Integrated monitoring and early warning forest Smoke detection system (IMEWSDS) implementation project

Document Purpose (2 Reports):

- Report 1: Activity 3.3: Internal test the system by the implementer
- Report 2: Activity 3.4 Train the future users and administrators of the system during a 2-days workshop

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1. Executive Summary

1.1. Project Overview

This initiative, undertaken by the International Business and Economic Development Center (IBEDC) under a contract with the United Nations, seeks to enhance forest Smoke management using innovative remote sensing tools.

The objective of this project (Integrated Monitoring and Early Warning Forest Smoke Detection System Implementation Project) is to implement a monitoring and early detection system for forest and landscape Smokes. The system enhances early detection capabilities, provides real-time monitoring, and facilitates quick response to potential Smoke incidents. The system will be installed on the Customer's local server and will provide secure access to authorized users through a web interface.

Project Key Objectives were:

- Develop an integrated monitoring and early warning system for forest Smokes.
- Utilize innovative remote sensing tools to enhance Smoke detection capabilities.
- Establish a standard operating procedure for the system's use.
- Train personnel on the new system for effective implementation.

Stakeholder Analysis

- United Nations (UN): Client, providing oversight and ensuring project aligns with global standards and protocols;
- International Business and Economic Development Center (IBEDC): Contractor responsible for project execution;
- LEPL The Agency of Protected Areas (http://apa.gov.ge/en) of Ministry of Environment and Natural Resources Protection of Georgia Protected Areas - Beneficiary of the System;
- Local Authorities and Park Management: Key stakeholders in the Borjomi-Kharagauli National Park who will utilize and manage the new system;
- Local Community: Indirect beneficiaries of enhanced Smoke detection and management systems.

2. Assignment Objectives

2.1. Activity 3.3: Internal test the system by the implementer

United Nations project (RFP 3100005138) for Provision of technical assistance for building up integrated monitoring and early warning forest Smokes detection system in the Borjomi - Kharagauli National Park by innovative remote sensing tools, in Georgia

According to the project assignment described in this document:

the Activity 3.3: Objective Is:

- *3.3 Internal test the system by the implementer:*

Deliverable is:

- *The implementer will run a test of the integrated monitoring and early warning forest Smokes detection system in the selected area.*
- *All bugs will be solved to deliver a fully operational pilot to the country at the end of this Technical Assistance.*

the Activity 3.4: Objective Is:

- *Activity 3.4 Train the future users and administrators of the system during a 2-day workshops onsite*

A demonstration workshop will be organized in the selected area in presence of the future users and administrators of the system to a) explain the way the system works, b) let the future users and administrators test the system by their own, c) explain the operational procedures that should be implemented based on the responses generated by the system, d) answer and clarify any questions the future users and implementers may have. An average of 25 persons are expected.

Deliverable s for outcome 3

- *3.1*
  - *a Minute of the meeting with a list of participants disaggregated by gender*
  - *b Definition of the criteria used for the selection of the site and name of the location selected for the pilot.*
- *3.2 The integrated monitoring and early warning forest Smokes detection system is operational*
- *3.3 The integrated monitoring and early warning forest Smokes detection system is functioning efficiently without bugs*
- *3.4*
  - *a. Minute of the workshop with a list of participants disaggregated by gender*
  - *b Materials developed for the workshop.*

The document below provide report how this tasks was accomplished.

3. Testing Strategy and plan

3.1. Purpose

To ensure the integrated monitoring and early warning forest Smokes detection system functions as intended, meets project requirements, and operates effectively in the selected area of Borjomi-Kharagauli National Park, Georgia. The testing strategy and corresponding testing process will identify and address any system defects or inefficiencies, ensuring a fully operational pilot system.

3.2. Testing Strategy

3.2.1. Objectives

1. Validate system components (hardware, software, and network infrastructure).
2. Verify compliance with functional and non-functional requirements.
3. Ensure system reliability under different environmental and operational conditions.
4. Detect and resolve system bugs to deliver a fully operational system.

3.2.2. Scope

- Testing all hardware components (cameras, solar panels, masts, shelters).
- Validating software modules, including control and management center, GIS platform, user management, and alarm systems.

3.2.3. Test Levels

1. **Unit Testing:** Evaluate individual components like cameras, software modules, and network devices.
2. **Integration Testing:** Ensure seamless interaction between system components (e.g., cameras with the control system).
3. **System Testing:** Test the complete system under operational conditions.
4. **User Acceptance Testing (UAT):** Conduct tests with end-users to validate usability and functionality.

3.2.4. Test Environment

- **Location:** Borjomi - Kharagauli National Park of Georgia.

- **Environment Setup:** The system[1] testing simulated system operating conditions, including real-time video monitoring, Smoke detection and network connectivity.
- **Equipment:** All installed infrastructure and components of the System.

4. Testing Scenarios and Procedures

4.1. Scenario 1: System Functionality Testing

- **Objective:** Validate core functionalities of Smoke detection and monitoring.
- **Steps:**
    1. Simulate smoke or Fire within the camera's coverage range.
    2. Verify that the camera detects and transmits data to the control center.
    3. Ensure the GIS platform accurately localizes the Smoke.
    4. Test real-time alarm generation (visual and sound).

4.2. Scenario 2: Hardware Reliability Testing

- **Objective:** Confirm the durability and functionality of hardware components.
- **Steps:**
    1. Test video camera functionality under varying light and weather conditions.
    2. Evaluate solar panel performance during different weather scenarios.
    3. Inspect masts and shelters for physical integrity under simulated adverse conditions.

4.3. Scenario 3: Control and Management Center Application

Objective: Validate the architecture, central database functionality, WEB GUI design, and video surveillance integration.

Steps:

1. **Database Testing:**
    - Verify the database schema matches the design specifications.
    - Test CRUD (Create, Read, Update, Delete) operations for video footage, user data, and logs.
2. **WEB GUI Testing:**
    - Test interface accessibility across devices (desktop, tablet, mobile).
    - Validate responsiveness and usability of the dashboard.
    - Perform cross-browser testing (e.g., Chrome, Firefox, Edge).

[1] System - Integrated monitoring and early warning forest fires detection system in the Borjomi - Kharagauli National Park by innovative remote sensing tools, in Georgia

3. **Video Surveillance System Testing:**
    - Connect camera to the system and test real-time video streaming.
    - Simulate Smoke events to evaluate AI-based detection capabilities.
    - Verify video feed recording and playback functionalities.

Acceptance Criteria:

1. Database operations are performed without errors or data loss.
2. WEB GUI is accessible, responsive, and user-friendly.
3. Real-time video streaming is stable, and Smoke events are detected within 5 seconds.

4.4. Scenario 4: Testing User Management System

Objective: Ensure effective role-based access control and privilege management.

Steps:

1. **User Role Setup:**
    - Create roles **(Admin, Operator, Viewer)** and assign privileges.
    - Validate that each role has access only to authorized functionalities.
2. **Authentication Testing:**
    - Test login functionality with single and multi-factor authentication.
    - Simulate incorrect login attempts to ensure account lockout policies function.
3. **Audit Log Testing:**
    - Verify that all user actions are logged correctly, including login, logout, and system changes.

Acceptance Criteria:

1. Roles and privileges are implemented correctly without overlap or gaps.
2. Authentication processes are secure and function as expected.
3. Audit logs capture all user actions accurately.

