Team Xypher

👨‍🔬 Team Members

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Climate Change Monitoring: Glacier Retreat & Land Degradation

Why It Matters in Kazakhstan/Central Asia

- Kazakhstan is facing rapid glacier retreat, increased drought, and land degradation, yet lacks affordable tools for continuous environmental monitoring in remote areas.
- 🧊 Glaciers in Central Asia have shrunk by 25–35% since the 1960s (UNEP, 2023).
- 💧 Aral Sea has lost over 80% of its water volume since 1960 (NASA).
- 🌾 66% of Kazakhstan's land is vulnerable to desertification (UNCCD).
- 👥 Local Impact : Reduced freshwater for agriculture and drinking. Crop failures and soil erosion in rural communities . Lack of real-time climate data hampers decision-making for farmers and policymakers.

🤖 Our Solution

Xypher Climate Scout is an autonomous rover

- Monitors glacier/vegetation height changes.
- Records temperature, humidity, and pressure.
- Transmits real-time geo-tagged data via Telegram or cloud.
- Reads Humidity
- Reads Temperature
- Gives prediction of the glacier melting and vegetation growth using AI and tracks the changes using Laser Based Vertical Height Measuring Robot(successfully protyped)

Innovative Approach

- We developed and successfully tested the upper module of Xypher Climate Scout — a laser-based height measurement system using MPU6050, ultrasonic sensor, and trigonometry to measure glacier, tree, or terrain height accurately.
- We are working on replacing Ultrasonic Sensor with Lidar/Camera
- Added Temperature and Humidity Sensor to track environment and moisture level in plants with automatic watering

- 🌱 Tech for Sustainable Impact
- It provides low-cost, contactless, and remote height monitoring, helping track glacier retreat, vegetation changes, and land shifts—crucial for climate adaptation.
- 🏞️ Locally Suited Built with affordable parts Tested indoors, designed for Kazakhstan’s remote terrain and Sends data via Telegram for use in hard-to-reach areas.
- With Geo mapping to track location and its find its monitoring fixed spot,

Environmental Benefits

- Enables better tracking of glacier retreat, vegetation loss, and land changes. Can help reduce water mismanagement by 20–30% in agriculture . Supports CO_2 capture indirectly by protecting green cover.

- 🔧 Feasibility in Central Asia Low-cost (~$100) and made with off-the-shelf components. Successfully tested indoors, ready for outdoor deployment . Simple to repair and ideal for rural or remote areas.

Plan and Milestones

- **1. Pilot Testing (Months 1–2)**
  Test height measurement outdoors and collect sample data.
- **2. Full System Build (Months 3–4)**
  Add GPS and weather sensors; improve design for outdoor use.
- **3. Field Testing (Months 5–6)**
  Test in rural areas (glaciers, farms, dried lakes) with local partners.
- **4. Scale-Up (Months 7–12)**
  Train users; share open-source kits; collaborate with government/NGOs.

- ⚠ Local Challenges & Solutions Problem
- Rough terrain or weather Strong wheels and waterproof case No internet in some areas Save data offline, sync later Sensor errors Calibrate before each use Less tech knowledge Simple training and setup guides
- 🌍 Scaling Across Kazakhstan & Beyond Low cost (~$100), easy to build . Works in mountains, deserts, farms.

Prototype of Xypher Scout

Working Principle OF Laser based vertical height measuring robot

Uses trigonometric formula
TAN THETA=PERPENDICULAT/BASE

FINDS BASE USING ULTRASNIC SENSOR/LIDAR

FINDS ANGLE THETA USING MPU6050

NOW BASE KNOWN
ANGLE KNOWN

HERE WE GO
PUT IN TAN THETA
NOW PERPENDICULAR IS ALSO KNOWN

WE CAN ALSO USE PYTHAGORUS THEOREM TO FIND SLANT HEIGHT FOR FINDING SLOPES ETC