UWR Rainwater Offset Unit Standard

(UWR RoU Standard)

Concept & Design: Universal Water Registry

www.uwaterregistry.io

Project Concept Note & Monitoring Report

(PCNMR)

Project Name: Piplantri Neer Sanchay Project

UWR RoU Scope: RoU Scope 1

Monitoring Period: 01/01/2014 - 31/12/2025

Crediting Period: 2014-2034

UNDP Human Development Indicator: 0.644 (India)

A.1 Location of Project Activity

State	Rajasthan
District	Rajsamand
Block Basin/Sub Basin/Watershed	Rajsamand / Banas River system[1]
Lat. & Longitude	25°06'24.6"N, 73°46'58.0"E to 25°07'48.8"N, 73°47'20.1"E
Area Extent	1,202.35 Ha
No. of Villages/Towns	1 Villages

The Piplantri Neer Sanchay Project is located in Piplantri Kalan Village, Rajsamand District, Rajasthan, under Rajsamand Panchayat Samiti and Rajsamand Tehsil. The project is situated within the Banas River system and covers approximately 1,202.35 hectares. The project activities and their associated contributing catchments are located within Piplantri Gram Panchayat. The geographical extent of the project area is defined by the following coordinates:

Geo-Coordinate	From	To
LATITUDE	25.106822 N	25.130208 N
LONGITUDE	73.782788 E	73.788907 E

[1] http://cgwb.gov.in/watershed/basinsindia.html

A.2. Project owner information, key roles and responsibilities

Piplantri Gram Panchayat is the Project Owner and Terrablu Climate Technologies Pvt. Ltd. is the Project Proponent/Seller and Claim Right Holder of the Piplantri Neer Sanchay Project and shall have overall responsibility for the management, coordination, implementation, monitoring, documentation and reporting of the project activity under the UWR RoU Program. The Project Owner shall ensure clear accountability and reporting for all activities undertaken within the defined project boundary.

Terrablu Climate Technologies Pvt. Ltd. confirms that it owns the water user rights for the area within the project boundary and holds an uncontested legal land title for the project area within the project boundary. The Project Owner shall obtain and maintain all necessary permits, approvals and authorizations required for implementation of the project activity, or has applied for the same, as applicable. The Project Owner shall also maintain and provide complete details of the costs associated with the implementation of the project activity, together with relevant supporting records and documentation.

The Project Owner shall be responsible for ensuring that the project activities are implemented and monitored in accordance with the applicable UWR requirements and shall maintain the necessary project, monitoring and supporting records for quantification and independent verification of the claimed RoUs.

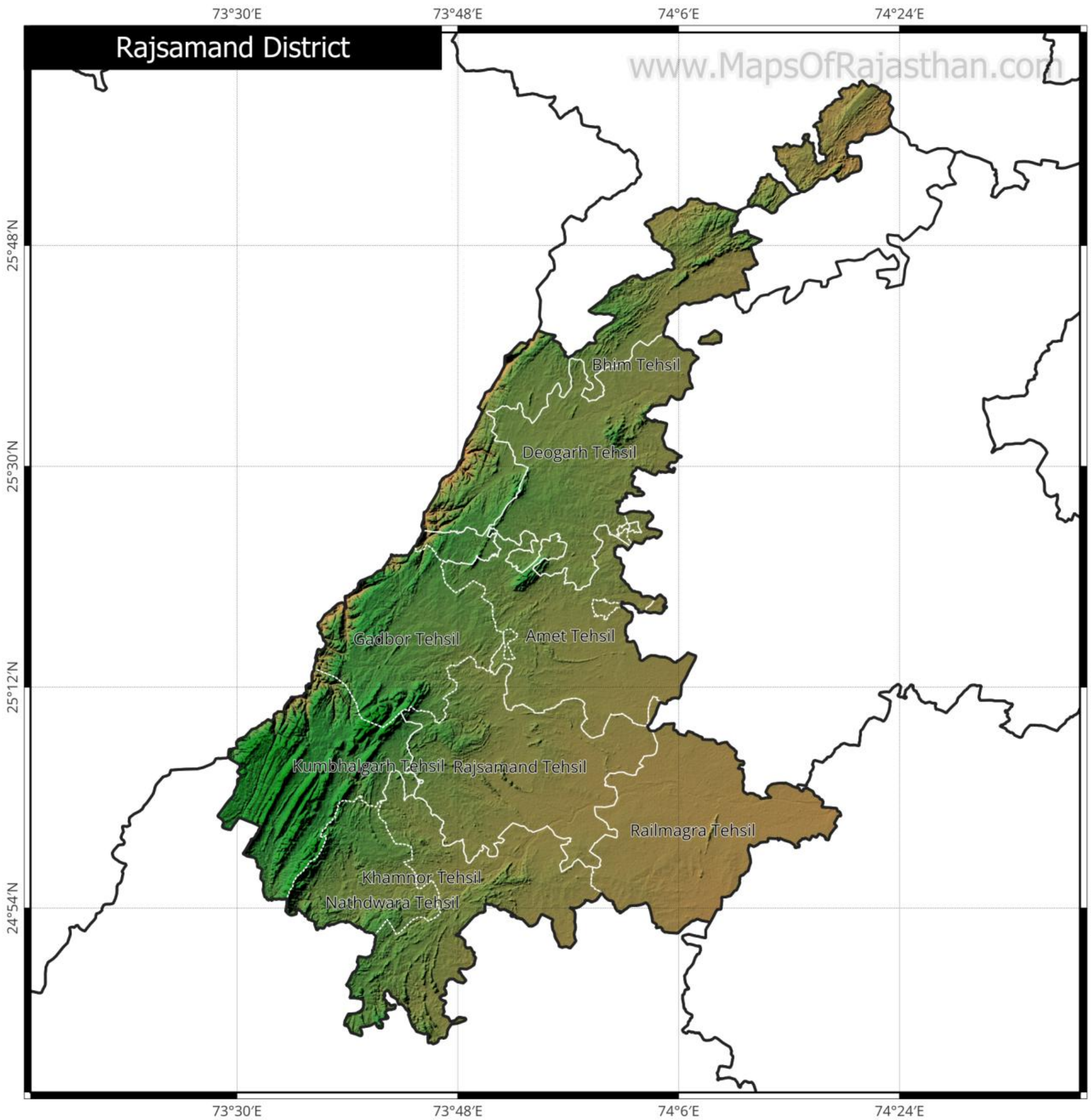
A.2.1 Project RoU Scope

PROJECT NAME	Piplantri Neer Sanchay Project
UWR Scope:	RoU Scope 1 – Measures which enhance the sustainable yield in areas where over-development has depleted the aquifer
Date PCNMR Prepared	10/09/2026

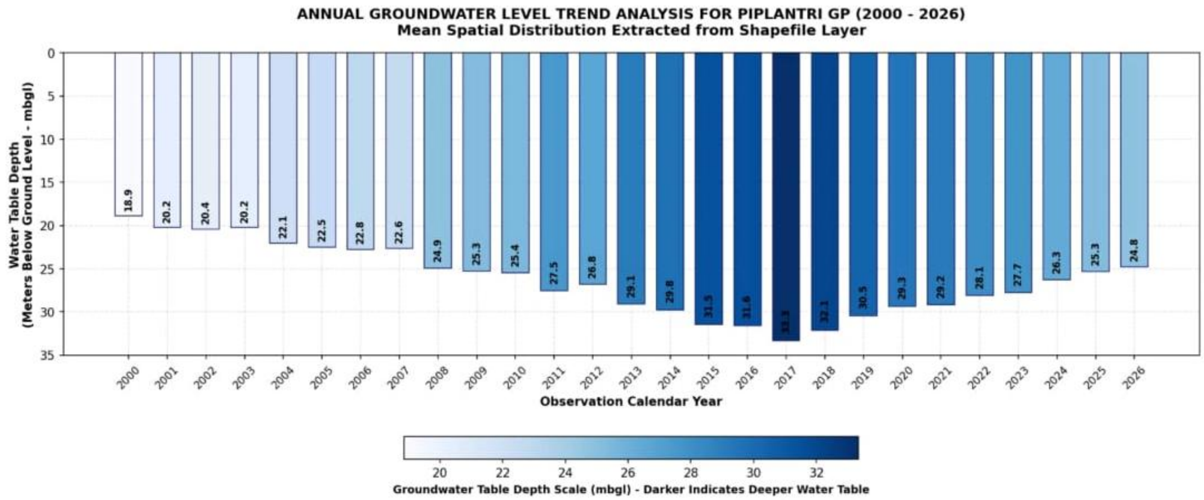
A.3. Land use and Drainage Pattern

The project area is situated in Piplantri Kalan Village, Rajsamand District, Rajasthan. The surrounding landscape is characterized by a combination of agricultural land, fallow and non-agricultural areas, natural vegetation and rural settlements. The land-use pattern is strongly influenced by the local terrain, soil characteristics, availability of water and agricultural practices.

