NEW INDIA INTERNSHIP

WATER, ENVIRONMENT AND WASTE MANAGEMENT

GROUP 1

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WEEK 1

IMPORTANCE OF WATER MANAGEMENT

Water management is a critical aspect of sustainable development that involves the planning, distribution, and utilization of water resources to meet the current and future needs of communities while ensuring the health of ecosystems.

The importance of water management stems from various factors:

CURRENT SCENARIO

- Poor potential for groundwater with only 3.7% of the total geographical area identified for very good potential sites.
- Non-perennial water sources; low availability in dry seasons (approx. 60% population relies on springs)
- Frequent landslides cause damage to water transportation and irrigation structures
- Most villages are remote and do not have access to good quality water present in cities
- Gravity-fed water supplies are primarily used which use gravitational force to transport water downhill into reservoirs or treatment plants
- Floods are recurring phenomena due to high precipitation

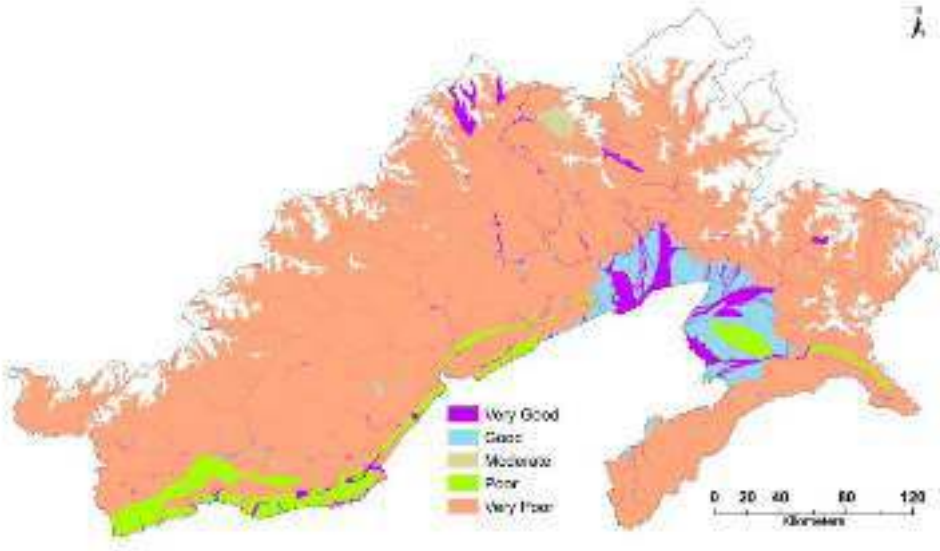


Figure 2-10: Ground Water Potential

CURRENT SCENARIO

- Heavy precipitation leads to waterlogging and oxygen depletion in agricultural lands; damaging crop yields
- There is a lack of data collection modules and monitoring systems for climate variability and water availability
- Tanks and storage facilities have inadequate storage capacities and are often poorly maintained
- NIT Arunachal Pradesh water treatment plant collects water using the gravitational system. The raw collected water is unsafe for use and is subject to sedimentation and chlorination before being sent off for use in the institution. During the dry season, the flow of water is slow and often unable to keep up with the demand. However, it is observed that such problems are less prevalent in the relatively urbanized areas of Itanagar.
- Some areas within the state may face localized water scarcity, particularly during certain seasons. This can be attributed to factors such as uneven distribution, changing weather patterns, and the increasing demand for water. December to February is the lean period, river stream gets dried due to which there is water crisis for three months, due to which sometimes students have to go back to their home

MAJOR DRIVERS OF WATER DEMAND

- Agriculture and horticulture (irrigation)
- Domestic use
- Livestock management
- Water consumption occurs in lecture halls, classrooms, laboratories, and offices due to activities like handwashing, laboratory experiments, and general facility use.
- In the NIT-AP campus, it is observed that the **mess dining halls** are a major driver of water demand since the students washing their own plates are often not mindful of the amount of water being consumed for each plate.

