Problem Statements for HackHeritage 3.0

HH301: Smart System for Green Building Monitoring and Carbon Footprint Management

As climate change becomes an increasingly urgent global issue, the challenge is to develop a smart, technology-driven solution that can help buildings, residential complexes, academic campuses, etc. to monitor their energy consumption, waste generation, water usage, mobility patterns, and other environmental factors to maintain a green campus and actively track and minimize carbon footprint over time.

Features:

1. Centralized Smart Monitoring Platform: A unified web and mobile platform to track and manage environmental parameters across the campus, including energy usage, waste generation, transportation data, and water consumption.

2. IoT-Enabled Real-Time Data Collection: Integration with smart sensors/meters for real-time monitoring of electricity, fuel, air quality, water usage, and waste levels to assess carbon-emitting activities accurately.

3. Automated Carbon Footprint Calculator: A module that computes the institution's carbon footprint using data from utilities, transportation, and waste systems, enabling data-driven sustainability planning.

4. Interactive Green Dashboard & Analytics: A visual dashboard presenting key metrics such as carbon emissions, renewable energy usage, recycling statistics, and sustainability trends—daily, weekly, and monthly.

5. AI-Driven Sustainability Suggestions: Intelligent recommendations for reducing environmental impact—such as power-saving tips, mobility shifts (carpooling, cycling), and optimal resource use.

6. User Engagement & Awareness: A participatory module for students and faculty that includes awareness campaigns, green behaviour challenges, eco-scores, leader boards, and reward systems.

HH302: Smart E-Waste Management System

Residential complexes, academic campuses, etc., generate a significant amount of electronic waste (e-waste) including outdated computers, projectors, lab equipment, mobile devices, batteries, and accessories. Due to lack of awareness, poor tracking, and insufficient recycling infrastructure, this e-waste often ends up in landfills, posing serious environmental and health risks.

Features:

1. Centralized E-Waste Management Portal: A system to log, track, and manage disposal of e-waste items (by department, category, age, etc.).

2. QR Code-Based Tagging System: Every e-waste item is tagged with a QR code for tracking its movement and status—from reporting to final disposal or recycling.

3. Smart Categorization and Scheduling: Automated classification of items (recyclable, reusable, hazardous) and schedule pickups or recycling drives with registered vendors.

4. Compliance and Reporting Module: Auto-generation of reports for environmental compliance, inventory audits, and traceability as per CPCB and E-Waste (Management) Rules.

5. User Engagement and Awareness: Campaign module with sustainability education, e-waste challenges, collection drives, green scoreboards, and student participation incentives.

6. Data Analytics Dashboard: Insights on e-waste volume trends, segment-wise contributions, recovery rates, and environmental impact saved through recycling.

HH303: Intelligent Building Automation System for Sustainable Development

The problem is to develop a smart building automation system that uses IoT, AI, and cloud technologies to control and optimize energy usage, improve comfort and safety, and enable real-time monitoring across buildings.

Features:

1. Centralized Building Management System: A web/mobile platform to control lighting, HVAC, water systems, and power outlets across buildings.

2. IoT-Based Sensors and Actuators: Integration of motion sensors, temperature sensors, smart switches, and automated valves to monitor and manage usage dynamically.

3. Smart Scheduling and Occupancy Detection: Automation of lights/AC/fans based on classroom schedules and real-time occupancy using RFID, cameras, or mobile app check-ins.

4. Energy Monitoring and Optimization: Real-time tracking of electricity/water consumption with AI-driven suggestions to reduce wastage.

5. Security and Access Control Integration: Smart locks, surveillance integration, and alerts for unauthorized access or abnormal activity.

6. Maintenance and Alert System: Automatic fault detection and notifications for device failures, overloads, or scheduled maintenance needs.

7. Sustainability Analytics Dashboard: Insights on energy savings, usage patterns, and carbon footprint reduction over time.

HH304: Smart Rainwater Harvesting and Purification System for Sustainable Development

The challenge is to design a smart, automated rainwater harvesting and purification system that can be implemented on academic campuses to efficiently collect, purify, monitor, and reuse rainwater for various purposes including drinking, gardening, flushing, or laboratory use.