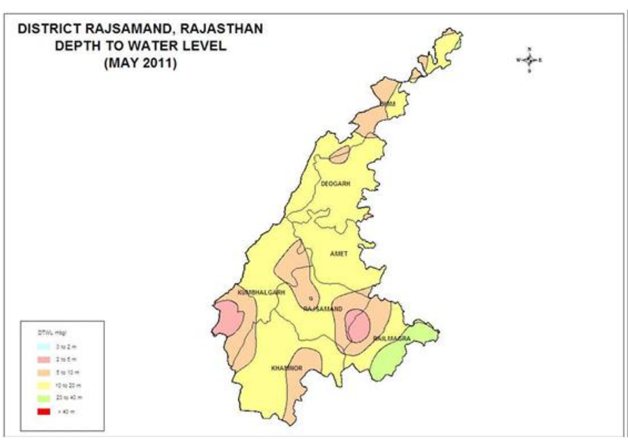
At the district level, approximately 145,629 hectares were classified as cultivable land, while the actual cultivated area was approximately 94,697 hectares during 2010–11. Forest area was approximately 25,952 hectares, fallow land approximately 100,285 hectares and non-agricultural land approximately 183,276 hectares. The district therefore represents a mixed rural landscape in which agricultural and non-agricultural land occur together with areas of natural and semi-natural vegetation.

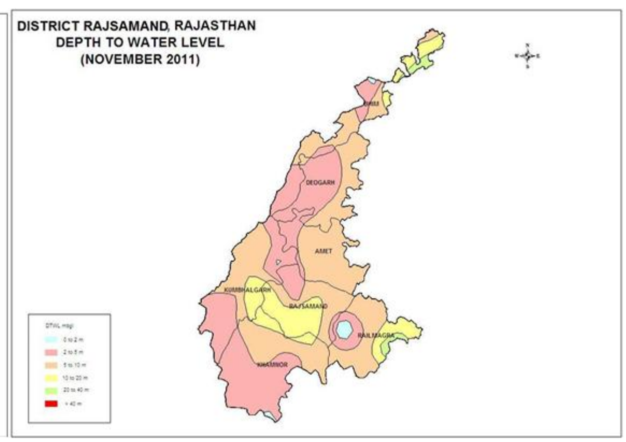


Agricultural activities within the region are substantially dependent on groundwater. Wells constitute the principal source of irrigation, including dug wells, dug-cum-bored wells and tube wells. During 2010–11, approximately 44,053 hectares of net irrigated area and 49,068 hectares of gross irrigated area were reported across the district from different irrigation sources, with the majority of the irrigated area being supplied through wells. This dependence on groundwater makes the conservation of monsoon runoff and enhancement of local groundwater recharge, particularly relevant to maintaining water availability for agricultural and domestic requirements.



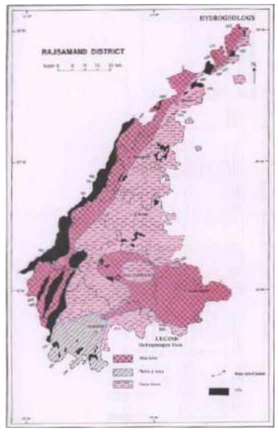
The terrain of the region is characterised by rolling landforms intersected by shallow valleys. The western portion of the district is influenced by the Aravalli hill system, with ridges generally trending in a northeast–southwest direction, while the central and eastern portions are comparatively more level and form the foothill and plain areas. The landscape includes structural hills, pediments, buried pediments, aggradation and denudational plains, valley fills and flood plains. Alluvial deposits are relatively limited in the rugged western areas but become more continuous towards the eastern side.



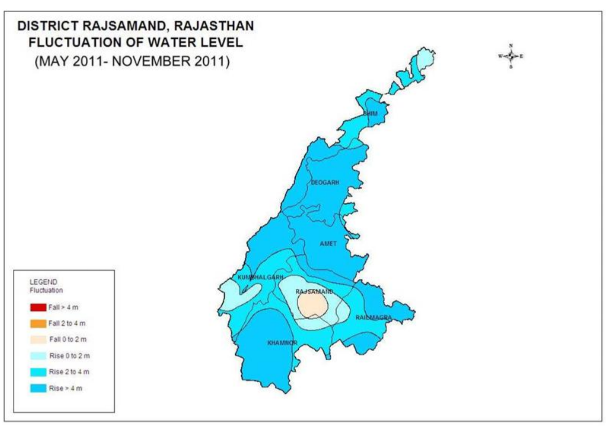


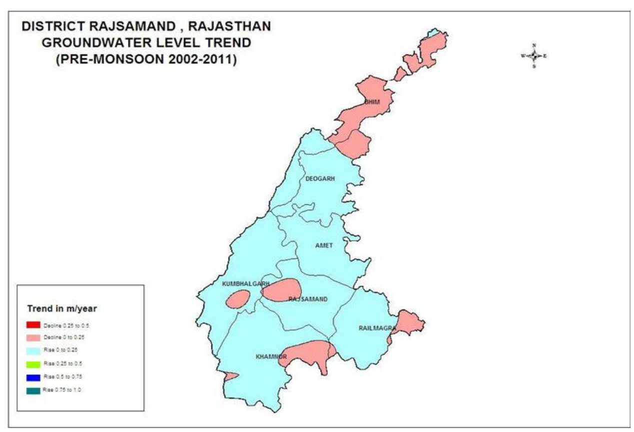
The drainage system is primarily associated with the Banas River and its tributaries, including the Khari, Chandrabhaga, Gomati, Kothari and Ahar rivers. These rivers and tributary channels are predominantly ephemeral and generally carry flow in response to significant rainfall events. The drainage pattern is predominantly rectangular to sub-rectangular in the western hill ranges and dendritic to sub-dendritic in the remaining areas. In the western hilly areas, drainage development is influenced by fractures and joints, while subsurface lineaments influence drainage in other portions of the district. Small lakes, tanks, check dams and other water-retention structures are also present within the regional drainage system and can contribute to the retention of runoff and enhancement of groundwater recharge.

The soils of the region vary according to topography and geological conditions. Lithosols occur mainly in the western sloping areas, while inceptions occur in accordance with the local topographic conditions. Soil texture varies from sandy loam in areas including Bhim, Deogarh and Amet to clay-loam in Rajsamand, Railmagra and Khamnor and heavier clay soils in Kumbhalgarh. These variations influence rainfall infiltration, surface runoff, soil-moisture retention and the effectiveness of individual water-conservation structures.



The geological setting is predominantly characterised by hard-rock formations, with gneisses, granites, schists, phyllites and limestone occurring in addition to alluvial deposits. Groundwater occurs mainly under water-table conditions, and its occurrence and movement are controlled to a significant extent by topography, weathering, fractures, joints and other structural features of the geological formations. Consequently, the recharge potential of the project area depends not only on the quantity of water retained by individual structures but also on the permeability of the soil, thickness of the weathered zone, presence of fractures and the hydraulic characteristics of the underlying formation.





The project interventions are designed to retain and regulate monsoon runoff within the local catchment through water-harvesting and water-conservation measures. Check dams, ponds, water-retention structures and catchment-treatment measures reduce the velocity of surface runoff and increase the period for which water remains available for infiltration. Where suitable soil and geological conditions exist, a portion of the retained water can infiltrate into the weathered and fractured subsurface and contribute to groundwater recharge. The project-level assessment therefore considers the intervention area as an interconnected catchment system rather than treating individual structures independently.

For the purpose of quantification under the UWR project, the final project boundary and land-use classification shall be established using the project GIS/KML boundary, village-level land records, structure locations and delineated contributing catchments. The area associated with each intervention shall be clearly identified so that the same runoff or recharge volume is not counted more than once where drainage lines contain a sequence of downstream water-retention structures. The actual project-area figures for cultivable, non-cultivable, forest, settlement and other land uses should therefore be populated from the project-specific GIS/land-use assessment rather than applying district-level percentages directly to Piplantri.

A.4. Climate

This Project is located in Rajsamand District of Rajasthan, which experiences an arid to semi-arid climate with distinct seasonal variations. The climate is characterized by a hot summer, a monsoon season concentrated during the middle and latter part of the year, and a comparatively cooler winter season. The Ground Water Department of Rajasthan describes the climate of Rajsamand District as arid to semi-arid.