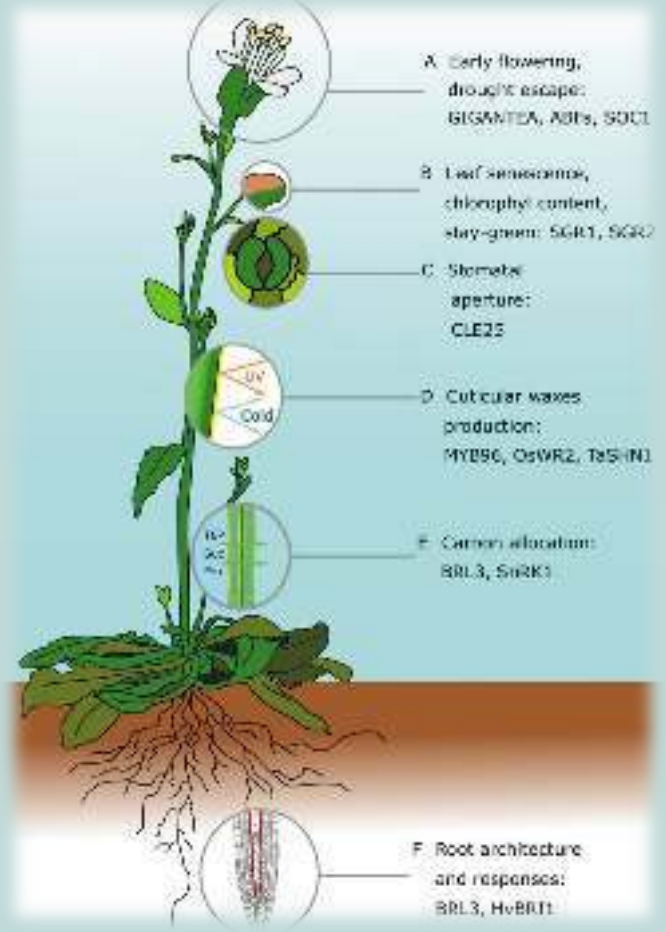
MAJOR AREAS TO SAVE WATER

Landscape Wisely:

- Choose native and drought-resistant plants for landscaping to minimize water requirements.
- Implement efficient irrigation systems such as drip irrigation, and water during early morning or late evening to reduce evaporation.

Install Water-Efficient Fixtures:

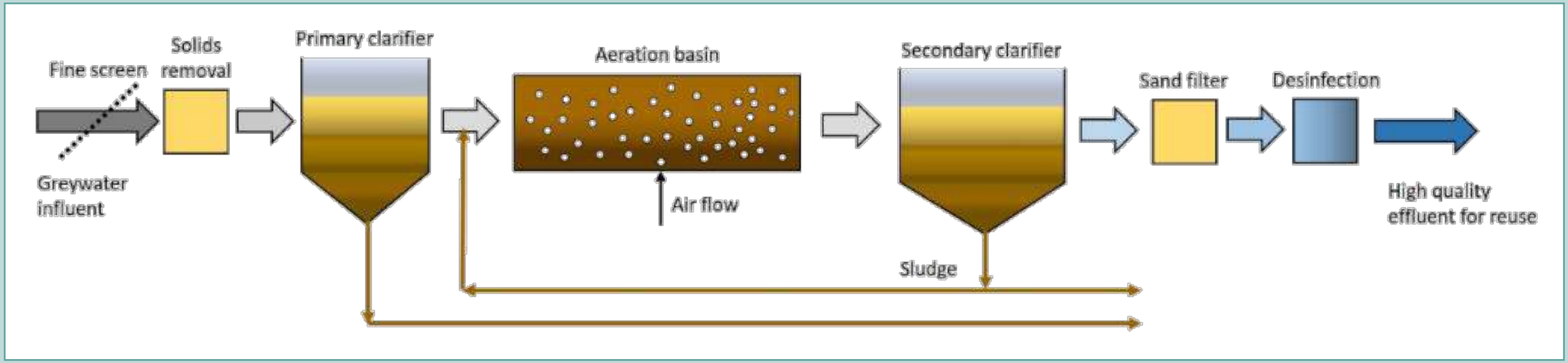
- Replace old and inefficient toilets, faucets, and showerheads with low-flow or water-efficient models.
- Consider installing sensor-activated faucets to reduce water wastage.



