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HIGH-PERFORMANCE BUILDING DESIGN PROFESSIONAL - HBDP EXAM REFRESHER

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ONLINE TRAINING BY KRISHNAJI PAWAR

LEED AP(BD+C), GSAS CGP, GCP, ISO 14001

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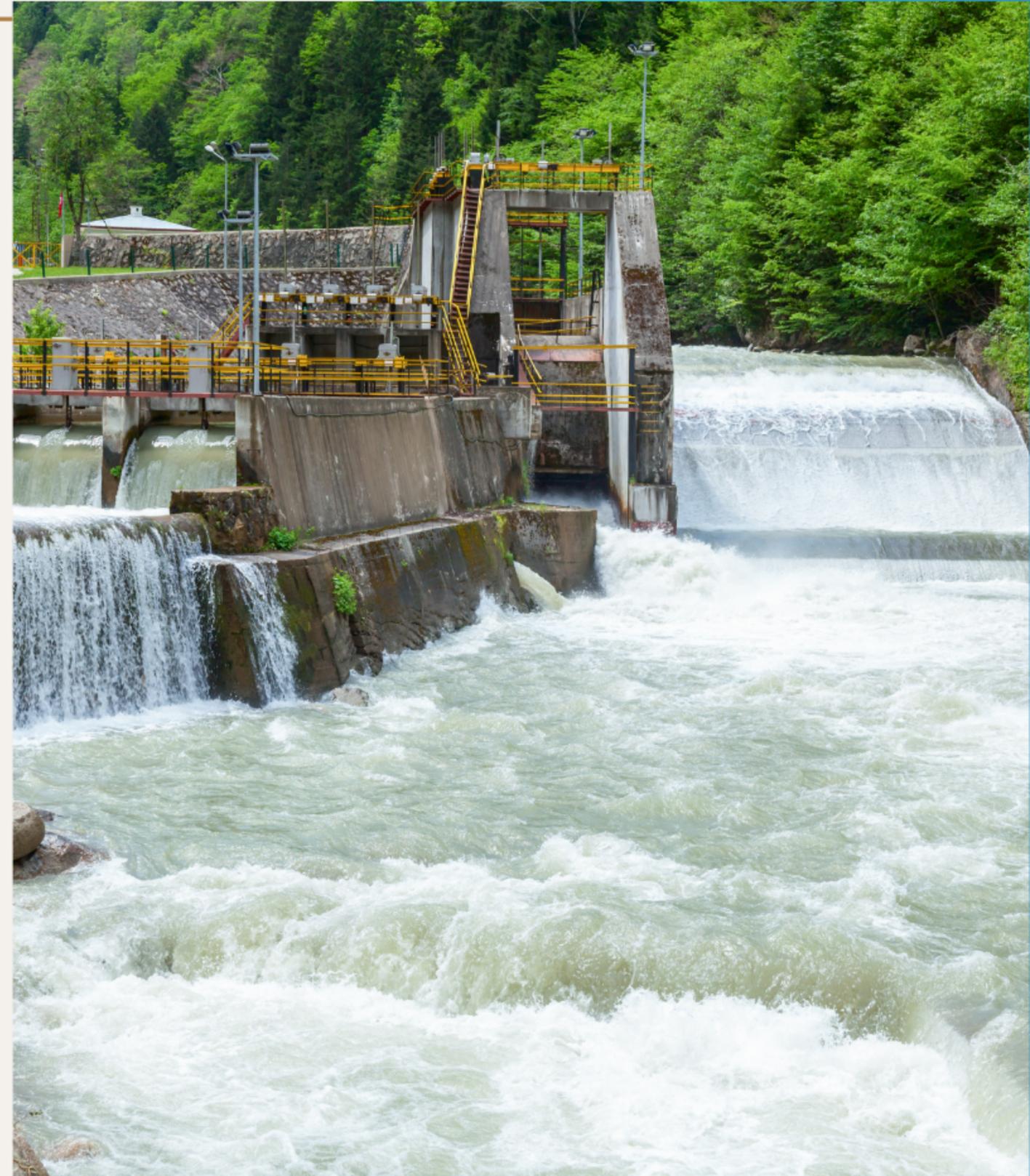
MODULE
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Water Conservation Storm Water Management

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Water conservation is a crucial practice that involves the strategic management and utilization of water resources to minimize waste and ensure sustainable access to this vital resource. As global populations continue to rise and climate change exacerbates water scarcity, the importance of effective water conservation practices cannot be overstated.