Features:

1. Automated Rainwater Collection and Filtration System: Intelligent rooftop or surface runoff collection units with pre-filtration (leaf/debris removal), sedimentation tanks, and activated carbon or membrane filtration units.

2. Smart Water Quality Monitoring: IoT sensors to track pH, turbidity, TDS, and microbial levels in real-time, ensuring the water meets safety standards for its intended use.

3. Water Storage and Usage Integration: Storage tank management with overflow alerts, distribution control, and usage tracking for applications like irrigation, washrooms, or cooling systems.

4. Data Dashboard and Analytics: Web/mobile dashboard displaying live water levels, quality metrics, harvested volume, usage stats, and environmental benefits (e.g., groundwater savings).

5. AI-Driven Insights and Forecasting: Use of weather data and past usage trends to optimize collection capacity, filtration schedules, and storage management.

HH305: Smart Surplus Food Redistribution for a Zero-Waste

Every day, campus canteens, hostels, and event venues discard large amounts of edible but unused food due to lack of coordination, awareness, and a system for timely redistribution. The challenge is to build a smart, sustainable platform that enables tracking, redistribution, and responsible management of surplus food across the campus. The solution should help reduce food waste.

Features:

1. Surplus Food Listing Platform: Canteens, hostels, and event organizers can list excess food (with type, quantity, freshness status and availability window) on the app or portal.

2. Real-Time Notifications and Pickup Coordination: Notifications to pre-registered students, staff, or NGOs about available food with pickup windows, location, and quantity.

3. Food Safety and Quality Tagging: Option to tag food as “Safe to Eat for X Hours,” with guidelines on packaging and storage; include expiry tracking and auto-removal after time limit.

4. Analytics and Environmental Impact Dashboard: Reports showing amount of food saved, carbon/water footprint avoided, and number of people served, promoting transparency and motivation.

5. Integration with Campus Events and Calendar: Automatic prompts or reminders for food logging after campus events (seminars, fests, workshops, etc.).

HH306: Collaborative Platform for Climate Action, Marine Conservation, and Biodiversity Protection

The challenge is to design a tech-enabled collaborative platform that brings together governments, NGOs, researchers, communities, and students to work jointly on climate action, marine ecosystem protection, and biodiversity conservation. The solution should support real-time environmental data sharing, project collaboration, citizen engagement, and impact tracking.

Features:

1. Multi-Stakeholder Collaboration Portal: A platform where government bodies, academic institutions, NGOs, and local communities can co-create, fund, and monitor environmental projects.

2. Crowdsourced Environmental Data Collection: Tools for individuals and groups to upload data related to deforestation, marine pollution, species sightings, and carbon emissions using mobile or web apps.

3. Real-Time Dashboards and Maps: Interactive visualizations of deforestation hotspots, coral reef degradation, plastic waste zones, or GHG emissions—powered by satellite, IoT, or crowdsourced data.

4. Sustainability Scorecards and Impact Metrics: Track progress against SDG 13, 14, and 15 goals at the local, regional, and national level; support decision-making and reporting.

5. Educational and Engagement Features: Learning modules, climate literacy resources, community challenges , and gamification to foster active citizen participation.

6. API and Open Data Integration: Connect with global databases like UNEP, Global Forest Watch, or Ocean Health Index for wider analysis and insight.

HH307: A Collaborative Tech Platform to Combat Poverty, Hunger, and Education Gaps

Despite numerous initiatives to alleviate poverty, end hunger, and improve access to quality education, efforts are often fragmented, lack visibility, and are not scalable due to poor coordination among stakeholders. The challenge is to develop a unified digital platform that fosters collaboration, data sharing, resource mapping, and citizen engagement to effectively support underserved communities.

Features:

1. Integrated Aid Mapping and Distribution System: Geo-tagged data platform to map underserved communities based on poverty, hunger, and education indicators. Enables NGOs and donors to channel resources effectively.

2. Crowdsourced Need Identification Module: Citizens and field workers can report food insecurity, dropout cases, or lack of infrastructure via a mobile app, enabling real-time data-driven response.

3. Partnership and Volunteer Matchmaking: A system to connect volunteers, educators, donors, and service providers with organizations and areas that need help the most.