MAJOR AREAS TO SAVE WATER

Greywater Recycling:

- Implement systems to recycle and reuse greywater (water from sinks, showers) for purposes like irrigation.
- We can use the greywater for flushing in the washroom.



MAJOR AREAS TO SAVE WATER

Promote Responsible Habits:

- Encourage students and staff to adopt water-saving habits, such as turning off taps when not in use and reporting any water wastage.
- Implement water-saving practices in common areas, such as using brooms instead of hoses for cleaning outdoor spaces.

Fix Leaks:
Regularly inspect and repair any leaks in faucets, pipes, toilets, and irrigation systems.
Encourage reporting of leaks by implementing a system for students and staff to easily communicate such issues.

WATER CONDITIONS

NIT JOTE CAMPUS

- Arunachal Pradesh is one of the heavy rainfall regions among the north-east region of India and the mean annual rainfall varies from 3000 to 5000 mm.
- NIT, AP (JOTE CAMPUS) is located at 93.61E longitude and 27.14 N latitude in Papumpare district of Arunachal Pradesh at an elevation of about 250 meters above mean sea level.

WATER CONDITIONS

NIT JOTE CAMPUS

- Papum Pare District has a very good precipitation with the mean of annual rainfall 3200 mm.
- In a certain village, residents sourced water from both a borewell and a pond. It is likely that the pond's water originates from a tributary of the Brahmaputra River passing through Jote.

Rainfall Data (mm) 2006-2016 for Itanagar (APMD)

Month/Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
January	38.4	7.2	73.4	35.8	NA	9.4	32.8	2.5	6.5	NA	34.2
February	200.6	93.4	21.2	9.4	NA	23	6.6	9.3	65.7	30	9.6
March	38.8	98.8	156.8	41.2	310	113.6	36	116.8	29.5	60.2	101.1
April	168.8	417.2	199.2	197.8	439.9	186	336	79	13	100.9	409
May	417.8	500.8	605.4	485.2	393	337.6	289	557.9	563.6	115.7	482
June	930.4	900	987.4	494.4	713.8	413.4	819	471.7	779.6	1158.9	398
July	365	691.4	750.2	483.6	416.8	936	779.2	551.5	546	319.2	660.6
August	171	367.6	824.9	516.2	366.9	518.2	494	405.6	741.6	483.5	193
September	244	533.6	363.2	123	674.8	274.8	537.8	333.4	570	221.4	486.7
October	105.4	112.8	157.4	240.4	45.8	37.2	215.6	167.4	51.2	87.5	225.3
November	30.8	12.8	NA	26.4	83.8	17.4	3	24	20	NA	NA
December	10.8	3.4	6.4	12.6	19.1	12.9	5	2.8	20	16.2	NA

Source: https://www.academia.edu/download/86114625/Investigation_of_Rainwater_Harvesting_System_for_NIT_Arunachal_Pradesh.pdf

The data indicates that there is comparatively less rainfall in the months of November, December, January, and February, leading to the drying up of the water source during this period. Consequently, the institute encounters a water crisis. To address this, implementing rainwater harvesting becomes crucial, enabling the storage of water to fulfill the demand for potable water during such crises. Additionally, recycled water can serve purposes like flushing toilets, irrigation, and recharging the groundwater table.

WEEK 2

FIELD VISITS

- The team conducted field visits to five neighbouring villages adopted by NIT Jote under **Unnat Bharat Abhiyan**:
  - Jote-I
  - Jote-II
  - Poma
  - Sandgupota
  - Kampo

- We engaged with the local communities and visited schools, hospitals, and traditional handloom and handicraft industries
- The village adoption programme was done under the guidance of NIT UBA coordinator Dr Achyuth Sarkarn.
- Visits were conducted to the bamboo processing unit in Poma, the Govt Secondary School in Jote, and the Govt Secondary School in Basar Nallo.