The hot weather period generally extends from March to June, during which temperatures increase substantially, with May generally being the hottest month. The district-level hydrogeological report indicates temperatures reaching approximately 44°C in May. The winter season begins around November, with January being the coldest month; the same report indicates a minimum temperature of approximately 10°C in January.

Rainfall is highly seasonal and is predominantly associated with the South-West Monsoon, generally occurring from the last week of June through September. July is identified as the rainiest month. This pronounced seasonality is an important characteristic of the project area because a large proportion of annual rainfall occurs within a relatively short period, resulting in significant periods of runoff generation followed by an extended dry season.

The climatic conditions therefore have a direct bearing on the water availability and hydrological performance of the project. The concentration of rainfall during the monsoon provides the principal opportunity for harvesting and retaining runoff, while the long dry period increases the importance of local water storage, infiltration and groundwater recharge. The Piplantri project is consequently designed around decentralized retention of monsoon runoff, including check dams, ponds/basins, catchment treatment and vegetation-based measures, to increase the residence time of water within the local catchment and facilitate infiltration where site conditions are suitable.

A.5. Rainfall

The project activity area is located in Piplantri Kalan, Rajsamand District, Rajasthan, and experiences a dry to semi-arid climate, with rainfall concentrated predominantly during the South-West Monsoon. The rainfall pattern is highly seasonal, with the majority of annual precipitation occurring during the monsoon period. The concentration of rainfall during the monsoon season results in substantial seasonal variation in water availability, with periods of increased runoff during significant rainfall events followed by a prolonged dry period.

The climatic characteristics of the project area are represented by an average annual rainfall of approximately 602.4 mm[2] for the period 1991–2020 at the Rajsamand rainfall station. The district experiences significant seasonal temperature variation, with temperatures reaching above 47°C during May–June and falling to approximately 2°C during December–January. The available climatological information indicates approximately 21 rainy days per year.

For establishing the rainfall conditions relevant to the project assessment, year-wise rainfall records for 2000–2025 maintained by the Ground Water Department, Government of Rajasthan have been considered. The available records provide monthly rainfall and annual total rainfall (YTOTAL) for the Rajsamand rainfall station. For example, the annual rainfall recorded at Rajsamand was 247 mm in 2000, while subsequent years show considerable inter-annual variability.

The historical rainfall records demonstrate that rainfall varies substantially from year to year. This variability is an important characteristic of the project area's hydrological regime and is relevant for assessing surface runoff, water retention and groundwater recharge. Accordingly, rainfall occurring during each respective project/monitoring year shall be maintained separately and, where applicable, used as an input for quantification of the water harvested, retained or recharged during that year rather than applying a single average rainfall value to all project years.

The project activity is particularly relevant in this climatic setting because rainfall is concentrated within a relatively short monsoon period. Rainfall-generated runoff from the contributing catchments can be intercepted through water conservation and water-harvesting interventions, including check dams, ponds/basins and other applicable catchment treatment measures. These interventions increase the opportunity for runoff to be retained within the local catchment and to infiltrate into the subsurface, subject to the characteristics of the structures, contributing catchments, soil conditions and prevailing hydrogeological conditions.

The available rainfall information will consequently be used to characterise the rainfall regime and, where applicable, to support the annual UWR water-harvesting and recharge quantification. The annual rainfall data for 2000–2025 are presented in the following table.

Climatic Parameters

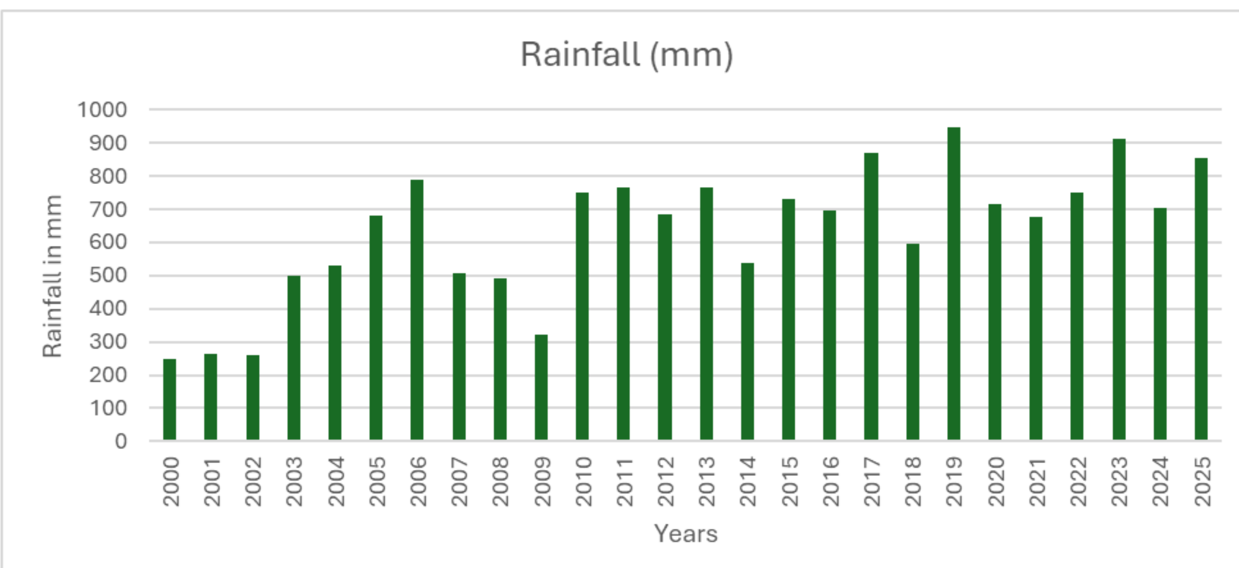
(a) Average annual rainfall: 602.4 mm (1991–2020)

[2] CGWB Aquifer Mapping and Management Plan of Rajsamand District, Rajasthan (AAP 2021–22)

(b) No. of rainy days: Approximately 21 days/year

(c) Temperature: Above 47°C during May–June; approximately 2°C during December–January

Year Wise rainfall of Rajsamand District			
Year	**Rainfall (in mm)**	**Year**	**Rainfall (in mm)**
2000	247	**2013**	764
2001	263	**2014**	539
2002	259	**2015**	729
2003	499	**2016**	695
2004	530	**2017**	871
2005	680	**2018**	597
2006	788	**2019**	948
2007	509	**2020**	714
2008	493	**2021**	675
2009	321	**2022**	750
2010	752	**2023**	912
2011	765	**2024**	704
2012	686	**2025**	854
Average Rainfall			
636.3077 mm			



A.6. Ground Water

The project activity area is located in Piplantri Kalan, Rajsamand District, Rajasthan. The regional hydrogeological setting is predominantly characterized by hard-rock formations. The main hydrogeological units occurring in the Rajsamand region include granite gneiss of the Bhilwara Supergroup, phyllite and schist of the Aravalli Supergroup, granite of the Post-Aravalli formations, and biotite-schist, calc-schist, calc-gneiss and mica-schist of the Delhi Supergroup. Groundwater generally occurs under water-table to semi-confined conditions within weathered and fractured zones of these formations. The occurrence, movement and availability of groundwater are largely controlled by the degree of weathering, fractures, joints and other secondary openings within the underlying formations.

The hard-rock nature of the region results in relatively limited subsurface storage capacity, with groundwater availability being dependent on the thickness and extent of weathered and fractured zones. The CGWB assessment identifies limited subsurface storage as one of the groundwater-related issues in the district and notes that suitable weathered zones are relatively limited.

The groundwater system is predominantly characterized by unconfined/water-table to semi-confined conditions within weathered and fractured rock zones. Based on the available groundwater-quality assessments, groundwater in most parts of Rajsamand District is generally suitable for drinking and irrigation, although localized areas show deterioration in groundwater quality and may range from potable to saline.

- **Potable:** Groundwater is potable/suitable for drinking in major portions of the district.
- **Brackish:** Localized areas may exhibit elevated electrical conductivity, total dissolved solids and salinity.
- **Saline:** Saline groundwater occurs in localized areas, particularly where elevated EC and related dissolved constituents have been reported.

Groundwater-quality concerns identified in the Rajsamand region include elevated salinity/electrical conductivity, fluoride, nitrate and total hardness, with iron also reported as a localized concern. The CGWB assessment indicates that EC exceeds 2,250 µS/cm and locally exceeds 3,000 µS/cm in parts of the district, while nitrate concentrations above the permissible limit have been observed in a significant proportion of samples. Excess fluoride has also been reported from parts of Rajsamand Block.

