner Railways. Rajasthan with an area of 3.42 lakh square k.m. is the largest state of the country having 10.41 % of the country's area and 5.5% of nation's populations but has water resources are just 1% of the country's resources.

Aravali mountain range divides the state into two distinct physiographies i.e. Eastern & Western Rajasthan. The area West of Aravali mainly forms part of the Great Thar Desert with average rainfall of 318.7 mm. This area does not drain in any river as whatever rainfall occurs it percolates. The Eastern part of the State is comparatively humid and rainfall ranges between 400 to 1000 mm (average 688.7 mm). 2/3rd part of the state is a part of the Great Thar Desert which is bigger than the area of most of the states except MP, UP, AP and Maharashtra. Out of the total 142 desert blocks in the country, 85 blocks are in Rajasthan. Out of 237 water blocks in the state, only 32 blocks are in safe category and only 2 basins (Chambal and Mahi) are perennial out of 15 defined basins which further aggravate the water crisis. The state has extreme climatic and geographical conditions since most of the part of state (94%) falls under arid and semi-arid conditions with low and erratic rainfall patterns and western part is covered with sand and dunes while the eastern, southern and southeastern parts are rocky and hilly with very few alluvial plains.

About 95% population of state is dependent upon ground water resources (Varadarajan et al, 2011), as Rajasthan has limited pool of surface water due

to scanty rainfall averaging 55 cm per annum. Excess use of ground water for irrigation and other purposes is declining the ground water and changing the natural geo chemistry of ground water. As result of this natural contaminants viz. fluoride, nitrate, arsenic, iron and salts have been increasing in ground water which make it unfit for drinking and even pose risk to health.

According to 1991 survey Rajasthan constitutes the major share of villages having ground water of excess salinity and fluoride, out of the 33552 villages suffering from excess salinity, 14415 villages are in Rajasthan which is 42.9% of the total Indian villages (Mining Department, 2001)<sup>94</sup>.

The district of Churu, Bharatpur, Barmer, Jhunjhunu, Nagaur, Jalore and Ajmer are the most affected having large number of villages with excessive salinity. High nitrate concentration is also an upcoming issue in Rajasthan. 20659 villages/habitations are having nitrates concentration more than 45 mg/L and 7675 villages/habitations are having nitrate in concentration more than 100 mg/L.

Nitrate problems in state are mostly due to excess use of fertilizers in cultivation (Choudary et al., 2010)<sup>95</sup> and geologic origin, especially the rock fossils and nitrate deposits; and the nitrate concentration in water increased with total hardness, calcium and magnesium whereas decreased with depth of the water table increased (Ozha et al., 1993)<sup>96</sup>.

22% villages/habitations in state are affected with excess nitrate problem. Jaipur, Barmer, Nagaur, Udaipur, Jodhpur, Tonk, Churn and Alwar districts are worst affected. In 152 villages of Jaipur, Jodhpur, Kota, Baran and Bhilwara districts have heavy metals concentration (sps. Iron) more than 1.0 mg/L. So far, arsenic has not been detected beyond permissible limit in any of the villages. Last 25 years data generated by CGWB/RGWD revealed that Nagaur has the highest average EC value followed by Barmer, Churu, Pali, Hanumangarh, Ganganagar, Jodhpur, Jaisalmer, Jalore, Bikaner, Bharatpur and Ajmer. This indicates that the groundwater in most of these districts is saline.

Hence major water quality issues of Rajasthan are related to salinity, fluoride, nitrate TDS, hardness and trace metals. These pollutants are both anthropogenic and geogenic and majority of groundwater quality related problems arise due to its contamination and over-exploitation. Thus, the state has water problem of quantity and quality both.

In view of serious problems of ground water quality in the state as obvious from the the above, management and sustainance of ground water resources is a critical challenge in Rajasthan. Many parts of Bhilwara district is also affected with problems of excess fluoride, nitrate, salinity,

hardness etc. that is why it has been selected for the present research study with the broad objectives.