POMA VILLAGE

- Poma has a total population of around 225
- Literacy rate is around 53%
- Main sources of livelihood:
  - Bamboo processing
  - Jhum cultivation (Cardamom, Red sticky rice, Banana etc.)
  - Dairy and livestock
  - Fisheries
  - Agarbatti production

BAMBOO PROCESSING UNIT – POMA

Location: Poma Village, Arunachal Pradesh

Products:

- Handicrafts and articles made of bamboo
- Handloom products

Market:

- Sold in Itanagar, the capital city

Social Impact:

- Women Employment Opportunities
- Empowering local artisans

Challenges:

- Village residents migrate to the city for better facilities and employment opportunities
- Power supply disruptions (however, this is navigated by using the time for manual work)

BAMBOO PROCESSING UNIT – POMA

Bamboo Products

New India Internship | Week 2

POMA YOUTH ASSOCIATION – INTERACTION

- The Poma Youth Association constructs bamboo sheds for festival celebrations, blending traditional methods with innovative approaches.
- Traditional palm leaf roofs have evolved into modern aluminum roofing. Sturdy bamboo-based stilts, arranged in a cross pattern, provide stability to structures.
- Structures are replaced every 6-12 months, ensuring sustainability and adaptability to changing needs.
- Despite the popularity of sports, there's a lack of facilities hindering the growth of athletic talents.

POMA YOUTH ASSOCIATION – INTERACTION

- High levels of education, including an M.Tech in Agricultural Engineering, but a lack of corresponding job opportunities.
- Civil engineering is a major profession, emphasizing the need for diversification of job opportunities.
- Substance abuse, including drugs and alcohol, is a major issue in the state.
- Rising health issues, including cancer, with only local Primary Health Centers (PHCs) available. Major hospitals require travel to Itanagar.

GOVT. SECONDARY SCHOOL – JOTE-I

- **School Details:**
  - Name: Government Secondary School, Jote-I
- **Attendance:**
  - Low attendance rates
- **Students and Teachers:**
  - Total of 51 students (Class 5 to 10)
  - Teacher to student ratio is 1:3, which implies if 1 teacher can be assigned to 3 students for proper monitoring.
  - All teachers have proper teaching qualification of B.A/M.A./B.Ed.
- **Student Engagement:**
  - Priority to livelihood over education
  - Students and families do not perceive education, grades etc. as crucial, hence the pass percentage of the school is low.

GOVT. SECONDARY SCHOOL – JOTE-I

- **Infrastructure Challenges:**
  - Lack of essential facilities such as labs, libraries, and computers
- **Midday Meal Scheme:**
  - Raw materials delivered for mid-day meals
  - Cooking facilities need improvement
- **Water Issues:**
  - Water shortages in the school, main source of water is the river stream and ground water.
  - Nearby Government Law College has a water surplus

GOVT. SECONDARY SCHOOL – JOTE-I

GOVT. SECONDARY SCHOOL – SANGDUPOTA

- A total of 80 students.
- The school benefits from a clean and plentiful river water supply
- Despite having infrastructure facilities, the school faces a common hurdle in Arunachal Pradesh - a shortage of specialized staff. For instance, computers are stored in cupboards due to the lack of experts.
- The school encounters challenges with low attendance and pass percentages, prompting the need for tailored strategies to enhance academic performance.
- In this region, there's a prevailing trend where livelihood activities take precedence over education, influencing students' educational choices.
- Students face difficulties commuting to the school.
- Many students from Sangdupota opt for boarding schools in Itanagar, indicating a desire for enhanced educational opportunities and experiences beyond their local community

GOVT. SECONDARY SCHOOL – SANGDUPOTA

WEEK 3

GEOGRAPHICAL OVERVIEW

- The hilly terrain of Arunachal Pradesh, India, presents unique challenges and opportunities for environmental management.
- This report examines the environmental issues specific to hilly regions and explores the initiatives and strategies employed in Arunachal Pradesh to address them.
- Arunachal Pradesh, located in the northeastern part of India, is characterized by its mountainous landscape, diverse ecosystems, and rich biodiversity.
- The state is home to numerous indigenous communities, each with a distinct culture heritage closely linked to its natural surroundings.

ENVIRONMENTAL CHALLENGES

DEFORESTATION	BIODIVERSITY LOSS	LANDSLIDES & EROSION
Steep slopes and challenging topography make Arunachal Pradesh susceptible to deforestation, driven by factors such as logging, agriculture expansion, and infrastructure development.	The region's unique flora and fauna face threats due to habitat destruction, fragmentation, and climate change.	Hilly terrains are prone to landslides and soil erosion, exacerbating the risk of natural disasters.