4.5. Scenario 5: Testing GIS Platform and Case Management System

Objective: Validate geospatial functionalities and incident tracking workflows.

Steps:

1. GIS Platform Testing:
    - Load maps and verify the accurate display of camera locations, forest areas, and Smoke zones.
    - Simulate Smoke events and verify precise localization on the map.
    - Test measurement tools for distances and areas.
2. Case Management System Testing:
    - Create and update incident cases linked to Smoke events.
    - Assign tasks to users and track case resolution progress.
    - Generate and export incident reports.

Acceptance Criteria:

1. GIS tools provide accurate and real-time geospatial data.
2. Smoke event localization is precise, with less than 50 meters of error.
3. The case management system supports end-to-end incident tracking and reporting.

4.6. Scenario 6: Testing Alarm and Notification System

Objective: Validate alarm generation, notification delivery.

Steps:

1. Alarm Testing:
    - Simulate smoke events to trigger sound and visual alarms.
    - Test alarm thresholds for different scenarios (e.g., smoke vs. Fire).
2. Notification System Testing:
    - Configure notifications for multiple users and test delivery via Integrate in system push notifications.
    - Validate notification accuracy, timing, and reliability.

Acceptance Criteria:

1. Alarms are triggered within 5 seconds of smoke detection.
2. Notifications are delivered to all users within 10 seconds without errors

4.7. Scenario 7: Software Integration Testing

- Objective: Validate integration between software modules and external systems.
- Steps:
    1. Test user management functionality, including role-based access controls.

2. Verify real-time data streaming between cameras and the control center.

4.8. Scenario 8: Network Stability Testing

- Objective: Ensure uninterrupted communication across the system.
- Steps:
    1. Simulate a network outage and evaluate system behavior.
    2. Test data recovery and failover mechanisms.
    3. Verify real-time data transfer during peak traffic conditions.

4.9. Scenario 9: Security Testing

- Objective: Ensure system protection against unauthorized access and data breaches.
- Steps:
    1. Conduct penetration testing on the network and software.
    2. Validate SSL/TLS encryption for secure communications.
    3. Test compliance with access control policies.

5. Risk Management in Testing

5.1. Risk Identification and Mitigation

Risk	Likelihood	Impact	Mitigation Strategy
Hardware failure	Medium	High	Perform regular maintenance and pre-testing hardware checks.
Network instability	High	High	Set up redundant communication channels.
False positive smoke detection	High	Medium	Calibrate detection algorithms and validate settings.
User authentication failure	Low	High	Test multi-factor authentication mechanisms.

5.2. Monitoring and Control

- Maintain a **Risk Register** for tracking identified risks, their status, and mitigation measures.
- Conduct periodic risk reviews and update mitigation strategies as necessary.

6. Test Summary Conclusion and Recommendations

The integrated testing of the Monitoring and Early Warning Forest Smokes Detection System was conducted successfully. All primary components of the system, including hardware, software, and network infrastructure, were tested against predefined scenarios and acceptance criteria.

In this chapter we will provide:

- Summary of testing outcomes.
- List of resolved issues and pending fixes.
- Recommendations for further improvement or maintenance schedules.

This summary and plan ensure the system operates reliably and efficiently while adapting to future requirements.

6.1. Testing Period

- Testing has Started: 17 October 2024.
- Testing Completed: 29 November 2024.

6.2. Key Outcomes

1. Control and Management Center Application (3.1):
    - The central database performed all CRUD operations without errors.
    - The WEB GUI demonstrated excellent responsiveness across all tested devices and browsers.
    - Real-time video streaming and recording operated smoothly, with no latency issues.
2. User Management System (3.2):
    - Roles and privileges were implemented accurately, and authentication mechanisms were secure.
    - Audit logs captured all user actions comprehensively.
3. GIS Platform and Case Management System (3.3):
    - GIS tools provided accurate geospatial data, and Smoke localization errors were within acceptable thresholds.
    - The Case Management System supported full lifecycle tracking of Smoke incidents.
4. Alarm and Notification System (3.4):
    - Alarms triggered within 5 seconds of Smoke detection.
    - Notifications were delivered to designated users within 10 seconds.

Overall Status:
All core functionalities passed testing successfully, confirming the system's readiness for deployment.

7. System Testing Report

7.1. Summary of Testing Results

Test Category	Total Tests	Passed	Failed	Pending	Status
System Functionality	2	2	0	0	Pass
Hardware Reliability	2	2	0	0	Pass
Software Integration	2	2	0	0	Pass
Network Stability	2	2	0	0	Pass
Security Testing	2	2	0	0	Pass

Test Case	Expected Outcome	Actual Outcome	Status (Pass/Fail)
Smoke detection functionality	Alarm triggers within 5 seconds	Alarm triggered successfully	Pass
Network connectivity	Continuous real-time streaming	Real-time streaming stable	Pass
Camera under low light	Detect smoke and stream data	Smoke detected and streamed	Pass

Overall Status: All tests successfully passed.

7.2. Bug Summary

Bug ID	Description	Severity	Status	Resolution
001	Alarm delay > 5 seconds	High	Resolved	Optimized logic
002	Network interruptions	Medium	In Progress	Adding redundancy

7.3. Scenario 1: System Functionality Testing

Objective: Validate core functionalities of Smoke detection and monitoring.

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
Smoke detection simulation	Smoke is detected within 5 seconds as soon as the designated geographical area entered the camera's field of view, alert is triggered, GIS shows accurate location.	Smoke detected, alarm triggered, location accurate.	Smoke detected, alarm triggered, location accurate.	Pass
Alarm notification	Alarm notification is sent to all designated users within 10 seconds.	Notifications received by all designated users.	Notifications received by all designated users.	Pass

7.4. Scenario 2: Hardware Reliability Testing

Objective: Confirm the durability and functionality of hardware components.

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
Camera operation in low light	Cameras capture and transmit clear footage in low-light conditions.	Clear footage transmitted in low-light.	Clear footage transmitted in low-light.	Pass

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
Solar panel efficiency in overcast conditions	Solar panels maintain 70% operational efficiency in overcast weather.	Panels maintained required efficiency.	Panels maintained required efficiency.	Pass

7.5. Scenario 3: Software Integration Testing

Objective: Validate integration between software modules and external systems.

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
User role functionality	Roles and privileges function correctly, restricting or granting access as needed.	Admin, Operator, and Viewer roles behave as expected.	Admin, Operator, and Viewer roles behave as expected.	Pass

7.6. Scenario 4: Network Stability Testing

Objective: Ensure uninterrupted communication across the system.

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
Network recovery from failure	The system restores communication within 30 seconds of a simulated network failure.	Network recovers within 30 seconds.	Network recovers within 25 seconds.	Pass
High-load network performance	Real-time video streaming continues without interruption during peak traffic.	Streaming remains stable.	Streaming remains stable.	Pass

7.7. Scenario 5: Security Testing

Objective: Ensure system protection against unauthorized access and data breaches.

Test Case	Acceptance Criteria	Expected Outcome	Actual Outcome	Status
Penetration testing	No unauthorized access achieved through simulated attacks.	All simulated attacks prevented.	All simulated attacks prevented.	Pass
Data encryption validation	All data transmissions are encrypted with SSL/TLS protocols.	Encryption verified for all transmissions.	Encryption verified for all transmissions.	Pass

7.1. Risk Summary

Overview of identified risks and their mitigation status.

