How to solve water problem of Nagaur ? Interlinking of Rivers and reviving traditional water sources

 can solve the water problem in Rajasthan

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# Abstract

*Nagaur is located in the center of Rajasthan (INDIA) between 27 0 25’& 27 0 40 ‘ N Latitude and 73*

*0 10 ‘ &75 0.15’ E Longitude covering a geographical area of about 17,718 sq k m . it has Bikaner in*

*west Churu in North , Sikar north west Jaipur East Ajmer south east Pali in south and*

*jodhpur in southwest.One can live without Love ,One can live without Oil But cannot live*

*without water. Flora of Nagaur is endemic to A****rid*** *and are specially adapted to survive in the*

*dry waterless region of the state. Nagaur is Flouride affected district ( Flouride is high in*

*underground water).10 Tehsils and 1610 villages are there in Nagaur. Average rainfall is 36.16*

*cm. Euphorbia caducipholia ,Echinops echinatus , Vachellia nilotica ,Dalbergia sisso, Tachomella*

*undulate ,Ficus religiosa, Calotropis procera , Catharanthus roseus ,*

*Argemone maxicanum are principal plants . Floral*

*and Faunal diversity are dependant on availability of water and low temperature. Water*

*problem is the is great problem of Nagaur . Due to Scarcity of Rains . Giving subcanals from*

*Indira Gandhi Canal towards east & Subcanals from Banas towards west can solve water*

*problem of arid Rajasthan .*

 *Interlinking of Rivers like Indira Gandhi canal and Luni River and Banas River and revival of*

*traditional water sources can solve the water scarcity problem of Rajasthan.*

***Key words*** *: Interlinking rivers ,Nagaur , Rajasthan .*

## Introduction

*Nagaur is located in the center of Rajasthan (INDIA) between 27 0 25’& 27 0 40 ‘ N Latitude and 73*

*0 10 ‘ &75 0.15’ E Longitude covering a geographical area of about 17,718 sq k m . it has Bikaner in*

*west Churu in North , Sikar north west Jaipur East Ajmer south east Pali in south and*

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*in the dry waterless region of the state. Nagaur is Flouride affected district ( Flouride is high in*

*underground water).Average rainfall is 36.16 cm.43 % households in rural areas use*

*handpumps borewells ,as main sourse of fresh water & drinking water . 41 % houses in*

*Urban areas use borewel ls water as main source of fresh water & drinking water .*

*condition becomes difficult in Summers. About 59 % houses in rural & 81 % houses in*

*urban areas has fresh water & drinking water facilities .Handpumps are main source of*

*fresh / drinking water in villeges or rural areas. Survey shows .(Neetu c. Sharma Nov. 2019).*

*Sikar , Churu Jodhpur ,Nagaur ,Jaipur Bhilwara , Udaipur , Ganganagar are Flouride rich water*

*Districts .(Dev Ankur Wadhwan June 2019).High quantity Fluoride gives diseases as Stone*

*,Fluorosis and Constipation . Underground Saraswati River is flowing in West Rajasthan (Union Jal*

*Shakti Minister Gajendra Singh Shekhawat .(TOI 10 Feb . 2020).* The water table vary 4-30 mbgl.  Interlinking of rivers can solve water Scarcity problem of Rajasthan .

The concentration of CO2 has increased from about 310 parts per million to more than 410 ppm since 1958. It is now increasing at a rate of more than 2 parts per million per year.

More than half (1/5) Earth is covered by desert. Some microbes are thermophilic . some microbes adapt to survive below sandstone rock in microbiotic environment. Annual rainfall in deserts is below 50 cm. Proteobacteria ,acidobacteria &

Actinobacteria rubrobactor (Actinobacteria ) is present in dry soil (Australia ). Hypolith & cyanobacteria grow underside of rock.

Nagaur has drinking water supply from Indira Gandhi canal ( IGC ) with the help of Japan

International Corporation Agency ( JIAC) , during summers because demand of water increases

, A branch of IGC should be given to Nagaur. Due to Scarcity of Rains .