A.7. Alternate methods

Based on the available information on topography, rainfall, hydrogeology, aquifer conditions and water availability, several water conservation and groundwater recharge measures may be suitable for the project area. These include check dams, percolation tanks and ponds, recharge structures, water-harvesting structures and catchment treatment measures. The suitability of each method depends on the local drainage pattern, topography, rainfall-runoff characteristics, soil conditions, geological setting and the potential for water storage and infiltration.

The project owner selected a combination of water conservation, water-harvesting and groundwater recharge interventions considering the site-specific physical and hydrological conditions of the project area. The selected combination enables rainfall-generated runoff to be intercepted at suitable locations, temporarily retained and, where conditions permit, allowed to infiltrate into the subsurface. The combination of interventions also allows different measures to be applied according to the local characteristics of individual sites rather than depending on a single method throughout the project area.

Alternative approaches, such as relying solely on surface storage, solely on groundwater recharge structures or solely on catchment treatment, may provide benefits but would address only part of the water-management requirement. The selected combination was therefore considered appropriate by the project proponent because it provides an integrated approach for runoff interception, water conservation, storage and enhancement of groundwater recharge, while allowing the intervention type to be matched with the prevailing site conditions.

The selection of the current method is consequently based on its suitability for the seasonal rainfall pattern, local runoff generation, topography, drainage characteristics and predominantly weathered and fractured groundwater system of the project area.

A.8. Design Specifications

The project activity covers a number of water conservation and water harvesting measures implemented at different locations within the project area covering the Piplantri kalan village. The individual interventions include Contour Continuous Trenches (CCT), Field Bunding, Pakka Check Dams, Mini Percolation Tanks (MPT), Water Harvesting Structures, renovation/restoration of existing Water Harvesting Structures and anicut renovation. The structures are located in different villages and are associated with their respective local catchments.

The design and function of each intervention depend on its location, surrounding land use, topography, drainage pattern and purpose. CCTs are provided in non-arable areas along suitable contours to intercept and slow down the movement of rainfall runoff. These measures reduce the velocity of runoff and increase the time available for water to infiltrate into the soil. Field bunding is carried out in arable areas to retain rainfall within agricultural fields, reduce the movement of surface runoff and improve soil-moisture retention. Pakka Check Dams are located across suitable drainage paths to temporarily retain runoff and reduce its rapid downstream movement. MPTs and other Water Harvesting Structures provide temporary storage and increase the residence time of water within the catchment, thereby providing an opportunity for infiltration and percolation. Renovation and restoration of existing Water Harvesting Structures and anicuts improve their capacity to retain and manage rainfall-generated runoff and maintain the intended water-retention function of the existing structures.

The individual structures are associated with their respective villages and catchment areas as identified in the project activity inventory. The catchment area represents the area contributing rainfall runoff to the respective intervention. The design of field-based measures such as CCT and Field Bunding is intended primarily to intercept runoff close to where it is generated. In the case of Pakka Check Dams, MPTs, Water Harvesting Structures and anicut-related works, the structures are positioned along drainage paths so that runoff generated in the upstream catchment can be temporarily retained. The detailed dimensions and storage capacities of individual structures are considered based on the available structure-specific records; where such dimensions are not available in the project documentation, no additional design dimensions or capacities have been assumed for the present description.

The main source of water for these interventions is rainfall and the surface runoff generated from the respective contributing catchments. During rainfall events, water flows from the surrounding catchment towards the natural drainage channels, local slopes and nalas and is intercepted by the relevant structure. For field-based interventions, rainfall is retained directly within the treated area, whereas for drainage-based interventions the runoff is collected and temporarily retained at the respective structure.

The quantity of rainfall-generated runoff associated with an intervention is estimated using the contributing catchment area, rainfall received and the applicable runoff coefficient. The basic calculation used for estimating the rainfall-generated runoff is:

$$\textbf{Volume of water (litres)} = \textbf{Catchment Area (m}^2\textbf{)} \times \textbf{Rainfall (mm)} \times \textbf{Runoff Coefficient}$$

The catchment area and rainfall therefore form the principal physical parameters used in the estimation, while the runoff coefficient accounts for the proportion of rainfall expected to become surface runoff from the relevant catchment. The resulting volume represents the rainfall-generated runoff available to the respective water-conservation or water-harvesting intervention. The calculated quantity is subsequently considered in relation to the function of the intervention, including temporary storage, infiltration/percolation and surface outflow.

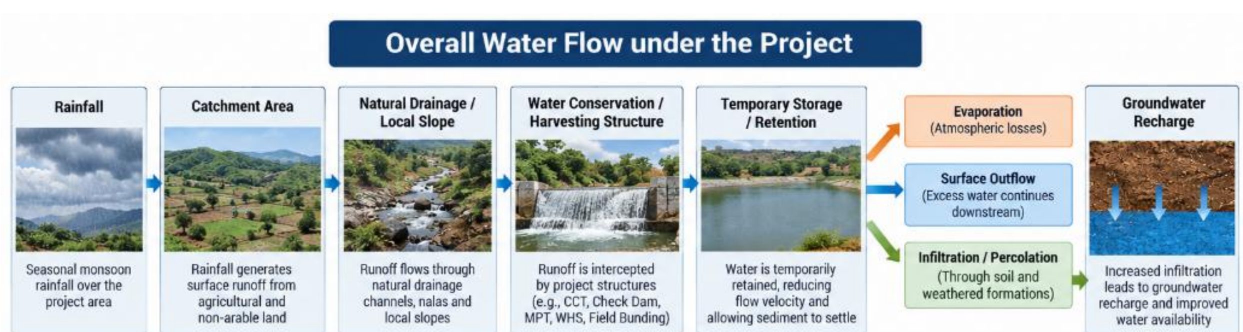
The estimated water is primarily available during and after rainfall events, particularly during the monsoon period when rainfall-generated runoff is available. The duration for which water remains available at an individual structure depends on the amount and intensity of rainfall, inflow from the contributing catchment, storage conditions, infiltration/percolation, evaporation and subsequent surface outflow. Accordingly, the project does not create a continuous year-round source of water; rather, it retains rainfall-generated water for a period following rainfall and increases the time available for infiltration and groundwater recharge.

The water reaching the structures is natural rainwater runoff generated from the surrounding agricultural, non-arable and other catchment areas. As runoff passes over the land surface, it may carry naturally occurring soil particles, silt and other suspended material. The water conservation and harvesting structures reduce the velocity of runoff and provide an opportunity for sediment to settle during temporary retention. The project does not involve chemical treatment of the rainfall runoff prior to its entry into the water conservation or recharge structures. The treatment of runoff therefore relies primarily on physical retention, natural sediment settlement and subsequent infiltration/percolation. Routine removal of accumulated sediment and maintenance of the structures, where required, supports continued functioning of the structures.

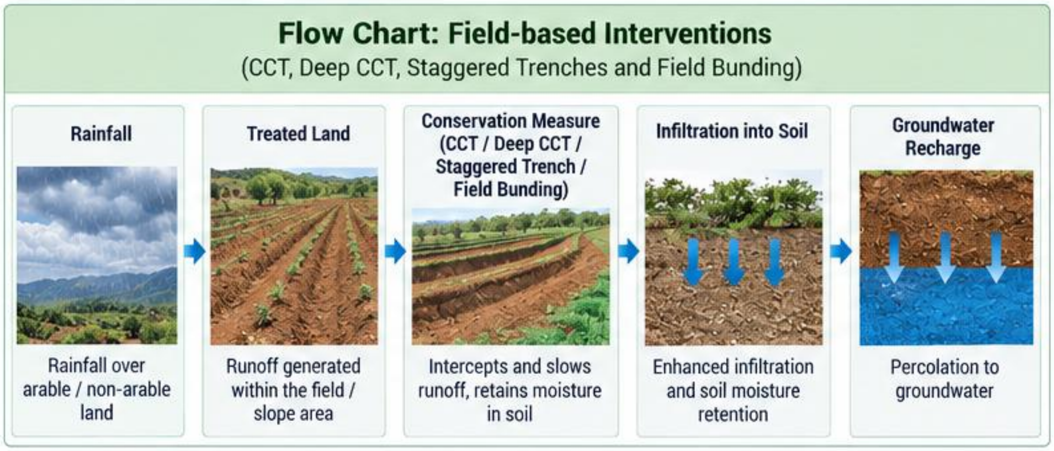
The conveyance of rainfall runoff to the respective structures is mainly through the existing natural drainage system, including local slopes, drainage channels and nalas. No major external water-transfer system is involved in conveying the rainfall runoff to the project structures. Rainfall runoff follows the natural topographic gradient and reaches the relevant intervention according to the local drainage pattern. In the case of CCTs and Field Bunding, runoff is intercepted directly within the treated area. In the case of Pakka Check Dams, MPTs, Water Harvesting Structures and anicut-related works, runoff is conveyed through the upstream natural drainage path to the respective structure, where it is temporarily retained.