## **IMPORTANCE OF RESEARCH WORK STUDY**

Quick development of populace, urbanization, decreasing characteristic asset and weakening in natural exercises are flow environmental worry for mankind. Increasing populace and urbanization are principle key elements making pressure ashore, water lodging and so on. This weight has expanded over abuse of common resources especially more genuine when this influence the nature of water.

No definite examination of the water nature of the chose sources as for drinking water contaminants had been attempted before in the Churu region of Rajasthan to investigate the status of ground water quality. The current examination has been attempted with a particular view to give steady records of drinking water tainting for safe future use so it is of incentive as a marker of transient improvement or decay in nature, while actualizing medicinal strategies just as to help clients at public or neighborhood level. At the end of the day, the expanding acknowledgment of the wide geographic spread of the issue has given the inspiration to do this examination at a territorial scale.

For a rustic and in reverse region like Churu, where most of the individuals live beneath the destitution line (BPL), the arrangement of safe drinking water is one of the earlier conditions for generally speaking social turn of events. Sadly, the essential realities in Churu locale are that, the individuals are as yet unconscious of drinking water sullyng and their likely impacts. The administrative endeavors are extremely poor than expected to moderate the emergency. Since water is straightforwardly identified with human wellbeing, a wellbeing danger overview among the individuals of the investigation zone is fundamental. This sort of overview will assist with recognizing the trouble spot and to make natural mindfulness among the average folks about the causes and results of water contamination.

It is trusted that in uniting and investigating the previous experience everything being equal, this examination will add to the improvement of a more vital and operational reaction to the drinking water related issues so purposeful technique can be made at the arranging level to keep the sullyng of drinking water at the base.

## **Physico-synthetic Analysis**

All the examples were investigated for the accompanying Physico-synthetic boundaries; pH, Total Alkalinity (TA), Total Hardness (TH), Calcium hardness (Ca H), Magnesium hardness (Mg H), Chloride, Nitrate, Fluoride, Total Dissolved Solid (TDS) and Electrical Conductivity (EC). The

investigation of water tests were completed in understanding to standard expository techniques. All the synthetic concoctions utilized were of AR evaluation and twofold refined water utilized for readiness of arrangements.

Subtleties of the investigation techniques are summed up boundaries and strategies utilized in the physicochemical of the water tests. Rapid growth of population, urbanization, dwindling natural resource and deterioration in environmental activities are current ecological concern for mankind. Increasing population and urbanization are main key factors creating pressure on land, water housing etc. This pressure has increased over exploitation of natural resources especially more serious when this affect the quality of water.

No detailed analysis of the water quality of the selected sources with respect to drinking water contaminants had been undertaken before in the Churu district of Rajasthan to explore the status of ground water quality. The present research has been undertaken with a specific view to provide unfaltering records of drinking water contamination for safe future use so that it is of value as an indicator of short-term improvement or deterioration in the environment, when implementing remedial policies as well as to help users at national or local level. In other words, the increasing recognition of the wide geographic spread of the problem has provided the motivation to carry out this study at a regional scale.

For a rural and backward district like Churu, where the majority of the people live below the poverty line (BPL), the provision of safe drinking water is one of the prior conditions for overall social development. Unfortunately, the basic facts in Churu district are that, the people are still unaware of drinking water contamination and their probable effects. The governmental efforts are very poor than needed to mitigate the crisis. Since water is directly related to human health, a health hazard survey among the people of the study area is essential. This type of survey will definitely help to identify the problem area and to create environmental awareness among the common people about the causes and consequences of water pollution.

It is hoped that in bringing together and analyzing the past experience of all researches, this study will contribute to the development of a more strategic and operational response to the drinking water related issues so that concerted strategy can be made at the planning level to keep the contamination of drinking water at the minimum.

**Physico-chemical Analysis**

All the samples were analyzed for the following Physico-chemical parameters; pH, Total Alkalinity (TA), Total Hardness (TH), Calcium hardness (Ca H), Magnesium hardness (Mg H), Chloride, Nitrate,

Fluoride, Total Dissolved Solid (TDS) and Electrical Conductivity (EC). The analysis of water samples were carried out in accordance to standard analytical methods. All the chemicals used were of AR grade and double distilled water used for preparation of solutions.