Learning Objectives +

- **Benchmarking with Performance Metrics**
- **Water Conservation**
- **Commissioning in Sustainable Construction**
- **Energy and Materials Use and Management**
- **Summary and Resources**
- **HBDP Practice Test V.4.1_Test Your Knowledge!**



WATER CONSERVATION IMPORTANCE AND STRATEGIES

- Water conservation involves strategic management and utilization of water resources to minimize waste and ensure sustainable access.
- The UN predicts that by 2025, two-thirds of the world's population may face water-stressed conditions.
- Water scarcity can lead to socio-economic implications such as reduced crop yields, increased food prices, and food insecurity.
- Water conservation is based on principles of efficiency, sustainability, and equity.
- Techniques to conserve water include installing low-flow showerheads, xeriscaping, rainwater harvesting, drip irrigation, soil moisture management, industry water conservation, and process optimization.
- Effective water conservation requires policy frameworks and community engagement, including establishing water use standards, incentivizing efficient technologies, and enforcing penalties for excessive water waste.
- Public education and engagement can educate the public about the importance of water conservation & practical measures.

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A hand in a dark suit sleeve holds a glowing yellow lightbulb. The background is a blurred cityscape at night. Overlaid on the scene are several white gears of various sizes and a network diagram of white lines connecting nodes. One gear contains a lightbulb icon, and another contains a globe icon.

STORM WATER MANAGEMENT

STORM WATER MANAGEMENT

- Storm water management is crucial in urban planning and environmental sustainability.
- It addresses challenges related to rainfall and snowmelt runoff.
- Urbanization increases impervious surfaces, leading to environmental issues like flooding and water quality degradation.

The Hydrological Cycle and Urbanization

- Storm water management is a part of the hydrological cycle, which includes evaporation, condensation, precipitation, infiltration, and runoff.
- Urbanization disrupts this cycle, causing rapid increases in streamflow and potential flooding.

Components of Storm Water Management

- **Runoff Control:** Detention Basins, retention ponds, green infrastructure, oil-water separators, constructed wetlands, and regulatory frameworks guide storm water management.
- **Water Quality Management:** Oil-Water Separators, constructed wetlands, and regulatory frameworks guide storm water management practices.



STORM WATER MANAGEMENT + Best Management Practices (BMPs)



- Structural BMPs: Physical construction of facilities to manage runoff.
- Non-Structural BMPs: Changes in policy, education, and planning.
- Operational BMPs: Routine maintenance activities to minimize pollutant loads.



Challenges in Storm Water Management

- Climate Change: Increasingly intense and frequent storms necessitate adaptive management strategies.
- Funding and Maintenance: Effective storm water management requires ongoing investment in infrastructure and maintenance.
- Public Awareness and Engagement: Initiatives that inform residents about maintaining green infrastructure and preventing pollution can enhance community resilience.