GOVERNMENT INITIATIVES

- FOREST CONSERVATION: Arunachal Pradesh has implemented various measures to curb deforestation, including community-based forest management, afforestation programs, and strict regulations on logging.
- BIODIVERSITY CONSERVATION: Protected areas and wildlife sanctuaries have been established to safeguard the diverse range of species. Conservation projects also involve local communities in monitoring and preservation efforts.
- DISASTER MANAGEMENT: The state government focuses on early warning systems, slope stabilization, and community awareness to mitigate the impact of landslides and erosion.

CHALLENGES AND FUTURE OUTLOOK

- INFRASTRUCTURE DEVELOPMENT: Balancing the need for development with environmental preservation remains a challenge. Sustainable infrastructure practices and environmental impact assessments are crucial.
- CLIMATE CHANGE RESILIENCE: Arunachal Pradesh is vulnerable to climate change impacts. Adaptation strategies and resilience-building measures need to be integrated into environment management plans.

COMMUNITY INVOLVEMENT

- TRADITIONAL ECOLOGICAL KNOWLEDGE: Indigenous communities play a crucial role in environmental management through their traditional knowledge into modern conservation strategies.
- COMMUNITY FOREST MANAGEMENT: Participatory approaches empower local communities to manage and protect their forests sustainably, fostering a sense of ownership and responsibility.

CONCLUSION

The environmental management in Arunachal Pradesh's hilly areas exemplifies a multi-faceted approach, combining governmental initiatives, community involvement, and the integration of traditional knowledge. As the region faces ongoing challenges, the success of these efforts will depend on continued collaboration, adaptive strategies, and a commitment to balancing development with environmental preservation.

WEEK 4

IDENTIFIED WATER PROBLEMS

- The absence of potable water from December to February prompts students to return to their homes.
- Water resources are constrained, primarily consisting of rivers and their tributaries, mainly allocated for drinking, irrigation, flushing, bathing, etc.
- The storage capacity of 200,000 liters only meets the needs of NIT Arunachal Pradesh residents for three days. Consequently, students face an inadequate supply of drinking water during lean months.
- The threat of landslides and earthquakes imposes limitations on significant construction efforts, leading to the abandonment of several construction sites.

PLAUSIBLE SOLUTIONS

Traditional bamboo based water taps used in Jote-1 village is a creative utilization of have bamboo. Bamboo based drip irrigation has been used in areas of NE India such as Meghalaya.

Water taps in aero-plane bathrooms provide highly pressurized and aerated streams of water that function effectively and efficiently while saving 80-90% of water.

PLAUSIBLE SOLUTIONS

Terraced water reservoirs:

- *Adaptable Terrain Design*: Conforms to hilly landscapes, minimizing excavation needs.
- *Soil Erosion Control*: Terraces slow water flow, reduce soil erosion and landslide risks.
- *Efficient Water Storage*: Multiple levels optimize water storage in areas with lower supply.
- *Controlled Irrigation*: Gradual water release supports controlled irrigation, enhancing productivity.
- *Landslide Risk Mitigation*: Acts as a natural barrier, reducing the impact and risk of landslides

