**Smart Waste Management System (Nepal)**

**Problem**

* Many citizens in Nepal are unaware of garbage truck arrival times, leading to unmanaged waste on streets.
* Sudden schedule changes or delays are not communicated effectively.
* Littering in public areas is common, and municipalities lack an easy reporting and tracking mechanism.
* Waste service bill payments are still mostly manual and time-consuming.

**Solution**

Our **Smart Waste Management System** connects citizens and local municipalities to create a clean and smart city ecosystem by:

1. **Real-Time Tracking:**  
   GPS-enabled waste trucks with live tracking via Google Maps API.
2. **Instant Notifications:**  
   Citizens receive alerts about garbage truck arrival, delays, or rescheduled timings.
3. **Littering Reports:**  
   Anyone can capture photos/videos of public littering; reports are sent directly to municipalities. If verified, the offender is fined, and the reporter earns reward points.
4. **Digital Payments:**  
   Integrated eSewa, Khalti, and bank payments for waste services.
5. **Transparency & Engagement:**  
   Improves collaboration between municipalities and the public.

**Tech Stack**

* **Frontend:** React.js, Redux, Tailwind CSS
* **Backend:** Node.js, Express.js
* **Database:** MongoDB (Mongoose)
* **APIs & Tools:**
  + Google Maps API (GPS tracking)
  + Cloudinary (media storage)
  + Multer (uploads)
  + Socket.io (real-time communication)
* **Payments:** eSewa, Khalti, Bank integration

**Process Flow**

**1. Citizen Workflow**

* Register/Login.
* View truck schedules and GPS location in real-time.
* Receive notifications about delays or reschedules.
* Upload a photo/video to report public littering.
* Pay service bills online.

**2. Municipality Workflow**

* Update garbage truck schedules and manage GPS tracking.
* Receive reports of public littering with evidence.
* Investigate reports, penalize offenders, and award reward points to reporters.
* Manage bill payments and citizen engagement.

**Impact**

* Cleaner streets and reduced unmanaged waste.
* Efficient waste truck scheduling and citizen awareness.
* Digital transformation of bill payments and municipal services.
* A transparent, tech-driven ecosystem for urban waste management.