Following retention, a portion of the stored water infiltrates into the surrounding soil and, where geological and soil conditions permit, percolates towards the underlying weathered and fractured formations. Another portion may be lost through evaporation or continue downstream as surface outflow after the storage capacity or retention condition is exceeded. The relative contribution of infiltration, evaporation and surface outflow varies according to rainfall, structure location, soil conditions, storage conditions and the duration for which water remains available. The project therefore increases the opportunity for water to remain within the local catchment and contribute to groundwater recharge rather than allowing rainfall runoff to rapidly leave the area.

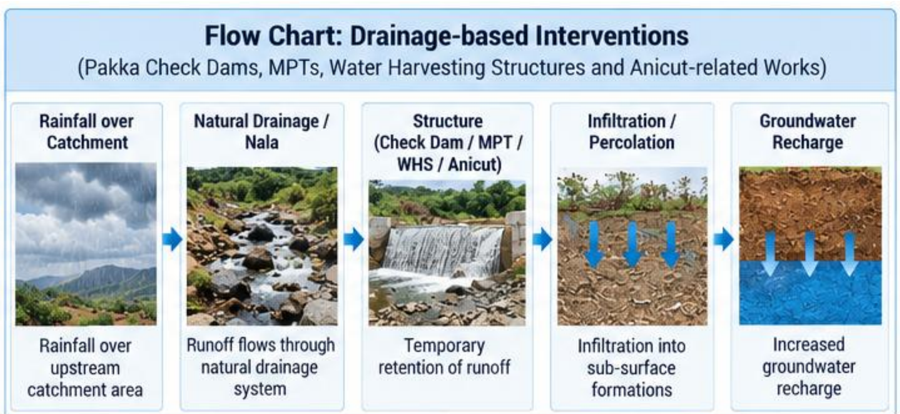
The main parameters considered for estimating the quantity of water are the contributing catchment area, rainfall and applicable runoff coefficient, with the subsequent hydrological processes of temporary storage, infiltration/percolation, evaporation and surface outflow determining the fate of the rainfall-generated runoff. The project activity inventory links individual interventions with their respective locations and catchment information, allowing the estimated rainfall-generated runoff to be associated with the relevant project activities.



For field-based measures such as CCT and Field Bunding:



For drainage-based structures such as Pakka Check Dams, MPTs, Water Harvesting Structures and anicut-related works:



A.9. Implementation Benefits to Water Security

The project has been implemented through multiple water conservation and water harvesting interventions distributed across the project area. The interventions have been selected and implemented to support the project's quantitative water-security objective by increasing the retention and availability of rainfall-generated water within the project area.

The project activity inventory comprises 31 individual activity records within Piplantri Kalan Village. The inventory includes 12 Field Bunding works, 4 Mini Percolation Tanks (MPTs), 3 Pakka Check Dams, 4 Contour Continuous Trenches (CCTs), 4 Agro Forestry activities, 2 PHED well/tubewell-related works, 1 Renovation/Restoration of a Water Harvesting Structure and 1 Anicut Renovation.

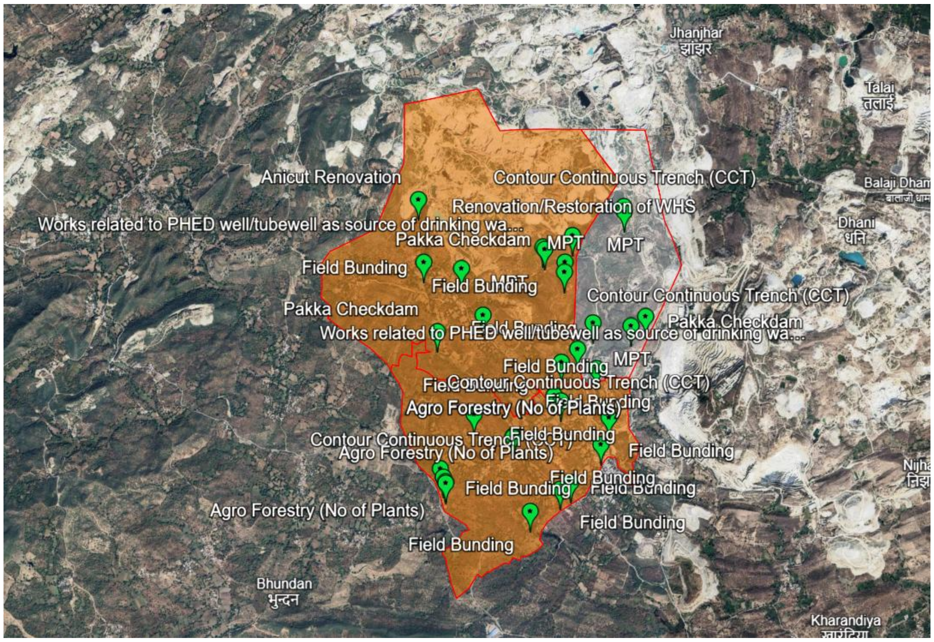
Of these, 25 activity records are directly associated with water conservation, water harvesting, storage or recharge, comprising 12 Field Bunding works, 4 MPTs, 3 Pakka Check Dams, 4 CCTs, 1 Renovation/Restoration of a Water Harvesting Structure and 1 Anicut Renovation. These interventions directly contribute to the retention, storage and management of rainfall-generated water within the project area.

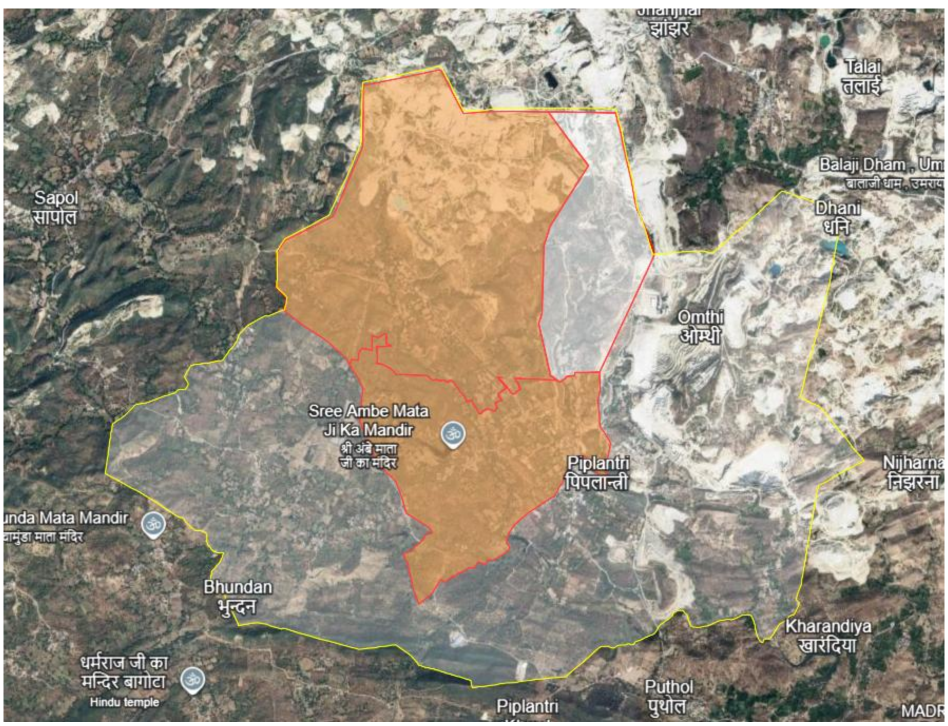
The remaining 6 activity records, comprising 4 Agro Forestry activities and 2 PHED well/tubewell-related works, are not included in the above count. The Agro Forestry activities are primarily associated with plantation and vegetation development and are not directly quantified as water-conservation, water-harvesting or recharge structures. Similarly, the PHED well/tubewell-related works relate to drinking-water source infrastructure and do not represent rainfall-runoff conservation or recharge interventions. Therefore, these activities are retained as part of the overall project activity inventory but are not included in the 25 water-conservation, water-harvesting, storage or recharge activity records.

The quantitative target is assessed based on the catchment area associated with the eligible water-conservation and water-harvesting activities and the rainfall-generated runoff available within those catchments. The number and distribution of these interventions allow the available rainfall runoff to be addressed across multiple locations and catchments. The resulting water benefit is quantified using the applicable catchment area, rainfall and runoff coefficient, with the calculated quantity forming the basis for the project's water-benefit assessment.