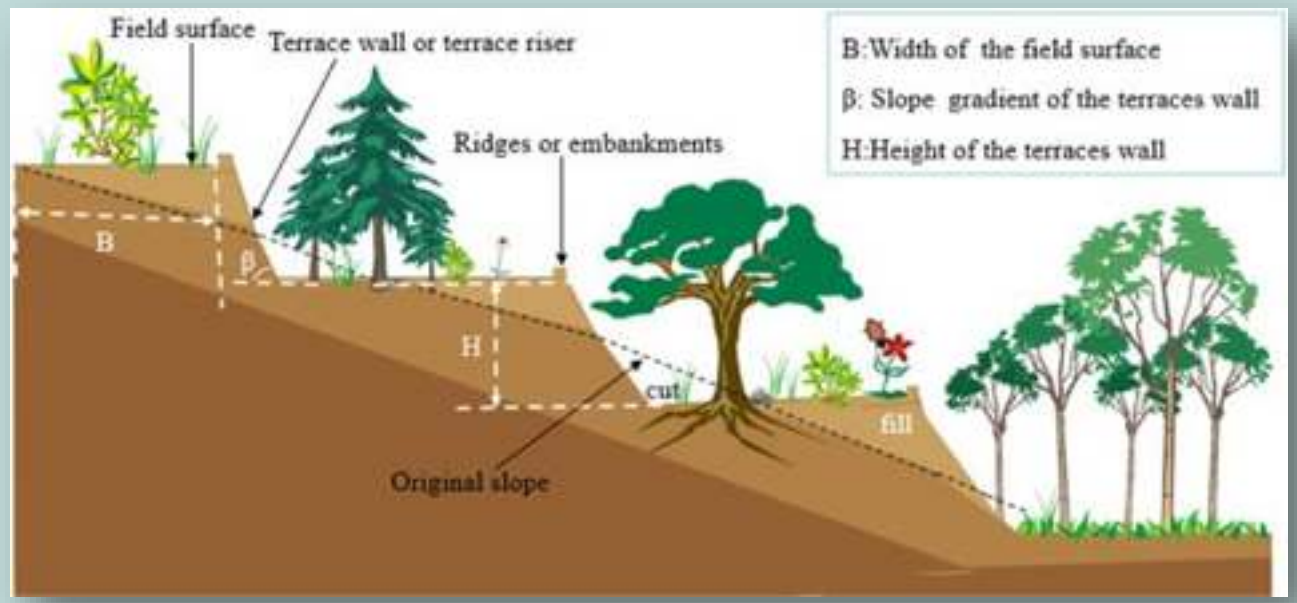
PLAUSIBLE SOLUTIONS

Bioengineering Techniques:

- Using plants with strong root systems for erosion control, a technique known as bioengineering, helps stabilize slopes and prevent soil erosion.
- Planting grasses, shrubs, or other vegetation with deep and fibrous roots is common in such practices. As a result, the campus would be more attractive, and the soil will be strengthened.

PLAUSIBLE SOLUTIONS

- Terracing and slope management techniques can be implemented to prevent soil erosion and landslides. This helps in maintaining soil fertility and stability, ensuring sustainable agriculture in hilly areas.



- Agriculture by contour and terrace farming helps to reduce the importing of the needed materials and food products.
- Dustbins are needed to be placed everywhere in the campus and all over the community areas.

PLAUSIBLE SOLUTIONS

Rain water harvesting:

The harvested rain water would be providing 80 lpcd of water to 1150 individual, to meet the demand of 2800 m3 of water per month, water is needed to be stored in the months of excess rainfall. From table 5.2 total amount of water deficiency is 14261.98m3~ 15000m3 which is needed to be stored in the months of May to September, for fulfilling the continuous demand in the month of October to April. In addition to this a volume of 2800m3 ~3000m3 is needed to be combined with the fixed storage. Thus a storage of 18000m3 of water would be provided to serve the 1150 students.

PLAUSIBLE SOLUTIONS

Zone 1 Analysis

Month	Rainfall (in mm)	Rainfall Volume Zone I (m3)	Demand (m3)	Surplus	Deficit	Consecutive Cumulative Surplus	Consecutive Cumulative Deficit	Net Water Availability
May	386.65	4682.17	2800	1882.17	0	1882.17		
June	679.28	8225.69	2800	5425.69	0	7307.86		
July	530.64	6425.81	2800	3625.81	0	10933.67		
August	415.97	5037.19	2800	2237.19	0	13170.86		
September	357.44	4328.45	2800	1528.45	0	14699.31		14699.31
October	108.98	1319.64	2800	0	-1480.36		-1480.36	
November	17.85	216.17	2800	0	-2583.83		-4064.19	
December	5.84	70.72	2800	0	-2729.28		-6793.47	
January	20.16	244.14	2800	0	-2555.86		-9349.33	
February	30.57	370.23	2800	0	-2429.77		-11779.1	
March	74.14	897.84	2800	0	-1902.16		-13681.26	
April	183.27	2219.28	2800	0	-580.72		-14261.98	437.33