In 2016 19 out of 33 districts in Rajasthan were drought affected. 17000 out of 44672

villages having severe water crisis .(The Hindu April 2016). Even Ajmer also get water supply

in 7 days sometimes. Har Ghar Nal Pariyojna has also started in Rajasthan.

Interlinking of Rivers like Indira Gandhi canal and Revival of Luni River and interlinking I G C &

of Banas River can solve the water scarcity problem of Rajasthan.

Rajasthan has 5 Rivers and one Indira Gandhi Canal , Five rivers of Rajasthan are Banganga,

Banas, Ghaggar, Luni, Chambal, Mahi.

Interlinking of these Rivers can solve the problem of Drought and flood both.

The interlinking of rivers is major venture to create additional storage facilities and transfer

surplus water to drought areas. This is an integrated approach becomes necessary when

dealing with water resource. This was issued in 1926 by Sir C.P. Ramaswamy , Aivarand ,

K.L. Rao and Capt. Dastur in 1970 and 1980 respectively.

Benefits of interlinking rivers are in irrigation, flood prevention, hydropower generation,

and navigation. *Floral and Faunal diversity are dependant on availability of water and low*

*temperature.*

*Floral and Faunal diversity are dependant on availability of water and low temperature.* This

 paper highlights interlinking of rivers, ecological and economic benefits,

Leading to sustainable development.

## Status of water resources.

Due to spatial disparity in the rainfall in Rajasthan some regions become water

Surfeit due to inundation and other regions become water meager due to drought .

Catenating of tributeries and Mass plantion trees bring enduring solution to

negative impact of drought and deluge. It brings transfer of water from water surfeit

 region to water scarce regions.

 Due to rapid growth of inhabitants & Urban areas ,rapid house building , and increase in

demand of fresh water .

Precipitation in Rajasthan is below 100 mm. and in Meghalaya it is above 11000mm.

Due to global warming and climate change , rainfall pattern will change, more rains in

wet areas and drought in dry areas. This will also affect water resources, & Biodiversity loss.

By 2020 the world population will increase to 7.9 billion, water constitutes more than ¾

Part of the land so earth is also known as blue planet. Of the total water 99 % is not

utilizable 97.2% ocean water, 2.15% in the form of glacier, 0.3% is underground water, so very

few portion as exterior water is available for use. So proper planning is essential for

utilization of limited surface water.

## Methods

Map of Rajasthan was studied with special references to rivers of Rajasthan and how they

can be interlinked.

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| River Map of Rajasthan |
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| Image 1. River Map of Rajasthan |

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|   |   |  http://2.bp.blogspot.com/-vugVWzWvGdE/UUiXDtnnzTI/AAAAAAAAXWk/5goD68mnKXU/s1600/Rajasthan_Rivers_Wildlife_Map.jpg |
|   |   |

Image 2 Map : Rivers of Rajasthan



**Image 3 : Jojari River Jodhpur Rajasthan**



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## Image 4 Major Rivers of Rajasthan.

ERCP Raj has planned ERCP ( Eastern Rajasthan Canal Project ) 37,500 Cr . Raj has 15 River basins .Chambal

& Mahi basin has surplus water.

During Rainy season Kunnu ,Kul ,Parbati ,Kalisindh ,Mez ,Chakan , Sub Basin has surplus water , Banas ,Banganga ,Gambirhi ,Parbati has deficit water or Scarcity of water for drinking & Irrigation , ERCP is planned to harvest & transfer surplus water to water deficit S. Rajasthan.

## ****What is the Eastern Rajasthan Canal Project (ERCP)?****

The Eastern Rajasthan Canal Project aims to harvest surplus water available during the rainy season in rivers in southern Rajasthan such as Chambal and its tributaries including Kunnu, Parvati, Kalisindh and use this water in south-eastern districts of the state where there is a scarcity of water for drinking and irrigation.

According to the state Water Resources Department, Rajasthan, the largest state of India with a geographical area of 342.52 lakh hectares which amount to 10.4 per cent of the entire country, holds only 1.16 per cent of India’s surface water and 1.72 per cent of groundwater.

Among the state’s water bodies, only the Chambal river basin has surplus water but this water cannot be tapped directly because the area around the Kota barrage is designated as a crocodile sanctuary.