This table provides a detailed summary of identified risks associated with the development, testing, and deployment of the Integrated Monitoring and Early Warning Forest Smokes Detection System. Each risk is assigned a unique ID, assessed for likelihood and impact, and provided with a mitigation strategy.

Risk ID	Risk Description	Likelihood	Impact	Severity	Mitigation Strategy	Status
R-001	Delay in smoke detection during peak system load	Medium	High	Critical	Optimize system performance and stress test during peak loads.	Monitored
R-002	Database corruption during high transaction volumes	Low	High	High	Implement database backup, recovery mechanisms, and transaction logging.	Mitigated
R-003	Network connectivity failure leading to data loss	High	High	Critical	Set up redundant communication channels and offline data caching.	Monitored
R-004	Inaccurate GIS localization for Smoke event coordinates	Medium	Medium	High	Calibrate GIS platform and validate coordinate accuracy using test scenarios.	Resolved
R-005	Unauthorized access to the	Low	High	High	Strengthen authentication	Mitigated

Risk ID	Risk Description	Likelihood	Impact	Severity	Mitigation Strategy	Status
	system or data breaches				mechanisms (MFA), conduct penetration testing, and implement encryption.	
R-006	Notification system delay impacting timely alerts	Medium	High	High	Optimize notification delivery system and conduct extensive testing for all scenarios.	Monitored
R-008	Solar power system underperformance during low sunlight	High	Medium	High	Use advanced monitoring to predict and mitigate power shortages with additional battery reserves.	Monitored
R-009	Hardware damage from adverse weather conditions	Low	High	High	Use weather-resistant materials and ensure regular maintenance of masts and shelters.	Mitigated
R-010	False positive alarms causing unnecessary responses	High	Medium	High	Calibrate detection algorithms and provide threshold adjustment options to operators.	Resolved

7.2. List of Resolved Issues and Pending Fixes

7.2.1. Resolved Issues

Issue ID	Description	Resolution
001	System interface and dialogs localization errors (translation into Georgian language)	Translation improved and checked

8. Conclusion and Recommendations

Described in this document testing process is designed to ensure the system's functionality, reliability, and compliance with project requirements. Above Comprehensive strategy and testing report reports facilitate the delivery of a robust, fully operational pilot system, minimizing risks and addressing potential issues before the final handover.

1. Conclusion:
   The system has met all acceptance criteria across functional, hardware, integration, network, and security tests. It is ready for deployment as a fully operational pilot.
2. Recommendations:
   - Implement ongoing monitoring and scheduled maintenance to ensure consistent performance.
   - Conduct additional training sessions for end-users to optimize system utilization.
   - Expand testing scenarios during future phases for broader environmental conditions.

8.1. Recommendations for Further Improvement

1. System Optimization:
   - Continuously monitor performance metrics and refine detection algorithms to handle diverse environmental conditions.
   - Implement periodic stress tests to ensure system reliability under peak loads.
2. Hardware Maintenance:
   - Schedule bi-annual inspections of all hardware components, including masts, shelters, solar panels, and cameras.
   - Replace critical components (e.g., batteries) based on lifecycle estimates to prevent downtime.
3. Network Resilience:
   - Establish backup internet connectivity to handle potential disruptions.
   - Upgrade network switches and routers for improved data transmission.
4. User Training:
   - Conduct refresher training workshops for users and administrators annually.
   - Provide updated user manuals and quick reference guides after each major system upgrade.
5. Ongoing Risk Management:
   - Maintain a dynamic risk register and review risks quarterly.
   - Regularly test and update mitigation strategies to address emerging threats.
6. Future Enhancements:
   - Integrate additional AI features for predictive analytics, enabling proactive Smoke management.

- Expand the system's GIS capabilities to include satellite data for enhanced situational awareness.
- Explore scalability options to cover additional areas or integrate more sensors.

8.2. Maintenance Schedule

Task	Frequency	Responsible Team
Hardware inspections	Bi-annual	Field Maintenance Team
Software updates	Quarterly	IT and Development Team
Battery and solar system checks	Monthly	Field Maintenance Team
Network performance testing	Quarterly	IT and Network Team
User and administrator training	Annual	Training and Support Team

9. Appendix

9.1. Smoke Detection

During the testing process, smoke detection was automatically triggered as soon as the designated geographical area entered the camera's field of view. The system identified smoke as a Potentially Dangerous Object (PDO) and notified the operator. The operator could then analyze the detected PDO using photo and video materials, manually adjust the camera to focus on the object, and confirm whether the detection was indeed smoke.