The implementation of multiple intervention types also allows the project to address water conservation at different scales. The combination of field-based measures, water-harvesting structures and restoration of existing structures provides a distributed approach to improving water retention within the project area. The project therefore contributes to the quantitative water-security target through the cumulative contribution of the eligible water-conservation and water-harvesting activities and their associated catchment areas.

Activity	**Number**
Field Bunding	12
Mini Percolation Tank (MPT)	4
Pakka Check Dam	3
Contour Continuous Trench (CCT)	4
Agro Forestry	4
Renovation/Restoration of Water Harvesting Structure	1
Anicut Renovation	1
PHED well/tubewell works	2
Total activity records	31





A9.1 Objectives vs Outcomes

Objective: The primary objective of the project activity is to improve local water security by conserving rainfall-generated runoff, reducing the rapid movement of water from the catchment, increasing water retention within the project area, and enhancing opportunities for groundwater recharge. The project also aims to improve the availability of water for agricultural and other local requirements by implementing a combination of water conservation, water-harvesting and recharge-oriented interventions suited to the local catchment conditions. The interventions are intended to improve soil-moisture retention, reduce runoff losses and support more sustainable use of available water resources.

Outcome: Following implementation of the project activities, rainfall-generated runoff is intercepted and retained at multiple locations through the water-conservation and water-harvesting measures implemented within Piplantri Kalan Village. These interventions provide opportunities for infiltration and percolation, thereby contributing to groundwater recharge and improving local water retention. Field-level measures such as field bunding and CCTs help reduce the movement and velocity of runoff and retain moisture, while Pakka Check Dams and MPTs provide temporary storage of runoff and allow a portion of the retained water to infiltrate. Renovation and restoration of existing water-harvesting structures and anicut renovation further support the retention and conservation of rainfall-generated water. Overall, the project contributes to improved local water retention, increased potential for groundwater recharge and greater availability of locally generated water following rainfall events..

A9.2 Interventions by Project Owner / Proponent / Seller

Terrablu Climate Technologies Pvt. Ltd., as the Proponent/Seller, has undertaken the project activity to address local water-security requirements through the conservation of rainfall and improved management of runoff within the project boundary. The implementation has been supported at the local level by Piplantri Gram Panchayat through facilitation of access to project assets and land, community coordination, records and long-term stewardship of the water-conservation infrastructure. Green Peepal Society has supported field implementation, community mobilisation, documentation, maintenance coordination, monitoring support and evidence collection.

The project interventions were carried out considering the local catchment conditions with the objective of retaining naturally available rainfall water within the project area. The implemented measures intercept rainfall-generated runoff and provide temporary retention at different locations. Land-based interventions help reduce the velocity of runoff and retain soil moisture, while water-retention interventions provide temporary storage and increase the duration for which water remains within the catchment. The retained water is subsequently subject to infiltration, evaporation and surface outflow depending on the prevailing local conditions.

Terrablu Climate Technologies Pvt. Ltd. has also undertaken the project-development activities associated with preparation of project documentation, establishment of the monitoring framework, coordination of validation and verification, and management of applicable registry-related processes. The combined implementation, monitoring and documentation arrangements support the continued management of the project activity and provide the basis for demonstrating the outcomes achieved through the interventions.

The project activity therefore supports sustainable management of the available water resource by improving the retention of rainfall water within the project area and creating greater opportunities for infiltration and groundwater recharge. This contributes to improved local water security through better conservation and management of naturally available water resources.

A.10. Feasibility Evaluation

The feasibility of the project activity has been supported through the planning and implementation of water-conservation measures under established government programmes and through the involvement of the concerned government departments. The project activity records identify the Watershed Department, Water Resource Department, Horticulture Department and PHED as the respective implementing departments for the recorded works, with activities undertaken under funding programmes including IWMP, EC-SPP, MJSA Untied Fund, PMKSY - Per Drop More Crop and PHED. The project records also provide sanction amounts, funding sources and implementation status for the individual activities, demonstrating that the interventions were taken up through established institutional and funding mechanisms.

The technical and resource-management feasibility of such interventions is further supported by the Central Ground Water Board (CGWB) Aquifer Mapping and Ground Water Management Plan for Rajsamand District. The assessment identifies over-exploitation of groundwater, frequent drought conditions and limited subsurface storage availability as important groundwater-related issues. It also identifies water-conservation structures and catchment-area treatment as supply-side management measures and evaluates their potential contribution to improving groundwater availability.

Accordingly, the project activity is considered feasible from an institutional, technical and water-resource management perspective, as the interventions were planned and implemented through existing government departmental mechanisms and established water-conservation programmes. The available documentation does not provide a separate project-specific financial feasibility study, cost-benefit analysis, IRR or payback assessment for the Piplantri Water Credit Project.

A.11. Ecological Aspects & Sustainable Development Goals (SDGs):

Sustainability Development Goals Targeted	Most relevant SDG Target /SDG Impact	Indicator (SDG Indicator)
SDG 1 : End poverty in all its forms everywhere.	**Target 1.4:** By 2030, ensure that all men and women, particularly the poor and vulnerable, have access to basic services and economic resources. Improved	**1.4.1:** Proportion of population living in households with access to basic services. The project activity contributes to

	water availability can support local livelihoods and reduce vulnerability associated with water scarcity.	improved water security by conserving rainfall-generated water and increasing its retention within the project area. Improved local water availability can reduce vulnerability to water scarcity, particularly for communities dependent on local water resources and agriculture and can support the continuity of water-dependent livelihood activities.
SDG 2 : End hunger, achieve food security and improved nutrition and promote sustainable agriculture.	**Target 2.4:** By 2030, ensure sustainable food production systems and resilient agricultural practices that increase productivity and production while maintaining ecosystems. Improved water retention and soil-moisture conservation can support more resilient agricultural practices.	**2.4.1:** Proportion of agricultural area under productive and sustainable agriculture The project supports sustainable agricultural practices by improving the retention of rainfall water and soil moisture within the project area. By reducing rapid runoff and increasing opportunities for water to remain available within the catchment, the project can support agricultural water availability and contribute to greater resilience of agricultural activities during periods of limited rainfall.
SDG 3: Ensure healthy lives and promote well-being for all at all ages		The project can provide an indirect contribution to health and well-being through improved local water security and management of rainfall water. The interventions are designed for temporary retention rather than prolonged stagnant storage, with retained water subject to infiltration, evaporation and surface outflow. This can help reduce the potential for prolonged waterlogging and associated conditions favourable for vector breeding.

SDG 6 : Ensure availability and sustainable management of water and sanitation for all	**Target 6.4:** By 2030, substantially increase water-use efficiency and ensure sustainable withdrawals and supply of freshwater to address water scarcity. The project conserves rainfall-generated runoff and supports groundwater recharge. **Target 6.5:** By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate. The project promotes integrated management of rainfall, surface runoff and groundwater resources.	**6.4.2:** Level of water stress: freshwater withdrawal as a proportion of available freshwater resources **6.5.1:** Degree of integrated water resources management The project directly contributes to sustainable water-resource management through the conservation of rainfall-generated runoff and enhancement of opportunities for infiltration and groundwater recharge. This is particularly relevant to Rajsamand, where the CGWB has identified groundwater over-exploitation, frequent drought and limited subsurface storage as key groundwater-related issues. The project therefore supports improved local water availability and more sustainable management of groundwater resources.
SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship and the growth of micro, small and medium enterprises. The project activities, including implementation and maintenance of rural water-conservation assets, can support local employment and livelihood opportunities through rural development	**8.3.1:** Proportion of informal employment in total employment, by sector and sex

	programmes such as MGNREGA.	
SDG 13 : Climate Action 	**Target 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. Improved rainwater retention and groundwater recharge can contribute to resilience against rainfall variability and drought conditions.	**13.1.1:** Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. The project contributes to strengthening local resilience to rainfall variability and drought-related water stress by retaining rainfall-generated water within the project area and increasing opportunities for infiltration. This is relevant to the project area because the CGWB has identified frequent drought as a groundwater-related issue in Rajsamand District. The conservation and retention of rainfall water can therefore support adaptation to periods of reduced water availability.
SDG 15 : Life on Land 	**Target 15.3:** By 2030, combat desertification and restore degraded land and soil, including land affected by drought, and strive to achieve a land degradation-neutral world. The project supports soil and moisture conservation and improved management of rainfall runoff.	**15.3.1:** Proportion of land that is degraded over total land area. The project contributes to sustainable management of land and soil resources by reducing the rapid movement of surface runoff and improving retention of rainfall and soil moisture. The conservation measures help manage runoff at the land and catchment level and support infiltration, thereby contributing to the conservation of soil moisture and sustainable management of terrestrial resources.