Details of the analysis methods are summarized parameters and methods employed in the physicochemical of the water samples.

| S.No. | Parameters                    | Unit     | Method Employed                 |
|-------|-------------------------------|----------|---------------------------------|
| 1     | pH                            | -        | Digital PH-meter                |
| 2     | Total Alkalinity              | mg/L     | Titrimetric method (With H2SO4) |
| 3     | Total Hardness (as CaCO3)     | mg/L     | Titrimetric method (With EDTA)  |
| 4     | Calcium Hardness (as CaCO3)   | mg/L     | Titrimetric method              |
| 5     | Magnesium Hardness (as CaCO3) | mg/L     | Titrimetric method              |
| 6     | Chloride (as Cl-)             | mg/L     | Titrimetric method (With AgNO3) |
| 7     | Nitrate (as NO3-)             | mg/L     | Spectrophotometric method       |
| 8     | Fluoride (as F-)              | mg/L     | Ion Selective Electrode         |
| 9     | Total Dissolved Solids        | mg/L     | Digital TDS-meter               |
| 10    | Electrical Conductivity       | µmhos/cm | Digital Conductivity- meter     |

Source : Parameters and methods employed by Research

**RESULT AND DISCUSSION**

H1: There is spatial - transient variety in the nature of consumable water in Churu tehsil, Churu locale, Rajasthan

Physico-synthetic boundaries of Drinking Water of Churu Tehsil of Churu District in Rajasthan (2016)

**According to I.S. Specification10500 {Drinking Water}**

**Description Colorless fluid**

| S. No. |                       |                  |                     |           |      |      |
|--------|-----------------------|------------------|---------------------|-----------|------|------|
| 1      | Thalasar              | Fresh Water Pond | Unobjectionable Nil | Agreeable | 24.5 | 37.4 |
| 2      | Asloottation          | Johna            | Unobjectionable Nil | Agreeable | 24.5 | 37.6 |
| 3      | Asalkheri             | Bore Well        | Unobjectionable Nil | Agreeable | 23.9 | 37.5 |
| 4      | Bas Dhakan            | Bore Well        | Unobjectionable Nil | Agreeable | 23.7 | 36.7 |
| 5      | Boontiya              | Hand Pump        | Unobjectionable Nil | Agreeable | 24   | 37.5 |
| 6      | Kotwal Tal            | Hand Pump        | Unobjectionable Nil | Agreeable | 23.9 | 36.8 |
| 7      | Humatpara             | Tube Well        | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 8      | Gajsar                | Tube Well        | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 9      | Kunissar Koi          | /Kundi/Tanka     | Unobjectionable Nil | Agreeable | 24.5 | 37.5 |
| 10     | DhadharKai            | /Kundi/Tanka     | Unobjectionable Nil | Agreeable | 23.9 | 36.8 |
| 11     | Dhameri               | Water Cooler     | Unobjectionable Nil | Agreeable | 24.5 | 37.8 |
| 12     | Satra                 | Water Cooler     | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 13     | Churu (Rural)         | Hand Pump        | Unobjectionable Nil | Agreeable | 23.5 | 37.5 |
| 14     | Churu(M Cl + OG)Govt. | Water supply     | Unobjectionable Nil | Agreeable | 23.5 | 36.9 |
| 15     | IndraprasGovt.        | Water supply     | Unobjectionable Nil | Agreeable | 4.5  | 37.5 |
| 16     | Bhariya               | Hand Pump        | Unobjectionable Nil | Agreeable | 25.9 | 36.8 |
| 17     | sirsali               | Tube Well        | Unobjectionable Nil | Agreeable | 24.5 | 38.8 |
| 18     | Ranasar               | Tube Well        | Unobjectionable Nil | Agreeable | 25.8 | 36.8 |
| 19     | suratpara             | Bore Well        | Unobjectionable Nil | Agreeable | 26.5 | 37.5 |
| 20     | Motisar               | Bore Well        | Unobjectionable Nil | Agreeable | 23.5 | 35.9 |