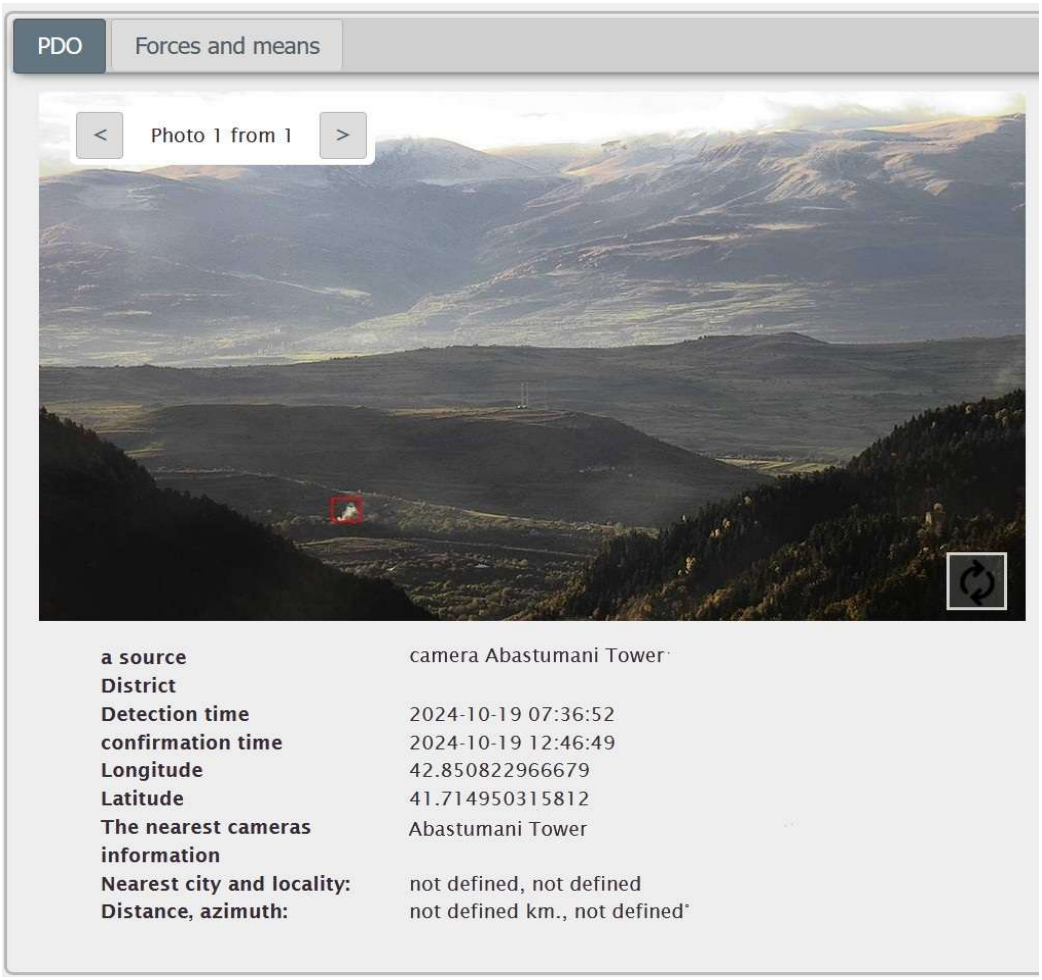


Figure 1 - Case N1 - distance from camera 4.62 km

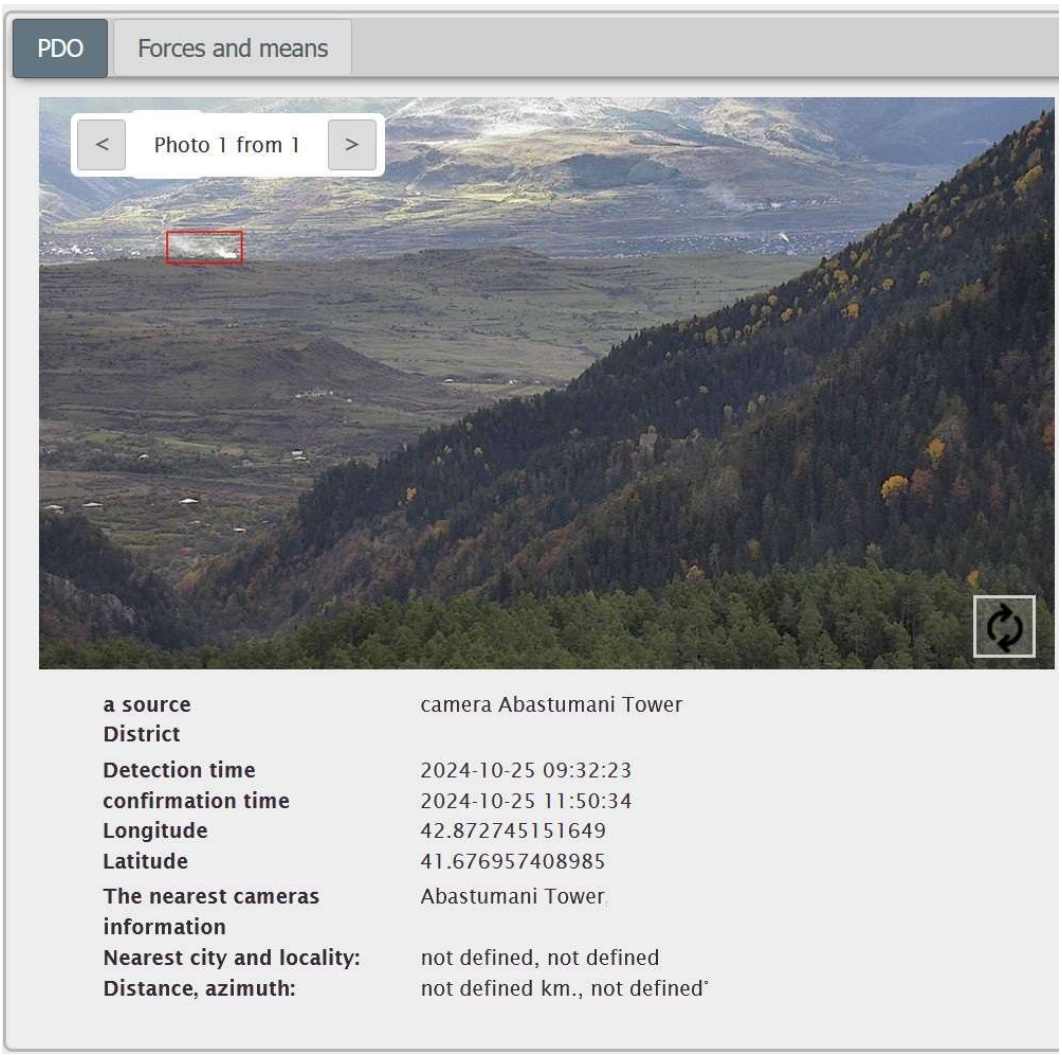


Figure 2 - Case N2 - distance from camera 8.82 km

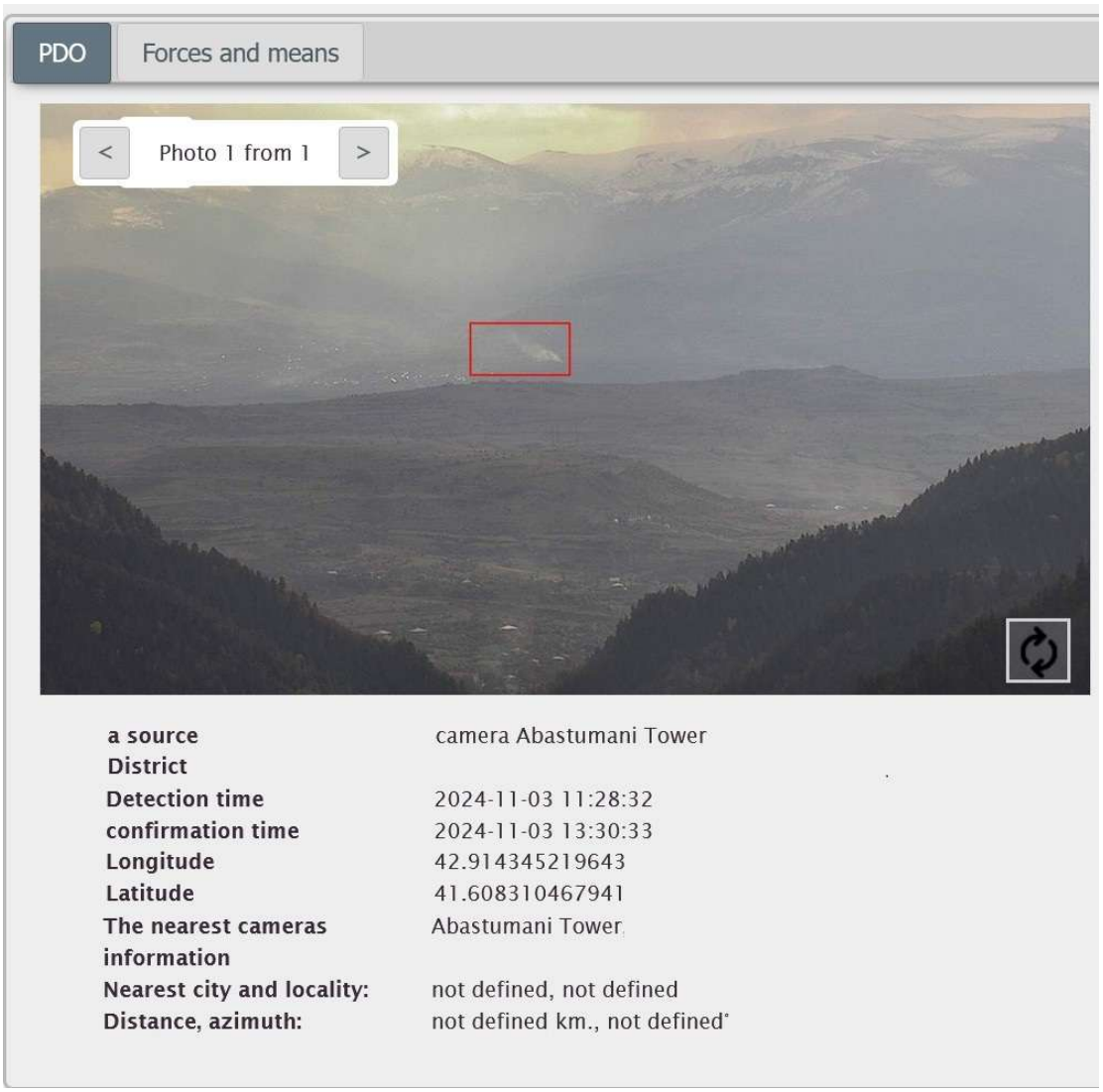


Figure 3 - Case N3 - distance from camera 17.86 km

9.2. Video Feed Collection

High-resolution cameras with night vision and thermal imaging capabilities continuously capture video feeds of the monitored area

System Displays live video feeds from selected cameras. Show interactive map with camera locations and orientations.