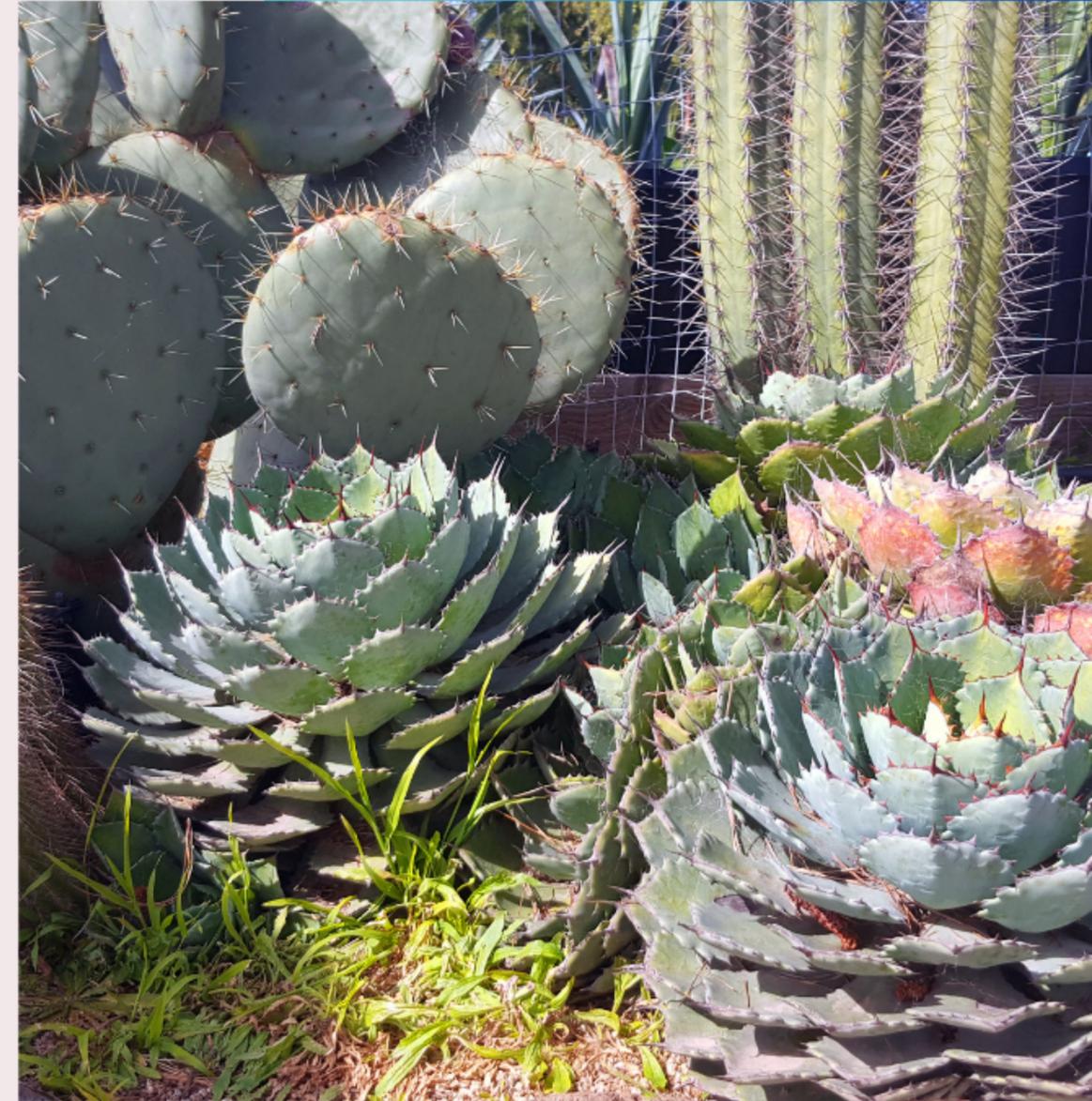
EXAMINING THE FEASIBILITY OF HARVESTING OPTIONS AND APPLICATIONS IN STORMWATER MANAGEMENT

Definition and Concepts of Stormwater Harvesting

- Stormwater harvesting refers to the collection, storage, and use of rainwater runoff for beneficial purposes.
- The feasibility of such harvesting systems depends on local climate, land use, infrastructure, legal frameworks, and community acceptance.

Types of Stormwater Harvesting Systems

- Rainwater Harvesting (RWH) systems capture precipitation directly from roofs and surfaces.
- Green Infrastructure (GI) integrates vegetation and soil into urban environments to manage stormwater.
- Detention and Retention Basins temporarily hold stormwater runoff and release it at a controlled rate.