Through the help of diversion structures, intra-basin water transfers, linking channels and construction of pumping main feeder channels, the ERCP aims to create a network of water channels which will cover 23.67 per cent area of Rajasthan along with 41.13 per cent population of the state.

**When was the project announced?**

In the budget of 2017-18, the then Vasundhara Raje-led BJP government in Rajasthan had said that the ERCP will help fulfil the long-term irrigation and drinking water needs of 13 districts-Jhalawar, Baran, Kota, Bundi, Sawai Madhopur, Ajmer, Tonk, Jaipur, Karauli, Alwar, Bharatpur, Dausa and Dholpur. Subsequently, the project was approved by the Central Water Commission in 2017. In her 2017-18 budget speech, Raje had also said that the state government had sent a proposal to the central government to declare ERCP as a project having national importance. Since then, this has remained a consistent demand of subsequent governments in Rajasthan across party lines.

**What will be the benefits estimated in the project?**

According to the Rajasthan Water Resources Department, ERCP is estimated to create an additional command area of 2 lakh hectares and an area of 4.31 lakh hectare will get irrigation facilities because of this project. The ERCP also intends to improve the groundwater table in rural areas of the state, positively influencing the socio-economic conditions of people from these areas. It also adds special emphasis on the Delhi Mumbai Industrial Corridor (DMIC), hoping that sustainable water sources will enhance and help industries grow in these areas resulting in investment and revenue. There are multiple sub-projects under the ERCP with budgets allocated for each phase.

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## ****What is the present demand by the Ashok Gehlot government?****

Ever since the Congress government came into power in December 2018, Rajasthan Chief Minister Ashok Gehlot has repeatedly urged Prime Minister [Narendra Modi](https://indianexpress.com/about/narendra-modi/) to declare the ERCP as a national project. Gehlot has written letters in this regard to Modi and also highlighted this during the Prime Minister’s interaction with Chief Ministers in NITI Aayog meetings.

Gehlot has also said that Prime Minister Modi had said that the project will be declared as a national project during his earlier visits to Rajasthan.

The reason cited by the Chief Minister for wanting the ERCP to be a national project is that its estimated cost is around Rs 40,000 crore, which, he said, it is not possible to be borne by the state government. Gehlot has argued that the central government should provide assistance in the interest of the welfare of the state.

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**What is the present status of the project?**

According to officials from the state water resources department, the work on a project under the ERCP in Kota district has started, the value of which is just a small fraction of the total cost of the project.

“Work on ERCP has been started in Kota district. This bit of the project is worth around Rs 600-650 crore. At present, the state is bearing all the costs. The state wants the Centre to declare this as a national project so that the cost-sharing ratio between the Centre and the state becomes 90:10, with the central government bearing 90 per cent of the cost,” said Ravi Solanki, Chief Engineer, Rajasthan Water Resources Planning Department.

He added that water from Chambal and its tributaries will be used under the project.

“The project will use canals, tunnels and pipes to meet the water requirement of the 13 districts. Once the ERCP is completed, water from the Chambal river and its tributaries can be harvested and stored in dams for 100 days every year. This water can be used throughout the year. The project is estimated to utilise 3,500 million cubic meter (MCM), which is the overall requirement of these 13 districts,” said Solanki.

He added that the project estimated the duration of the project completion in 10 years.

The project was initially proposed to be completed in three phases between 2017 and 2023.

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**Image 5 : Indira Gandhi Canal**

## PREREQUISIT TO CONSERVE FRESH WATER

## Agriculture

More than 90% of fresh water is used for irrigation to produce plenteous amount of food.

## Drinking Water

The total population of Nagaur is 1,10,800 (2011) persons. The human body contains more

than 71 % of water for proper functioning of body more than 7 liters of water is required

per day. Nagaur has drinking water supply from Indira Gandhi canal ( IGC ) with the help

of Japan International Corporation Agency ( JIAC) , during summers because demand of water

increases , A branch of IGC should be given to Nagaur.

## Washing

Water is also used for washing vegetables, fruits, clothes etc. Because it forms emulsions and

solutions. Water is also used in industrial process . Chemicals dissolve in water.

For hygene also water is used.

Transportation

Transportation of material through rivers and oceans (Shipping).