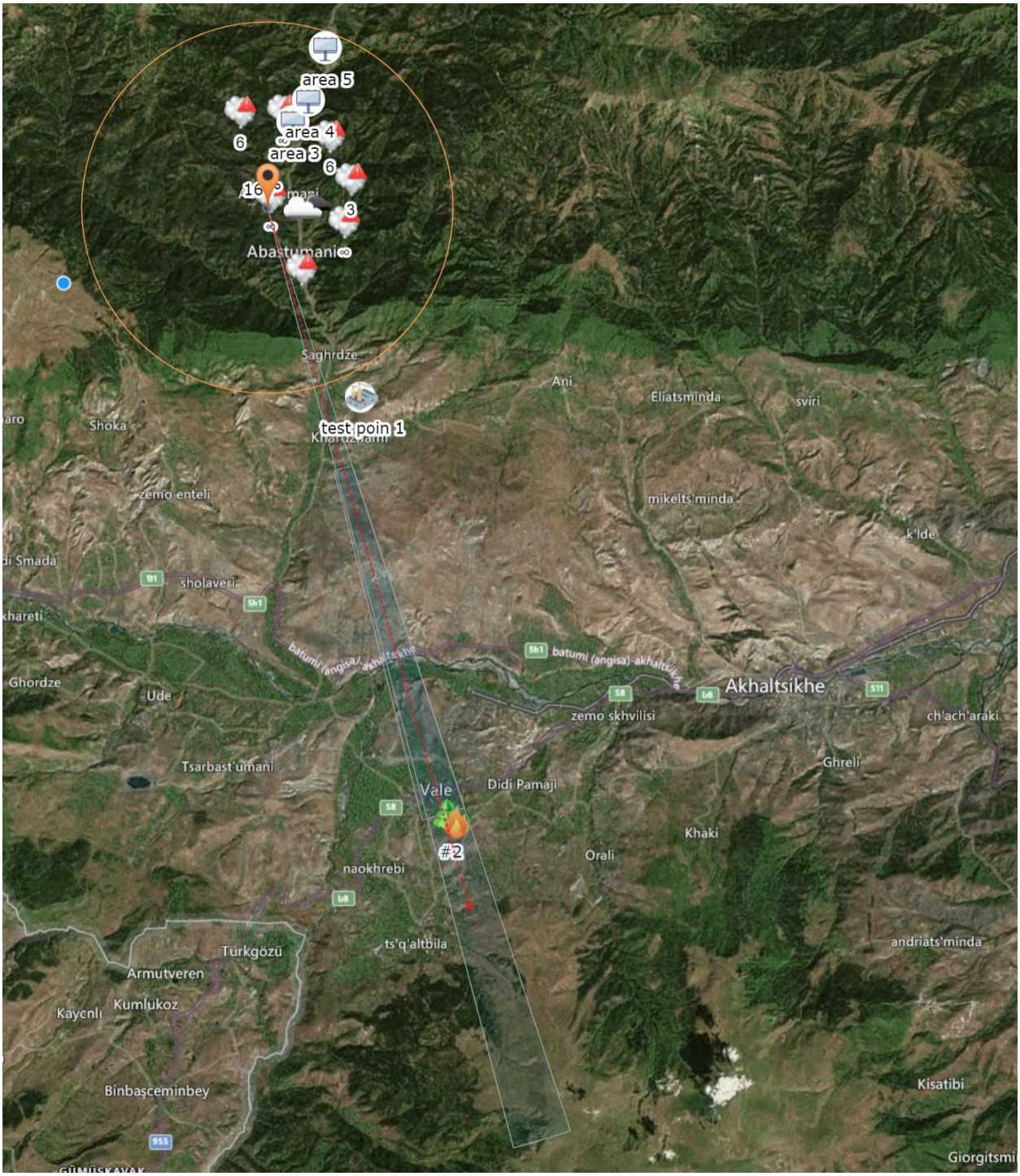


Figure 4 – Patrolling Mode in the Application

Figure 5 – Camera Monitoring area 1 (from 360 Degree)