EXAMINING THE FEASIBILITY OF HARVESTING OPTIONS AND APPLICATIONS IN STORMWATER MANAGEMENT +

Feasibility Considerations

- **Technical Feasibility:** Assesses the capacity of existing infrastructure to support stormwater harvesting systems.
- **Economic Feasibility:** Involves cost-benefit analyses, including initial capital costs, maintenance expenses, and potential savings from reduced water usage or flood damage.
- **Environmental Feasibility:** Assesses the ecological impacts of stormwater harvesting systems, including effects on local ecosystems and water quality.
- **Social Feasibility:** Involves community acceptance and engagement, regulatory frameworks, and the potential for public education on stormwater management practices.

Applications of Stormwater Harvesting

- **Urban Agriculture:** Utilizes harvested rainwater for irrigation to reduce reliance on municipal water supplies.
- **Landscape Irrigation:** Reduces the demand for potable water in irrigation.
- **Industrial Use:** Leverages stormwater harvesting for non-potable applications, leading to significant cost savings and reduced environmental impact.



STORAGE METHODS AND QUANTITIES IN STORMWATER MANAGEMENT

Storage methods refer to physical and engineered systems designed to detain or retain stormwater temporarily or permanently.



- **Detention Basins:** These are designed to temporarily hold stormwater runoff, releasing water at a controlled rate to prevent downstream flooding.
- **Retention Basins:** These are designed to hold water permanently, providing ecological benefits by creating wetland habitats and improving water quality.
- **Green Infrastructure:** Techniques such as green roofs, permeable pavements, and bioretention systems (rain gardens) allow rainwater to infiltrate the ground, reducing surface runoff.
- **Underground Storage Tanks:** These tanks can be used in densely populated urban areas to collect and store stormwater.

QUANTITIES IN STORMWATER MANAGEMENT +

- The effectiveness of stormwater management systems is closely tied to their design capacities, which are dictated by the expected storm events they must accommodate.
- A thorough hydrological analysis will inform the required storage capacities to ensure that stormwater systems are resilient against flooding and other hazards.

Treatment Options in Stormwater Management

- Structural Treatment Options: Sedimentation Basins: These systems capture and settle out sediment from stormwater runoff.
- Swales and Bioretention Areas: These systems facilitate infiltration and filtration through soil and vegetation.
- Constructed Wetlands: These systems mimic natural wetlands and are engineered to treat stormwater through biological, physical, and chemical processes.
- Non-Structural Treatment Options: Source Control Measures: These practices aim to prevent pollutants from entering stormwater systems in the first place.
- Education and Policy: Public education campaigns and regulatory frameworks can promote practices that reduce stormwater pollution.