A.12. Recharge Aspects :

Not Applicable, since the project involves conservation and management of rainfall-generated runoff through water conservation and water-harvesting interventions within the project area. The surplus water retained by the interventions is allowed to undergo natural infiltration and percolation where site conditions permit, thereby contributing to groundwater recharge. The project does not involve intentional recharge using sewage, industrial effluent or other contaminated water sources; the source water is rainfall-generated runoff from the local catchment. The quality of recharge water is therefore dependent on the characteristics of the contributing catchment and the condition of the retained runoff. The project area is located within a predominantly hard-rock groundwater environment, where groundwater occurrence is controlled mainly by weathered and fractured zones. Groundwater quality in Rajsamand is generally suitable in major areas, although localized issues relating to salinity/EC, fluoride, nitrate and hardness have been reported. Accordingly, recharge is undertaken through natural rainfall runoff without introducing an external wastewater or contaminated-water source into the aquifer.

A.12.1 Solving for Recharge

The project does not quantify groundwater recharge using a **field-scale water-budget approach** based on rainfall, surface inflow, evapotranspiration, surface outflow and change in storage. Instead, the project quantifies the **rainfall-generated water** available for conservation and harvesting using the applicable catchment area, rainfall and runoff coefficient, as follows:

Volume of Water Harvested/Conserved (L) = Catchment Area (m^2) × Rainfall (mm) × Runoff Coefficient

The catchment area represents the area from which rainfall runoff reaches the respective project activity. The rainfall value represents the rainfall recorded for the relevant monitoring year, and the runoff coefficient is used to estimate the portion of rainfall that becomes surface runoff. The calculated volume therefore represents the estimated rainfall-generated water available for conservation and harvesting through project interventions.

The retained water can subsequently infiltrate into the soil and percolate into the underlying formations, depending on the local soil, geological, topographical and hydrogeological conditions. This natural infiltration can contribute to groundwater recharge. However, the project does not apply a separate recharge or infiltration factor to the calculated water volume and does not consider the entire conserved volume as groundwater recharge. Some of the retained water may infiltrate and percolate, while some may be lost through evaporation or surface outflow.

The field-scale water-budget parameters, including surface inflow, evapotranspiration, surface outflow and change in storage, are not separately quantified for the project activities. Therefore, the field-scale water-budget equation is not used to determine a separate groundwater recharge volume.

Groundwater-level information available for the project area is used as supporting information on groundwater conditions. However, groundwater levels can also be affected by rainfall, groundwater abstraction and other factors. Therefore, groundwater-level observations are not used independently to calculate the quantity of recharge attributable to the project.

Accordingly, groundwater recharge is considered a benefit of the project, but it is not separately quantified. The quantified water volume is based on the rainfall, applicable catchment area and runoff coefficient used for the project activities. This approach clearly distinguishes between the rainfall-generated water conserved/harvested by the project and the portion that may subsequently contribute to groundwater recharge.

A.13. Quantification Tools

The project quantifies the rainfall-generated water available for conservation and harvesting using the identified contributing catchment area, annual rainfall and applicable runoff coefficient. In the absence of direct flow-metering systems that accurately measure the volume of water conserved or harvested, the water-harvesting potential is estimated using the following approach.

Water Harvesting Potential

The water-harvesting potential is calculated for each year for which RoUs are claimed. The amount of rainfall received over the contributing catchment represents the available rainfall water, while the portion that can be considered for conservation or harvesting is estimated using the applicable runoff coefficient.

The formula for calculation for harvesting potential or volume of water received or runoff produced or harvesting capacity is given as:-

Harvesting potential or Volume of water utilized (liters) =	**Area of Catchment (m^2) X Amount of rainfall (mm) X Runoff coefficient**

Estimated Net Runoff from an Impervious Catchment Surface Adjusted by its Runoff Coefficient (metric

For each project activity, the catchment area represents the area contributing rainfall-generated runoff to the respective intervention. The annual rainfall represents the rainfall received during the relevant monitoring year, and the runoff coefficient represents the proportion of rainfall expected to contribute to surface runoff from the respective catchment.

Conversion into RoUs:

The calculated volume of conserved/harvested water is converted into RoUs using the applicable conversion:

1 RoU = 1,000 litres

Therefore:

RoUs = Calculated Volume of Water (litres) ÷ 1,000

The calculation is undertaken separately for each relevant project activity and for each monitoring year. The resulting RoU quantity is rounded down to the nearest whole RoU.

Runoff coefficient

The runoff coefficient represents the proportion of rainfall that contributes to surface runoff from the relevant catchment. It accounts for losses associated with infiltration, surface wetting, evaporation and other characteristics of the catchment. The selection of the coefficient considers the characteristics of the relevant area, including land use, soil, terrain and surface conditions. The runoff coefficient is therefore applied in relation to the contributing catchment area and is not considered to represent the efficiency of the individual water-conservation structure.

Type of Area	Runoff Coefficient (K)
Contour Continuous Trench (CCT)	0.40
Pakka Checkdam	0.80
Field Bunding	0.20
Water Harvesting Structure (WHS)/ Renovated WHS	0.60
Agro Forestry (No. of Plants)	0.00
Works related to PHED well/tubewell as source of drinking water	0.00
Mini Percolation Tank (MPT)	0.50
Renovation/Restoration of WHS	0.60
Anicut Renovation	0.60

Annual Rainwater harvesting Potential

The annual rainfall value used in the calculation corresponds to the rainfall received during the respective monitoring year. Accordingly, the water-harvesting potential is calculated separately for each year rather than using a single average rainfall value for the entire monitoring period. This allows the calculated quantity to reflect the actual rainfall conditions applicable to each year of the RoU claim.

Annual rainwater harvesting potential is given by $V = K \times I \times A$

Where, V=Volume of water that can be harvested annually in liters.

K = Runoff coefficient

I = Annual rainfall in (mm)

A = Catchment area in (m^2)

Analysis of the catchment area

The catchment analysis considers the type of eligible water-conservation or water-harvesting activity, terrain characteristics, land-use conditions and the contributing catchment area associated with each project activity within Piplantri Kalan. The eligible activities include Field Bunding, Contour Continuous Trenches (CCTs), Pakka Check Dams, Mini Percolation Tanks (MPTs), Renovation/Restoration of Water Harvesting Structures and Anicut Renovation. These activities are located at different points within the local drainage and catchment system and are associated with catchment areas from which rainfall-generated runoff reaches the respective intervention. Field Bunding and CCTs help retain rainfall and reduce runoff movement, while Pakka Check Dams and MPTs intercept runoff along drainage pathways and provide opportunities for temporary storage and infiltration. Renovation/restoration of existing water-harvesting structures and Anicut Renovation support continued water retention at existing locations. The contributing catchment area and relevant surface, land-use and terrain characteristics are considered in applying the runoff coefficient to the respective activity. The applicable catchment area and runoff coefficient are then combined with the rainfall received during each monitoring year to estimate the rainfall-generated water available for conservation and harvesting.

Type of Area	Catchment area (A) in Ha	Catchment area (A) in m^2
Agro Forestry (No of Plants)	97.69539383	9,76,953.9383
Anicut Renovation	46.64673864	4,66,467.3864
Contour Continuous Trench (CCT)	272.518702	27,25,187.02
Field Bunding	389.4333514	38,94,333.514
MPT	57.00558789	5,70,055.8789
Pakka Checkdam	189.1539836	18,91,539.836
Renovation/Restoration of WHS	48.64131271	4,86,413.1271
Works related to PHED well/tubewell as source of drinking water	101.257239	10,12,572.39
Agro Forestry (No of Plants)	97.69539383	9,76,953.9383
Total Catchment Area	**1,202.352309**	**1,20,23,523.09**

Quantification

For each monitoring year, the quantity of rainfall-generated water available for conservation and harvesting is calculated for the eligible project activities using the applicable catchment area, annual rainfall and runoff coefficient. The calculated water volume is converted into RoUs using 1 RoU = 1,000 litres.

In accordance with the applicable UWR Standard, the annual RoU quantity is subject to a maximum threshold of 1,000,000 RoUs per year, equivalent to 1,000,000,000 litres per year, over the applicable project period. Accordingly, where the calculated annual quantity exceeds 1,000,000 RoUs, the quantity considered for RoU claiming is limited to the applicable annual threshold.