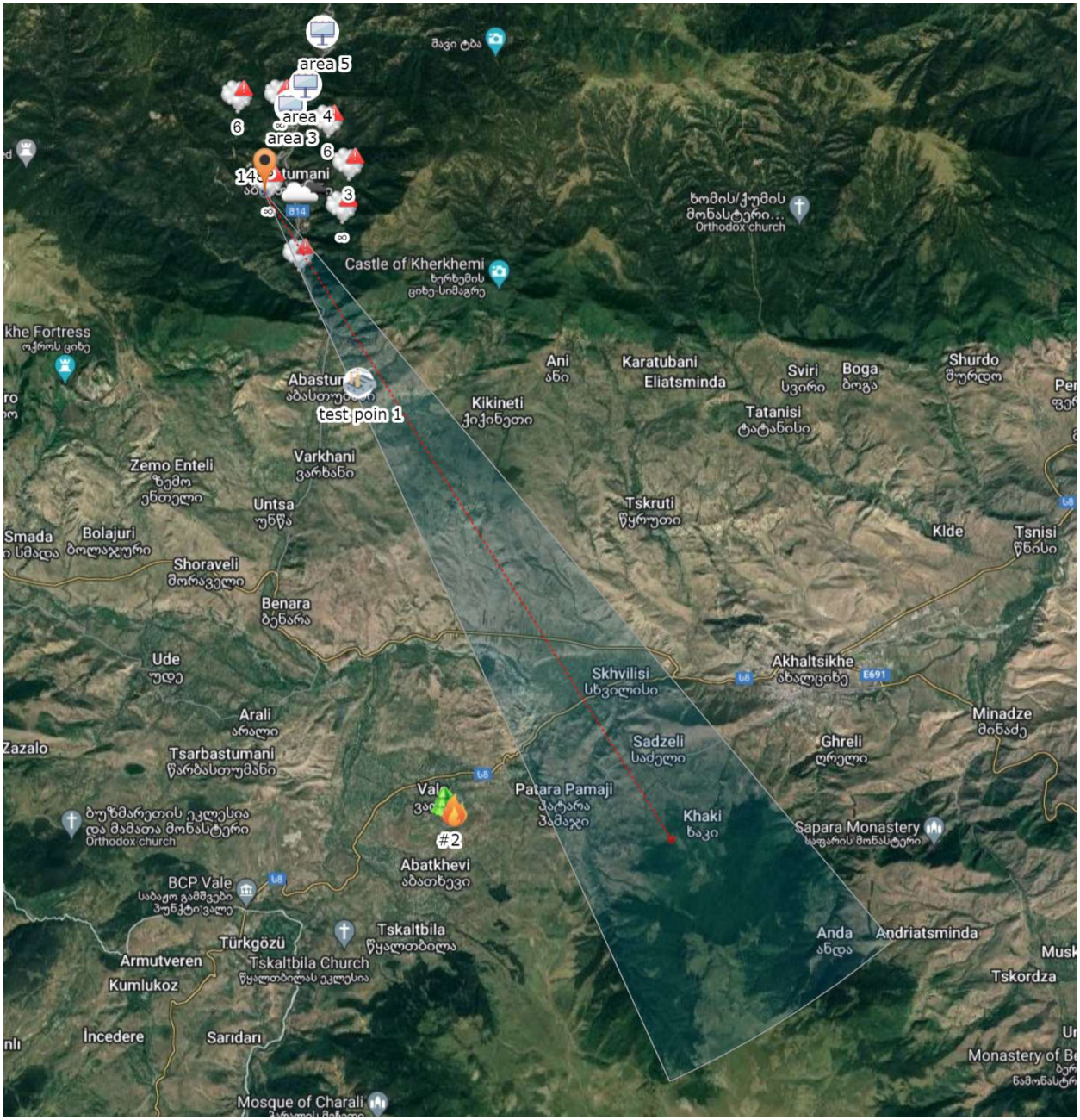


Figure 6 - Camera Monitoring area 3 (from 360 Degree)

9.3. Weather Data Collection

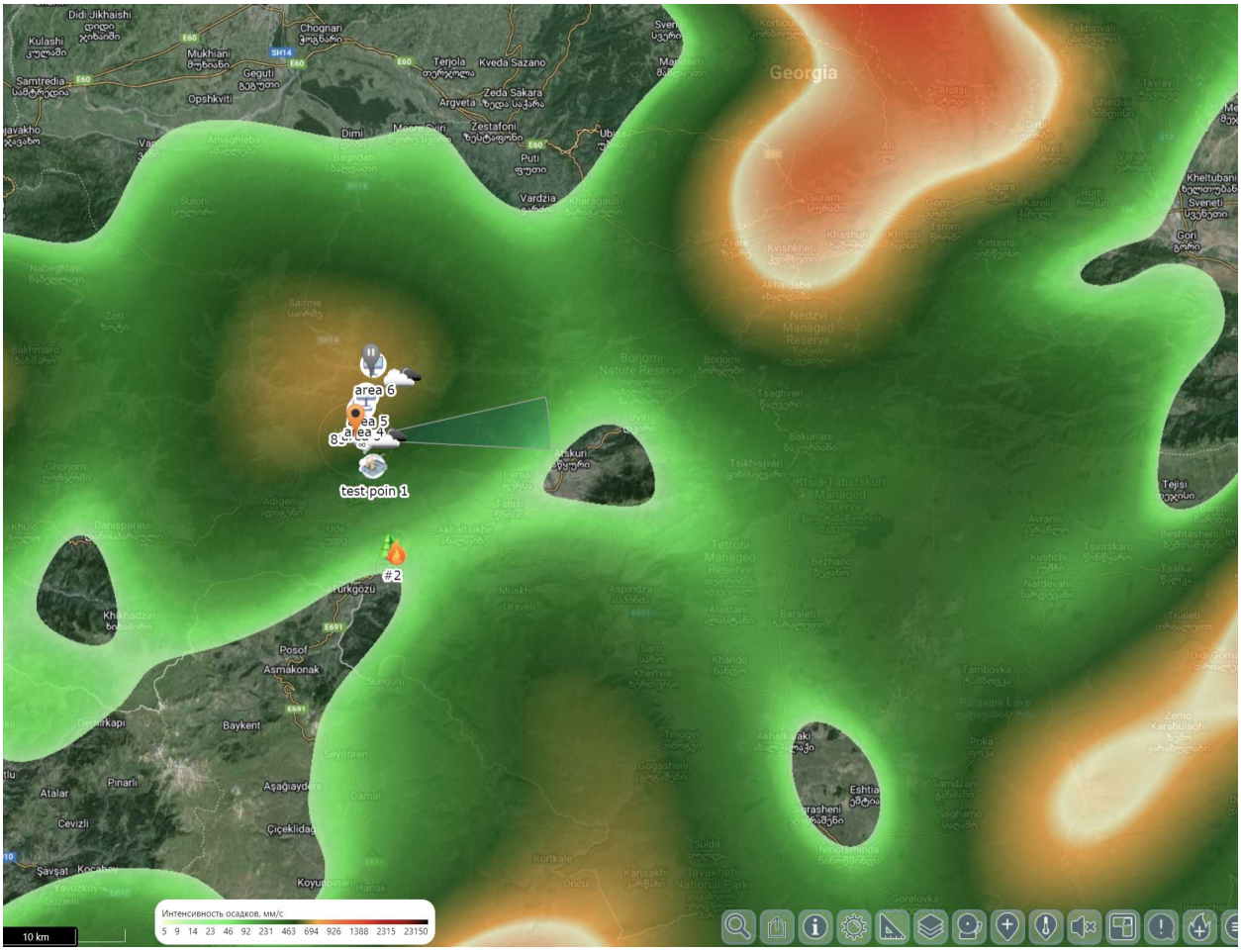
Weather stations integrated with the system collect real-time meteorological data, including temperature, humidity, wind speed, and direction. System Present current weather conditions

and Smoke hazard levels. Below there are following demonstrations about the Weather in the monitored area:

- Wind direction and speed
- Intensity of atmospheric precipitation
- Air humidification - rain
- Air temperature at a height of 2 meters

Figure 7 - Wind direction and speed (M/S)

Figure 8 - Intensity of atmospheric precipitation (MM/C)


Georgia
area 6
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#2
Интенсивность осадков, мм/с
5 9 14 23 46 92 231 463 694 926 1388 2315 23150
10 km