*Chemical use (Dying etc.)*

Water is also used in chemical reactions as solvent.

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|   |   | Heat ExchangeWater is also used as heat exchange fluid due to its high heat capacity. Water is also used as Neutron moderator.Fire ExtinctionWater is used for fire annihilation. Water is inert and it has high heat of vaporization.RecreationHumans use water for dalliance like swimming, sports, boating, surfing, diving , ice staking water parks etc. water is also used in fountains. Aquarium also use water. Power generationWater is also used in power generation. Electricity is produced from hydropower.Industrial ApplicationsWater is also used in Industries. Hydroelectricity is obtained from hydropower. Water is also used in industrial processes and also as chemical solvent. But discharge untreated water from industries  cause pollution. Purification techniques should be used to purify polluted water.  |

## Food Processing

Water is also used in cooking food, Food hydrolysis. Boiling, steaming, simmering.

Water is also used as dishwashing. So we should safeguard water as much as possible to

meet our future needs.

The advantage of interlinking rivers is excess flood water is redirected to basins having

meager rainfall.

This has twofold advantage it protect flood prone areasfrom large amount of water and

supplies drought prone areas with a source of water NWDA planned interlinking of rivers

under late PM Indira Gandhi (1982).

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## SUCCESS OF INTERLINKING RIVER PROJECTS

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|   | There are many benefits of interlinking rivers like solving drought and flood problems, water available for irrigation, water is available for drinking, hydropower, more navigation, employment generation.Successful Interlinking river projects are:Indira Gandhi Canal Embarked in 1958. It utilizes 9,367 Mm3/yr of total 10,608 Mm3 /yr assigned to Rajasthan from surplus water of Ravi and Beas rivers.The project is devided into two stages:Stage I - 204 Km long feeder canal discharge capacity of 460 m3/sec. start from Harike Barrage. 170 Km feeder canal lie in Punjab and Haryana and 34 Km in Rajasthan.RSEB to install a total 12.76 MW of mini hydroelectric power stations to utilize available waterfall in canal one such powerstation started in Suratgarh branch.  |

Stage II 256 Km long main canal and 5,606 Km lined distribution system. Utilising 4,930 Mm3

/yr water. The canal in entire length completed in 1986.

### Colorado Big Thomson USA

## Vindication of ILR

The interlinking is about linking surplus water rivers to water deficient rivers.

So that rivers that have large amount water can be transported to water scarce regions.

For example from Kashmir to Rajasthan.

This will help inundation, commercial use, industries, drinking purpose, washing , cleaning

to generate hydroelectricity etc.

## Rainfall

 Rajasthan is western state of India and climate is arid or semiarid.

Temperature is extreme in summer temperature reaches above 45-48 0 C. and in winters sometimes below 10 0 C.

 Rajasthan has hot desert. Receives low rainfall.

Annual average rainfall is 14- 300 cm. Summer is longest season.

Water availability is low. Strong dusty wind in summer known as loo.

In winter weather is pleasant. Water is scarce in Rajasthan and waisted as flood in

northern and eastern states. So interlinking of rivers can help.

## Storage Capacity

Rajasthan is not having storage formulations resulting in dearth of water. USA has per

capita storage capacity 5961m 3 per person and India 200m3 per person.

Rajasthan is scarce in water so increasing storage capacity will be beneficial.

## Food production

Food production will be improved if good amount of water is present for irrigation.

Grain demand for India by 2050 is 425 million tons. Rajasthan irrigation potential should also

be increased to increase grain production.