The annual quantification is therefore presented as follows:

Year	Total ROUs (1000 liters)/yr	UCR Cap(1 million RoUs/yr)
2014	22,84,727	10,00,000
2015	30,90,104	10,00,000
2016	29,45,984	10,00,000
2017	36,92,017	10,00,000
2018	25,30,579	10,00,000
2019	40,18,407	10,00,000
2020	30,26,522	10,00,000
2021	28,61,207	10,00,000
2022	31,79,119	10,00,000
2023	38,65,809	10,00,000
2024	29,84,133	10,00,000
2025	36,19,957	10,00,000
Total RoUs	**-**	**1,20,00,000**

A.14. UWR Rainwater Offset Do No Net Harm Principles

According to the UWR RoU Standard principles, the project activity accomplishes the following:

- **Increases the sustainable water yield in areas where over-development has depleted the aquifer:** Piplantri is located in Rajsamand district, Rajasthan, where groundwater resources have historically been under significant pressure. The Central Ground Water Board has reported that Rajsamand district is an over-exploited groundwater area, with groundwater development exceeding the available resource. The CGWB Aquifer Mapping and Management Plan further reports a groundwater development stage of 112.90%, with groundwater draft exceeding annual groundwater resource availability, and identifies over-exploitation, frequent droughts and poor aquifer sustainability as key groundwater issues.

  The project addresses this local water-resource pressure by conserving rainfall-generated runoff and retaining water within the project catchments through water-conservation and harvesting interventions. The retained water provides an opportunity for infiltration and percolation into the underlying soil and weathered/fractured formations, thereby contributing to groundwater recharge and improving the availability of water within the local hydrological system.

The available groundwater-level trend analysis for Piplantri Gram Panchayat for 2000–2026 also provides supporting evidence of long-term groundwater-level variation. The mean groundwater-table depth increased from approximately 18.9 m below ground level in 2000 to about 32.5 m below ground level in 2017, indicating a substantial deepening of the groundwater table during this period. Subsequently, the depth reduced to approximately 24.8 m below ground level by 2026, indicating a partial recovery in groundwater levels. The project activity therefore forms part of the broader water-conservation and recharge efforts aimed at improving local water availability. The observed groundwater trend is used as supporting evidence of groundwater conditions and is not independently attributed entirely to the project. Publicly available information on Piplantri also reports the use of watershed measures such as check dams and rainwater harvesting to control runoff and improve water availability.

- **Collect unutilized water or rainwater and preserve it for future use:** The project captures rainfall-generated runoff within the respective contributing catchments instead of allowing the available runoff to be rapidly lost as uncontrolled surface flow. The water-conservation and harvesting interventions temporarily retain runoff and provide an opportunity for infiltration, percolation and local water availability.

  This approach is consistent with the wider watershed-management practices reported for Piplantri, where check dams and other measures have been used to control the movement of rainwater and maximise rainwater harvesting. Public documentation of Piplantri reports that these measures were introduced to address seasonal water shortages and reduce wastage of rainfall runoff.

  The project therefore contributes to retaining a portion of seasonal rainfall within the local catchment for subsequent groundwater recharge and other local water requirements rather than allowing the entire unutilized runoff to leave the area.

- **Conserve and store excess water for future use:** The project conserves excess rainfall-generated runoff by slowing and temporarily retaining water within the project area. The retained water remains available for subsequent infiltration and groundwater recharge, while a portion may also remain available for local water requirements depending on the location and characteristics of the intervention.

  This principle is particularly relevant to Piplantri because the local water regime is strongly seasonal. Public information on the village notes that although groundwater is replenished during the monsoon, water availability becomes limited during the long dry and hot periods. The use of rainwater-harvesting and check-dam measures helps retain rainfall within the village landscape for longer periods.

- **Enhance local women's participation and professional development:** The Piplantri model also has a strong community and women's-participation component. The village is publicly recognised for linking environmental conservation with the empowerment of girls and women. The initiative of planting 111 trees for every girl child born has become an important part of the village's environmental and social-development approach. Public documentation further reports that women from Piplantri have participated in nursery and plantation-related activities under MGNREGA, gaining practical work experience while contributing to environmental restoration. Women have also been involved in other community-based activities associated with sustainable living and local environmental management.

  The project therefore supports the principle of women's participation by building on the existing community-based environmental and water-conservation framework of Piplantri. The participation of women in plantation, nursery, community mobilisation, documentation and other project-related activities can provide opportunities for skill development, employment and greater involvement in local environmental and water-resource management. Specific employment or professional-development outcomes are considered only where supported by project records.

A.15. Scaling Projects-Lessons Learned-Restarting Projects

The Piplantri water-conservation approach can be scaled further by building on the existing watershed-development programmes and institutional mechanisms of the Government of Rajasthan. The State has adopted an integrated approach to water conservation through programmes such as Mukhyamantri Jal Swavalamban Abhiyan (MJSA) 2.0[3], Rajiv Gandhi Jal Sanchay Yojana (RGJSY)[4] and the Watershed Development Component of Pradhan Mantri Krishi Sinchayee Yojana (WDC-PMKSY 2.0)[5]. These programmes support activities such as anicuts, check dams, mini percolation tanks, farm ponds, subsurface barriers, drainage-line treatment, field bunding, contour treatment, staggered trenches and restoration of existing water-harvesting structures.

The existing Government programmes provide an important opportunity for scaling because the project does not have to create a separate water-management system. Instead, additional suitable catchments can be identified within the existing watershed planning framework and water-conservation measures can be integrated with activities already supported through these schemes. For example, MJSA 2.0, launched to promote rainwater harvesting, water conservation and judicious use of available water resources, includes construction of new anicuts, farm ponds, Mini Percolation Tanks and Sub-Surface Barriers as well as repair of existing water-harvesting structures. The Government has proposed

[3] https://jankalyanfile.rajasthan.gov.in/Content/UploadFolder/DepartmentMaster/166/2025/Feb/30409/166fc88acc1-df17-45f3-bdfc-a9054819229d.pdf?

[4] https://jankalyanfile.rajasthan.gov.in/Content/UploadFolder/DepartmentMaster/166/2023/Feb/30409/125427.pdf?

[5] https://finance.rajasthan.gov.in/docs/budget/statebudget/2026-2027/Economicreviewe.pdf?

implementation of 5 lakh water-harvesting and water-conservation structures in 20,000 villages under the programme.

Similarly, WDC-PMKSY 2.0 provides a suitable framework for expanding an integrated catchment approach. The programme covers ridge-area treatment, drainage-line treatment, soil and moisture conservation, water-harvesting structures, field and contour bunding, trenching, afforestation and pasture development. This is relevant to Piplantri because scaling can focus not only on constructing additional storage structures, but also on treating the upstream catchment so that rainfall runoff is retained and managed progressively through the watershed.

A key lesson for further scaling is the need to avoid duplication of water benefits. Different Government schemes may operate within the same village or watershed, and several interventions may receive runoff from the same contributing catchment. Therefore, additional projects should be planned with reference to existing structures, drainage lines, catchment boundaries and previously treated areas. This will help avoid constructing overlapping interventions where an existing structure already provides the intended water-conservation function and will also avoid counting the same rainfall runoff more than once for Water Credit purposes.

The Government of Rajasthan has also recognised the importance of maintaining existing watershed assets. Under the watershed-development framework, the Watershed Development Fund[6] can be used for maintenance and repair of assets such as Mini Percolation Tanks, Percolation Tanks, Pucca Check Dams, Water Harvesting Structures and Anicuts, with the Gram Panchayat playing an important role in asset maintenance after completion of the project. This provides a practical basis for the restarting or restoration of existing/underperforming water-conservation assets, where rehabilitation may provide a greater additional water benefit than constructing a completely new structure.

MGNREGA[7] also provides an established mechanism for supporting water conservation and drought-proofing works. Government guidance specifically identifies renovation of traditional water bodies, water conservation and harvesting structures, check dams and similar groundwater-augmentation works, together with plantation and land-development activities. Accordingly, future scaling of the Piplantri approach can make use of convergence between watershed programmes, MGNREGA and Panchayati Raj institutions rather than developing parallel implementation arrangements.

The project can therefore be scaled through additional untreated catchments, restoration of existing structures, convergence with Government water-conservation schemes, improved catchment-level planning and continued community participation. The main lesson from the existing approach is that scaling should focus on the water system as a whole, rather than simply increasing the number of structures. Priority can be given to locations where additional interventions provide a distinct water-

[6] https://environment.rajasthan.gov.in/content/dam/water/watershed-development-and-soil-conservation-department/Order/Circulars/6759-6864.pdf?

[7] https://nrega.rajasthan.gov.in/pdmn/view_document.aspx?fname=Drought_proof_120001.pdf

conservation or recharge benefit and where existing Government programmes have not already addressed the same catchment requirement.

Appendix -1