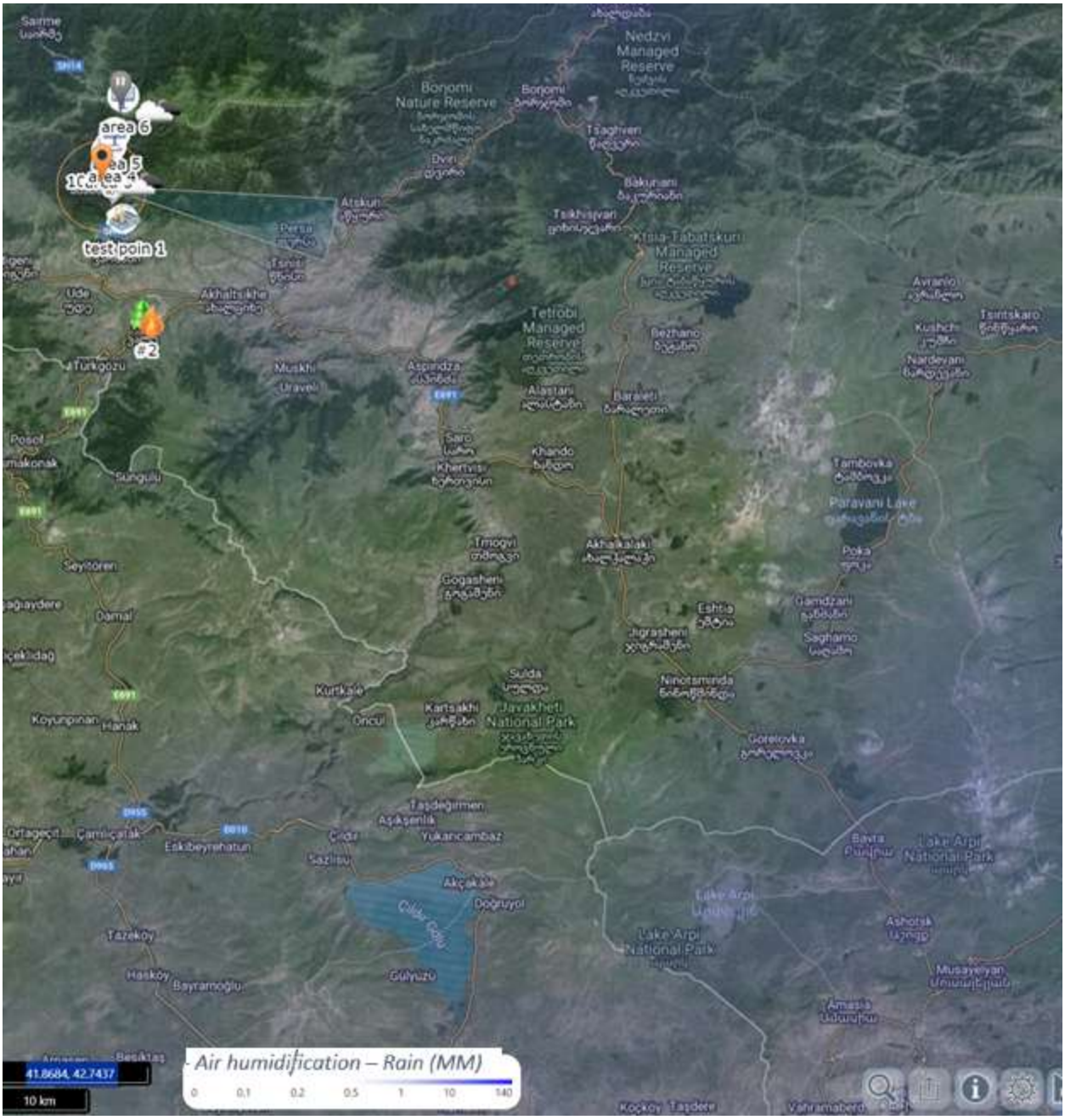


Figure 9 - Air humidification – Rain (MM)

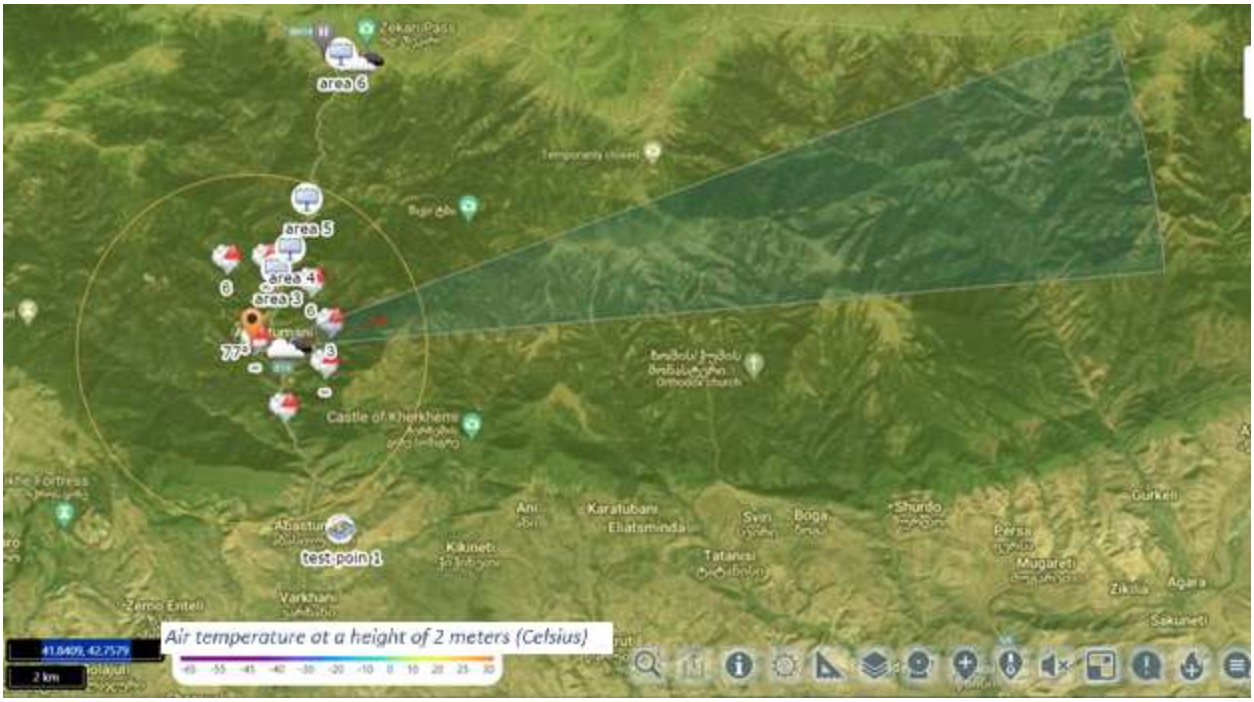
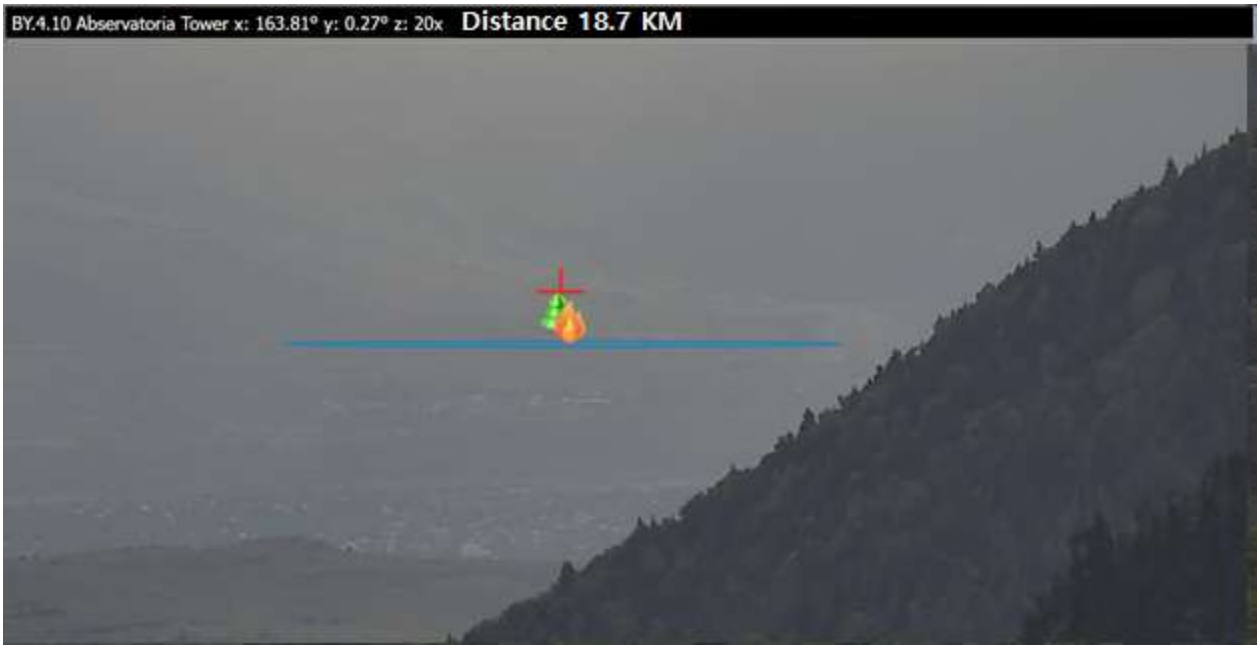