|     |                       |                  |                     |                     |      |      |
|-----|-----------------------|------------------|---------------------|---------------------|------|------|
| 01. | Thalasar              | Fresh Water Pond | Unobjectionable Nil | Agreeable           | 24.5 | 37.6 |
| 2.  | As loottation         | Johna            | Unobjectionable Nil | Unobjectionable Nil |      |      |
| 3.  | Asalkheri             | Bore Well        | Unobjectionable Nil | Agreeable           | 23.9 | 37.5 |
| 4.  | Bas Dhakan            | Bore Well        | Unobjectionable Nil | Agreeable           | 23.7 | 36.7 |
| 5.  | Boontiya              | Hand Pump        | Unobjectionable Nil | Agreeable           | 24   | 37.5 |
| 6.  | Kotwal Tal            | Hand Pump        | Unobjectionable Nil | Agreeable           | 23.9 | 36.8 |
| 7.  | Humatpara             | Tube Well        | Unobjectionable Nil | Agreeable           | 23.8 | 36.8 |
| 8.  | Gajsar                | Tube Well        | Unobjectionable Nil | Agreeable           | 23.8 | 36.8 |
| 9.  | Kunissar Koi          | /Kundi/Tanka     | Unobjectionable Nil | Agreeable           | 24.5 | 37.5 |
| 10. | DhadharKai            | /Kundi/Tanka     | Unobjectionable Nil | Agreeable           | 23.9 | 36.8 |
| 11. | Dhameri               | Water Cooler     | Unobjectionable Nil | Agreeable           | 24.5 | 37.8 |
| 12. | satra                 | Water Cooler     | Unobjectionable Nil | Agreeable           | 23.8 | 36.8 |
| 13. | Churu (Rural)         | Hand Pump        | Unobjectionable Nil | Agreeable           | 23.5 | 37.5 |
| 14. | Churu(M Cl + OG)Govt. | Water supply     | Unobjectionable Nil | Agreeable           | 23.5 | 36.9 |
| 15. | IndraprasGovt.        | Water supply     | Unobjectionable Nil | Agreeable           | 4.5  | 37.5 |
| 16. | Bhariya               | Hand Pump        | Unobjectionable Nil | Agreeable           | 25.9 | 36.8 |
| 17. | sirsali               | Tube Well        | Unobjectionable Nil | Agreeable           | 24.5 | 38.8 |
| 17. | sirsali               | Tube Well        | Unobjectionable Nil | Agreeable           | 24.5 | 38.8 |
| 18. | Ranasar               | Tube Well        | Unobjectionable Nil | Agreeable           | 25.8 | 36.8 |
| 19. | suratpara             | Bore Well        | Unobjectionable Nil | Agreeable           | 26.5 | 37.5 |
| 20. | Motisar               | Bore Well        | Unobjectionable Nil | Agreeable           | 23.5 | 35.9 |

H1: There is spatial -temporal variation in the quality of potable water in Churu tehsil, Churu district, Rajasthan

Physico-chemical parameters of Drinking Water of Churu Tehsil of Churu District in Rajasthan (2016)