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|   |   | Improving Rural as well as urban lifeMore than 70 % Indias population lives in villages. And most population depend for livelihood on agriculture. If water resources are proper and manageable ther will be good grain production and improve the life of rural population.Hydropower 34000 will be generated. These will create employment also.But there are also adverse impacts of Inter l inkingL River . Danger of seismic hazard in Himalayas due to ILR transfer of river  pollution will also be there.  |
|  | Traditional water harvesting systems**Jhalara :** This is traditional water harvesting system present in Thar desert.**Talab :** Talab is a large pond used to harvest water**.** Stockpile to store water.Pokhariyan is natural talab and Tikamgarh in Bundelkhand .**Talai :** Small pond used to harvest rainwater**.****Bandhi :** Old Rain water harvesting system.**Sagar :. C**onserve water .**Bawari** : Stepwells to store water in Rajasthan.**Samand :** Ponds are made to conserve water.**Jhalaras :**  Rajasthan specially in Jodhpur 8 Jhalaras are there to conserve water . Mahamandir jhal is oldest one.**Tanka :** Cylindrical underground well to store rainwater ( For 7 persons in summers ) in  Jaisalmer. Made artificially**Ahar Pynes** : Artificial water channels ( to irrigate rice fields ) from falgu river in South Bihar.**Johads** : Small fictile dams to store rain water. Makad in Karnataka. Pemghara in Odhisa.**Panam keni :** Wodden cylindrical structures are made to store water by Kuruma tribe in  Wayanad .**Khadin dhana** : Long earth bank to slope land is gravel. Used by Paliwal Brahmins to store water in Jaisalmer.**Kund :** Bowl shaped area to store water used in Gujarat. First madeby Raja Sur Singh**.****(1607).****Baoli**  **:** Stepwells to store water in Rajasthan Made for Philanthropic reason.**Nadi : In** Jodhpur , used to conserve water, Large water storage capacity**.** **Bhandara** : In Maharashtra it is phad community based irrigation system, canals build to carry water to fields**.****Zings** : Ladakh small tanks Zings collect melting snow from mountains. Which is channeled to farm.**Kuhls :** In Kangra ( Himachal Pradesh ) water harvested through Khuls.**Zabo ( Ruza ) :** Hilly areas rainwater collected in puddles . It is used for agriculture.**Bamboo drip irrigation** : Asam , Meghalaya , Manipur , Mizorum , Nagaland , Tripura , Sikkim and Arunachal Pradesh water is passaged from strings using bamboo pipes to fields ( Khasi and  Jaintia and Khasi hills black pepper fields.**Ramtek network :** Maharashtra , Malguzars ( Landowners ) chain of tanks connect ground and  surface water. This conserve 80 % rainwater.**Jackwells : In** Nicobar pits or Jackwells made to conserve water surrounded by woods and logs.**Pat system :** Madhya Pradesh ( Bhitada, Jhabua and villages ) , Bunds are made near stream ,lined with leaves. These passaged in diches .**Eri (Tank).** Water harvesting system used in Kerala**.** Tamilnadu , Karnataka (Kares ) , Andhra Pradesh ( Cheruvus ) , Asam ( Dongs ) Rainwater harvesting percolation skills.Rainwater harvestingTo stop extra water flow into river or sewage systems. Rainwater harvesting is important. Ground water and surface water are different . There are different techniques for irrigation .2018 - 2028 is declared water conservation decade .DesalinationRemoval of salt from hard water is another solution for the problem but hard water is  also not available in Ajmer. Desert is spreading rapidly due to cutting of Aravallis and mining activities. Desert is spreading.Cloud seedingIntentional rains and weather changing . amount and type of precipitation change.Orice nuclei cloud condensation. This is done to increase precipitation.Criteria for Interlinking riversSurplus water should be there in donor rivers. So Canal like Indira Gandhi Canal should be developed and interlinked to solve water problem of Nagaur ,Ajmer ,Bikaner ,Jodhpur ,Jaisalmer ,Barmer, Rajasthan. Green Buildings ( G B ) Water conservation in Green Buildings 1. Green Buildings are self sufficient in water .2. Drinking water quality is best in Green Buildings .3. Water retention Green Buildings imitate water retention .4. In Green Building air cooled & humidity increase evaporation of water .Large number of plants are there in GB .5 . GB has 70 % less potable water consumption .6 . 70 % water requirement is from rain water harvesting . Hand wash basin , sink shower head & flush has lowest or low water flow rate to conserve water.Water conservation 1.1 Introduction Clean water is becoming an increasingly scarce commodity. Green buildings aim to develop systems to minimise the consumption and pollution of this resource. Careful design is used to develop rainwater harvesting, plumbing and ecological sanitation systems that enable buildings to be self reliant for their water needs and avoid polluting water. This reduces the requirement for large-scale water and sanitation infrastructure that consumes energy and can be highly wasteful.  This chapter describes water systems used in green buildings and sets out some objectives that could be aimed for. It also outlines some calculations that can be used to design water systems in green buildings. Finally, aspects of green building water systems are described, so that designers can select, and work with, the most appropriate of these to develop high performance sustainable water systems in buildings. 1.2 Water in green buildings Water systems in green buildings are different in a number of ways from conventional buildings. A number of these characteristics are described below. • Self sufficiency: Green buildings aim to meet all, or most of their water needs from rainwater harvesting. • Water quality: The quality of water is matched with use. For instance, the best quality water may be used for drinking and cooking and poorer quality water, such as grey water, used for flushing toilets and irrigation. • Onsite retention: In natural environments vegetation and soil absorb and retain a large proportion of rain water that falls on to it. Green buildings aim to emulate this by ensuring that buildings and sites absorb and retain rain water on site and avoid generating large quantities of run off. • Evaporation and transpiration: Air can be cooled and the humidity increased through evaporation of water and transpiration from plants. This may be used in green buildings to improve comfort levels without the use of mechanical systems. 1.3 Key performance objectives Some performance objectives for green building water systems are provide below.  Aspect Performance Objective Achieved? Potable water consumption Buildings consume 50% less mains potable water compared to conventional buildings. Rainwater harvesting Buildings meet at least 40% of its water requirements from rainwater harvesting Hand basin taps Hand wash basin taps specified have flow rates lower than 6L/minute Showerheads Showerheads specified have flow rates lower than Green Building Handbook for South Africa Chapter: Water Conservation Dr. Jeremy Gibberd CSIR Built Environment  1 Water conservation 1.1 Introduction Clean water is becoming an increasingly scarce commodity. Green buildings aim to develop systems to minimise the consumption and pollution of this resource. Careful design is used to develop rainwater harvesting, plumbing and ecological sanitation systems that enable buildings to be self reliant for their water needs and avoid polluting water. This reduces the requirement for large-scale water and sanitation infrastructure that consumes energy and can be highly wasteful.  This chapter describes water systems used in green buildings and sets out some objectives that could be aimed for. 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Green Building Handbook for South Africa