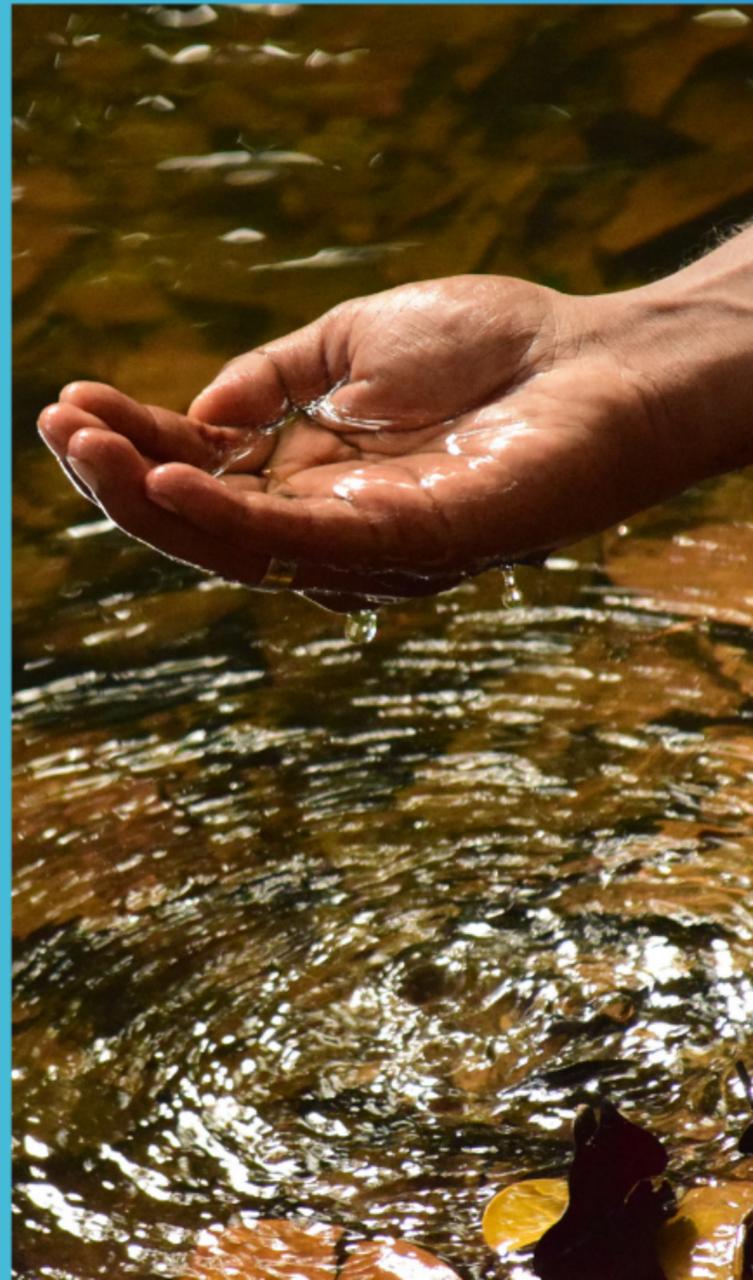


CALCULATING OPTIMUM CAPACITY AND USE IN STORMWATER MANAGEMENT



Understanding Stormwater Management

- Stormwater refers to precipitation falling on impermeable surfaces, which can lead to flooding, water quality degradation, and habitat destruction if not managed properly.
- Stormwater management involves strategies to collect, convey, treat, and discharge stormwater in a manner that minimizes these negative impacts.



Optimum Capacity in Stormwater Management

- Optimum capacity refers to the ideal size and functionality of stormwater management systems that can effectively handle the expected volume and rate of stormwater runoff.
- Factors determining optimum capacity include rainfall intensity and duration, land use and impermeability, soil type and hydrology, and system design and configuration.

CALCULATING OPTIMUM CAPACITY AND USE IN STORMWATER MANAGEMENT +

Calculation of Optimum Capacity

- The Rational Method is used to estimate peak runoff rates using the formula: $Q = CiA$.
- The calculation involves converting the area from acres to square feet and calculating the peak runoff.

Using Optimum Capacity

- Stormwater management systems must consider various storage options, including Detention Basins, Retention Ponds, and Green Infrastructure.
- The dimensions of the basin can be calculated based on the desired depth and area of the basin, ensuring it can accommodate this volume while allowing for sufficient outflow rates to prevent downstream impacts.





BEST MANAGEMENT PRACTICES IN STORMWATER MANAGEMENT

Understanding Best Management Practices (BMPs)

- BMPs are strategies used to mitigate the impacts of stormwater, ensuring sustainable water management.
- BMPs are categorized into two types: structural BMPs and non-structural BMPs.



Structural BMPs

- Physical systems designed to manage stormwater runoff.
- Examples include Retention Basins and Green Roofs.

Non-Structural BMPs

- Focus on changing behaviors and land use practices to reduce runoff and pollution.
- Examples include Public Education Programs and Land Use Planning.

BEST MANAGEMENT PRACTICES IN STORMWATER MANAGEMENT +

Implementing BMPs: A Systematic Approach

- Assessment and Planning: Identifying existing drainage patterns, land use, soil types, and current water quality.
- Integration with Existing Infrastructure: BMPs should complement existing infrastructure.
- Community Involvement: Engaging local stakeholders is essential for successful BMP implementation.
- Maintenance and Adaptability: BMPs require ongoing maintenance and adaptation based on changing climate conditions and urban development.





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