4. Education and Meal Tracker for Schools: Modules for schools or learning centers to log attendance, mid-day meal distribution, and educational outcomes for children in vulnerable communities.

5. Transparency and Impact Dashboard: Visual dashboards showing how many children were fed, educated, or lifted out of extreme poverty through platform-enabled partnerships.

6. Learning and Awareness Hub: Educational content in regional languages on nutrition, hygiene, digital skills, rights, and vocational training for community upliftment.

HH308: Collaborative Digital Ecosystem for Inclusive Health and Well-Being

Access to quality healthcare remains a challenge in many parts of the world, especially for marginalized communities. There is a need for a collaborative platform that connects all stakeholders, ensures effective implementation of health programs, and promotes preventive healthcare and mental well-being. The challenge is to develop an integrated digital solution that supports multi-stakeholder partnerships to advance good health and well-being (SDG-3). The platform should enable real-time health data tracking, service mapping, health education, and community participation to improve health outcomes across regions.

Features:

1. Collaborative Health Resource Hub: Centralized platform connecting healthcare providers, health workers, NGOs, and volunteers to share health services, infrastructure, and expertise.

2. Community Health Reporting and Mapping: Users and health workers can report cases of illness, outbreaks, or mental health crises in real-time using mobile or web apps.

3. Telemedicine and Virtual Consultation Interface: Integration with verified health professionals for online consultations, especially in underserved areas, along with mental health support lines.

4. Preventive Healthcare and Wellness Education: Modules with interactive, multilingual content on nutrition, exercise, hygiene, reproductive health, and mental well-being.

5. Health Campaign and Program Tracker: Dashboards for tracking immunization drives, free health checkups, mental health camps, blood donation, and wellness programs.

6. Feedback and Referral Loop: Mechanism for citizens to rate services, refer others, or escalate emergency cases to higher authorities or nearby facilities.

HH309: E-Governance for Academic Institutions

The problem is to design and develop a web based solution that can streamline, automate, and standardize the data collection, verification, reporting, and document management process for different accreditations processes like NAAC/NBA/NIRF/QS across departments and stakeholders in an academic institution.

Features:

1. Modular dashboards for different stakeholders (admin, faculty, IQAC/NBA coordinators, HODs).
2. Upload facility for supporting documents and evidences (PDFs, images, etc.).
3. Faculty-wise and department-wise data input forms (teaching-learning, research, infrastructure, etc.)
4. Data validation, de-duplication, and export/import functionalities.
5. Dynamic search and filtrations based on requirements.
6. Criteria based Report generation
7. Should be scalable for multiple departments.

HH310: Timetable Creator and Automated Attendance System

Academic institutions often face logistical challenges in preparing class schedules that meet complex constraints such as faculty availability, course requirements, classroom availability, student groupings, etc. Additionally, manual attendance tracking remains time-consuming, prone to errors, and inefficient for large-scale institutions.

Features:

1. User-friendly interface for admin/faculty to input: courses, teachers, classrooms, time slots, and student groups; Automatic generation of conflict-free timetables taking care of constraints such as, teacher availability, classroom capacity, non-overlapping classes for student groups; subject frequency per week, etc; Option to manually override or adjust schedules.
2. Centralized Web and Mobile Application: A unified platform accessible via web and mobile devices for real-time attendance management by students, faculty, and administrators.

3. Routine-Synced Automated Attendance: Automated attendance trigger and tracking aligned with the class timetable and academic calendar to ensure accurate logging during scheduled sessions.
4. Role-Based Dashboards:
    i. Faculty Dashboard for viewing, validating, and editing attendance records.
    ii. HoD/Admin Dashboard with advanced analytics, attendance trends, defaulter reports, and downloadable summaries.
    iii. Student Dashboard for viewing the records.
5. Smart Notifications and Alerts: Automated alerts for low attendance, missed classes, or anomalies, sent to students and faculty for timely intervention.

HH311: Open Innovation 01: Innovation linked to SDG17

(https://sdgs.un.org/goals)

HH312: Open Innovation 02: Indian Knowledge System driven innovation

(https://iksindia.org/)