Chapter: Water Conservation

Dr. Jeremy Gibberd

CSIR Built Environment

1 Water conservation

1.1 Introduction

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develop systems to minimise the consumption and pollution of this resource. Careful

design is used to develop rainwater harvesting, plumbing and ecological sanitation

systems that enable buildings to be self reliant for their water needs and avoid

polluting water. This reduces the requirement for large-scale water and sanitation

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This chapter describes water systems used in green buildings and sets out some

objectives that could be aimed for. It also outlines some calculations that can be used

to design water systems in green buildings. Finally, aspects of green building water

systems are described, so that designers can select, and work with, the most

appropriate of these to develop high performance sustainable water systems in

buildings.

1.2 Water in green buildings

Water systems in green buildings are different in a number of ways from conventional

buildings. A number of these characteristics are described below.

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Self sufficiency: Green buildings aim to meet all, or most of their water

needs from rainwater harvesting.

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Water quality: The quality of water is matched with use. For instance, the

best quality water may be used for drinking and cooking and poorer quality

water, such as grey water, used for flushing toilets and irrigation.

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Onsite retention: In natural environments vegetation and soil absorb and

retain a large proportion of rain water that falls on to it. Green buildings aim to

emulate this by ensuring that buildings and sites absorb and retain rain water

on site and avoid generating large quantities of run off.

•

Evaporation and transpiration: Air can be cooled and the humidity

increased through evaporation of water and transpiration from plants. This

may be used in green buildings to improve comfort levels without the use of

mechanical systems.

1.3 Key performance objectives

Some performance objectives for green building water systems are provide below.

Aspect Performance Objective Achieved?

Potable water

consumption Buildings consume 50% less mains potable water

compared to conventional buildings.

Rainwater

harvesting Buildings meet at least 40% of its water requirements

from rainwater harvesting

Hand basin

taps Hand wash basin taps specified have flow rates lower

than 6L/minute

Showerheads

Showerheads specified have flow rates lower than