PLAUSIBLE SOLUTIONS

Zone 2 Analysis

Month	Rainfall (in mm)	Rainfall Volume Zone II (m3)	Demand (m3)	Surplus	Deficit	Consecutive Cumulative Surplus	Consecutive Cumulative Deficit	Net Water Availability
November	17.85	519.57	1005	0	-485.43		-485.43	
December	5.84	169.97	1005	0	-835.03		-1320.46	
January	20.16	586.79	1005	0	-418.21		-1738.67	
February	30.57	889.83	1005	0	-115.17		-1853.84	-1853.84
March	74.14	2157.94	1005	1152.94	0	1152.94		
April	183.27	5333.99	1005	4328.99	0	5481.93		
May	386.65	11253.53	1005	10248.53	0	15730.46		
June	679.28	19770.33	1005	18765.33	0	34495.79		
July	530.64	15444.34	1005	14439.34	0	48935.13		
August	415.97	12106.8	1005	11101.8	0	60036.93		
September	357.44	10403.36	1005	9398.36	0	69435.29		
October	108.98	3171.73	1005	2166.73	0	71602.02		69748.18

PLAUSIBLE SOLUTIONS

Rain water harvesting:

Analysis of rainfall, demand and the amount of water to be harvested has been done. The analysis has been done by dividing the area into two zones, zone I (hostel, staff quarters) and zone II(academic block, administrative block and central library). Zone I analysis has been performed for a scenario in which constant demand is taken as 2800 m3/month. After the analysis it is found that for 2800 m3 demand, a storage of ~15000 m3 is required for fulfilling the demand of 1150 individuals throughout the year. The analysis done for Zone II shows that a storage of ~2000 m3 is required to meet the continuous demand of 1005 m3/month of academic blocks (laboratories and bathrooms), central library and the administrative block. There is surplus of 70000 m3 water which can be used for ground water recharge, irrigation, supply to near by villages, etc.

WASTE MANAGEMENT

- Segregation of waste has to be managed to convert the biodegradable waste into manure and to recycle the non-biodegradable waste.
- Biogas plant can be installed to manage the biodegradable wastes.
- Construction waste can be repurposed like wood, metal, and concrete can be recycled for new construction projects.
- The unusable construction waste can be used for landscaping such as crushed concrete for making pathways and soil strengthening.
- Proper sorting and disposal can be made to maximize the potential for recycling and reusing construction waste.

More Ways Forward…

- Advocate for community sports facilities and collaborate with local authorities to develop sporting infrastructure.
- Encourage entrepreneurship through skill development programs. Explore possibilities for agro-based businesses within the community.
- Promote skill diversification and entrepreneurship in various sectors beyond civil engineering.
- Launch awareness campaigns on the risks of substance abuse. Collaborate with NGOs and local authorities for addiction rehabilitation programs.
- Advocate for improved healthcare infrastructure in the region, possibly through partnerships with governmental and non-profit organizations.

More Ways Forward…

- **Low Attendance and Engagement:**

  Introduce interactive teaching methods, extracurricular activities, and mentorship programs to enhance student engagement. Involve parents in awareness campaigns to stress the importance of education.

- **Infrastructure Challenges:**

  Advocate for increased government funding to address infrastructure gaps. Collaborate with NGOs and local businesses for support in providing necessary facilities, including computers and laboratories.

- **Midday Meal Scheme:**

  Work closely with the government to ensure proper implementation of the midday meal scheme. Encourage community participation to enhance the quality and regularity of cooked meals.

More Ways Forward…

- **Specialized Staff Shortage:**

  Collaborate with educational institutions and the government to attract qualified teachers. Provide training programs for existing staff to bridge the skill gap.

- **Livelihood Prioritization:**

  Conduct awareness campaigns highlighting the long-term benefits of education. Introduce vocational training programs that align with local livelihoods, making education more relevant to students.

- **Commute Challenges:**

  Advocate for improved transportation infrastructure. Collaborate with local authorities to ensure safe and accessible commuting options for students.

- **Low Academic Performance:**

  Implement academic support programs, such as tutoring and mentorship initiatives. Involve parents in monitoring and supporting their children's academic progress.


THANK YOU!!