**As per I.S. Specification 10500 {Drinking Water}**

**Description Colorless liquid**

|     |                        |                  |                     |           |      |      |
|-----|------------------------|------------------|---------------------|-----------|------|------|
| 1.  | Thalasar               | Fresh Water Pond | Unobjectionable Nil | Agreeable | 24.5 | 37.4 |
| 2.  | Adrottation            | Johra            | Unobjectionable Nil | Agreeable | 24.5 | 37.6 |
| 3.  | Asalheri               | Bore Well        | Unobjectionable Nil | Agreeable | 23.9 | 37.5 |
| 4.  | Basdhakan              | Bore Well        | Unobjectionable Nil | Agreeable | 23.7 | 36.7 |
| 5.  | Boontya                | Hand Pump        | Unobjectionable Nil | Agreeable | 24   | 37.5 |
| 6.  | KotwadTal              | Hand Pump        | Unobjectionable Nil | Agreeable | 23.9 | 36.8 |
| 7.  | Hunatpura              | Tube Well        | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 8.  | Gajnar                 | Tube Well        | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 9.  | Kansisar Kui           | Kundi/Tanka      | Unobjectionable Nil | Agreeable | 24.5 | 37.5 |
| 10. | DhadharKui             | Kundi/Tanka      | Unobjectionable Nil | Agreeable | 23.9 | 36.8 |
| 11. | Dhameri                | Water Cooler     | Unobjectionable Nil | Agreeable | 24.5 | 37.8 |
| 12. | Satra                  | Water Cooler     | Unobjectionable Nil | Agreeable | 23.8 | 36.8 |
| 13. | Churu (Rural)          | Hand Pump        | Unobjectionable Nil | Agreeable | 23.5 | 37.5 |
| 14. | Churu (M.C.+O.G) Govt. | Water supply     | Unobjectionable Nil | Agreeable | 23.5 | 36.9 |
| 15. | Indrapuragovt.         | Water supply     | Unobjectionable Nil | Agreeable | 4.5  | 37.5 |
| 16. | Ihariya                | Hand Pump        | Unobjectionable Nil | Agreeable | 25.9 | 36.8 |
| 17. | irsali                 | Tube Well        | Unobjectionable Nil | Agreeable | 24.5 | 38.8 |
| 18. | Ranasar                | Tube Well        | Unobjectionable Nil | Agreeable | 25.8 | 36.8 |
| 19. | Sarstpara              | Bore Well        | Unobjectionable Nil | Agreeable | 26.5 | 37.5 |
| 20. | Motesar                | Bore Well        | Unobjectionable Nil | Agreeable | 23.5 | 35.9 |

Source : Primary Data Collected by Research Scholar

Note: Standard parameters used for analysis to test water sample

| S. NO. | Parameters | Is Code         | WHO Standards       |
|--------|------------|-----------------|---------------------|
| 1      | Colours    | 5-25 Hazan Unit | 5-25 on Pt-Co Scale |
| 2      | Odour      | Unobjectionable | Unobjectionable     |
| 3      | Taste      | Agreeable       | Unobjectionable     |

**SUGGESTIONS**

1. The governments should focus on instruction, delivering all the more new water and diminishing the waste!
2. Water desalination by utilizing sustainable power sources (sunlight based vitality can utilized yet may be costly right now and less expensive advancements ought to be created).
3. Appropriate value water strategy ought to be received. Diminish the water squander in ventures and homes by setting a sensible cost on water.
4. Improve water system and horticultural practices. Decrease the water use for cultivating and farming by utilizing present day methods, for example, dribble water system. Customary techniques utilized in certain nations are not productive and there is an excess of waste.
5. Farmers to be instructed against exorbitant utilization of pesticides and concoction composts.
6. Renovation and Upgrading the water flexibly foundation and organizations to decrease water misfortunes from the capacity, transmission, and dissemination framework

7. Educating general society about this significant issue and urging to add to the arrangements of the water shortage issue. Instruct individuals to change

**FINDING**

1. The governments should concentrate on education, producing more fresh water and reducing the waste:
2. Water desalination by using renewable energy sources (solar energy can used but might be expensive at the moment and cheaper technologies should be developed).
3. Appropriate price water policy should be adopted. Reduce the water waste in industries and homes by setting a realistic price on water.
4. Improve irrigation and agricultural practices. Reduce the water use for farming and agriculture by using modern techniques such as drip irrigation. Traditional methods used in some countries are not efficient and there is too much waste.
5. Farmers to be educated against excessive use of pesticides and chemical fertilizers.
6. Renovation and Upgrading the water supply infrastructure and networks to reduce water losses from the storage, transmission, and distribution system
7. Educating the public about this important issue and encouraging to contribute to the solutions of the water scarcity problem. Educate people to change

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