SHRI JAI NARAIN MISHRA PG COLLEGE, LUCKNOW

BEST PRACTICE OF THE COLLEGE IMPACT AREA: CLIMATE MANAGEMENT

Title of the best Practice – Construction/Installation and Impact Assessment of Rain Water Harvesting Structures



Construction/Installation of Roof Top Rainwater Harvesting Structures at Shri Jai Narain Mishra PG College (KKC), Lucknow

Introduction

Rainwater harvesting (RWH) is a well-established, sustainable water management technique that involves the collection, storage, and utilization of rainwater for groundwater recharge and other purposes. Rapid urbanization, increasing population, and excessive groundwater extraction have led to severe water stress in many regions, including Lucknow. The depletion of groundwater resources has necessitated the adoption of efficient water conservation strategies to ensure long-term water security.

Institutional campuses, with their large roof areas and open spaces, present an excellent opportunity for implementing RWH systems and solar panel istallation. Shri Jai Narain Mishra PG College (KKC), located on Station Road in Lucknow, is an ideal site for such an initiative due to its substantial and the pressing need for sustainable water and energy management in the region.

Need for Rainwater Harvesting at JNMPG College

Lucknow, the capital city of Uttar Pradesh, faces significant groundwater depletion due to excessive extraction for domestic, industrial, and agricultural use. The Central Ground Water Board (CGWB) has reported a declining trend in groundwater levels in several parts of the city. Traditional water sources are becoming insufficient, making it imperative to adopt alternative water conservation methods.

A rooftop rainwater harvesting system can:

- ✓ Replenish groundwater through direct recharge.
- ✓ Reduce dependence on municipal water supply and borewells.
- ✓ Mitigate urban flooding by controlling stormwater runoff.
- ✓ Promote environmental awareness among students and faculty.
- \checkmark Serve as a model for other educational institutions and residential areas.

Practice and Environmental Relevance

- National Water Policy(2012) Emphasizes rainwater harvesting for sustainable water management.
- > Atal Bhujal Yojana (ABHY) Aims at groundwater recharge and community participation.
- PM Surya Ghar Yojna (2024) Aims at providing subsidy for installation of solar panels connected to grid at household and institutional levels.
- Sustainable Development Goal (SDG 6) Ensures availability and sustainable management of water.

Objectives

The implementation of the rooftop rainwater harvesting (RWH) at Shri Jai Narain Mishra PG College (KKC), Lucknow, is driven by the urgent need for sustainable water and energy management in urban areas facing groundwater depletion and electricity crisis. This practice aims to create a scalable and replicable model for rainwater conservation while addressing multiple environmental, economic, and educational challenges.

- ✤ Impact Assessment on Groundwater Recharge
- ✤ Impact Assessment of Solar Panel installation
- Flood Mitigation & Runoff Control
- Reduction of Electricity Bills
- Sustainability & Awareness Building

Benefits

- Lower water procurement costs by reducing dependence on municipal supply and borewells.
- Enhance soil moisture retention, supporting green cover and biodiversity on campus.
- Mitigate urban heat island effect by maintaining groundwater-dependent vegetation.
- Serve as a case study for cost-effective and scalable water conservation solutions.

Goals of the Best Practice

- Improve groundwater levels within and around the campus.
- Reduce the institution's water bills by optimizing rainwater utilization.
- Enhance climate resilience by mitigating water scarcity and urban flooding.
- ✤ Inspire other institutions to adopt similar sustainable water management practices.

This structured approach ensures that the practice not only addresses immediate water scarcity issues but also fosters long-term environmental consciousness and community participation.

Site Location & Description

The Location of Shri Jai Narain Mishra PG College (KKC) in Lucknow Urban provides a geographical context of the site. The college is situated in a densely populated urban area of Lucknow district, Uttar Pradesh.

Key features include:

- ♦ Coordinates: Approximately between 26.85°N latitude and 80.95°E longitude.
- Nearby landmarks: Major roads, residential areas, and institutional zones.
- Accessibility: Proximity to transportation networks (roads, public transit).
- Topography: Gently sloping terrain typical of the Gangetic plains.

Institutional Profile

Shri Jai Narain Mishra PG College (KKC) is a premier educational institution situated at Station Road, Lucknow - a strategically important location in Uttar Pradesh's capital city. Established in 1917, the college spans 4.2 acres with:

- 12 academic buildings featuring RCC roofs (total catchment area: 8,500 m²)
- 2 administrative blocks
- Open spaces covering approximately 60% of campus area
- Geographical & Climatic Analysis
- Geospatial Characteristics:
- Coordinates: 26°50'48"N, 80°56'46"E
- Elevation: 123m above MSL
- Topography: Gentle slope (1.5% gradient) towards southeast

Climatic Parameters:

Parameter	Value	Significance	
Annual Rainfall	986mm (2010-2020 avg)	82% occurs in June-September	
Peak Rainfall Month	July (298mm)	Maximum recharge potential	
Evapotranspiration	1,450mm/year	Highlights water deficit	
Temperature Range	5°C (Jan) - 45°C (May)	Impacts evaporation losses	

Rainwater Harvesting (RWH) Impact (Hydrogeological Analysis):

The RWH system follows CPHEEO (Central Public Health and Environmental Engineering Organisation) guidelines with:

- First Flush Principle: Diverts initial 2mm rainfall
- Gravity-fed Design: 1:100 slope for pipelines
- Modular Approach: Allows future expansion

Impact Assessment

Parameter	Pre-Installation	Post-Installation	Change
Water Table Rise	Baseline (0m)	+3.2m (avg)	+28%
Recharge Volume	Not measured	3800 KL/year	-
Runoff Reduction	85% (unmanaged)	35% (controlled)	-50%

Capital Expenditure:

- Total Project Cost: ₹3,471,488.07 (as per BOQ total).
- Cost per Liter Capacity: ₹0.49 (based on 7100 KL/year system capacity).

Key Findings

- The system achieves 82% collection efficiency of rooftop runoff
- Recharge rate: 25 liters/second during peak rainfall
- Water quality improvement: TDS reduction by 40%
- Significant groundwater recharge (3800 KL/year).
- Reduced surface runoff by 50%, mitigating urban flooding risks.
- Improved water table sustainability (+3.2m rise).