Figure 10 - Air temperature at a height of 2 meters (Celsius)

9.4. Potentially dangerous object detection

AI-powered algorithms analyze video feeds in real-time to detect smoke or Fire. The system compares current images with baseline images to identify anomalies as shown in the images below:

Figure 11 - Potentially dangerous object detected – Alert in the Map



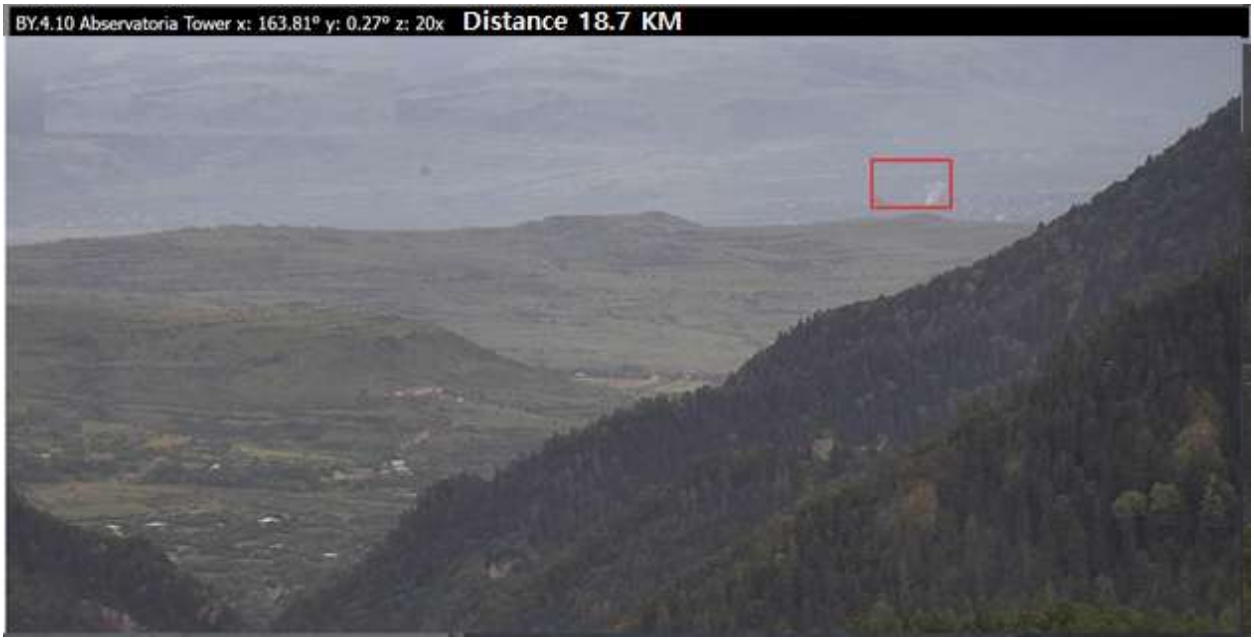


Figure 12 - Potentially dangerous object detected – Real-time View

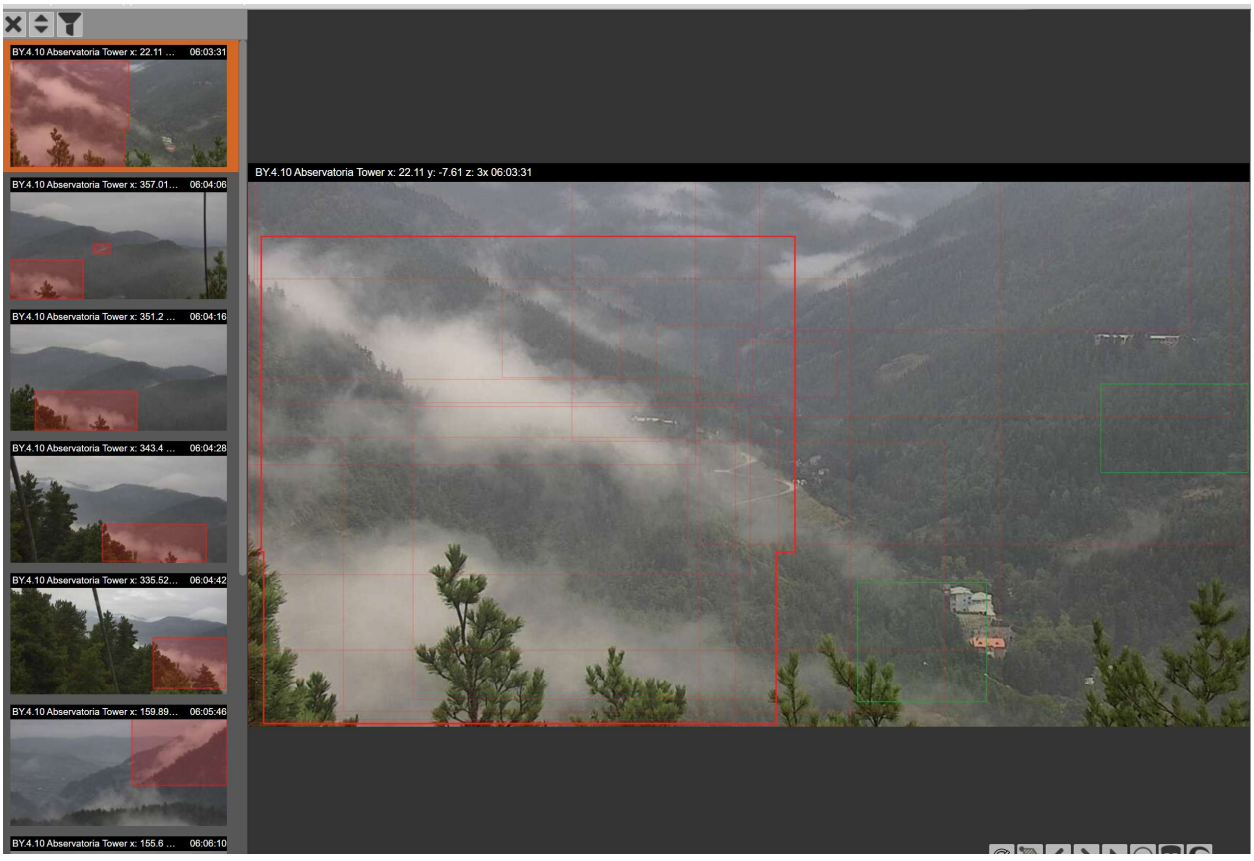
Alarm initial Report:

- Condition: Potentially dangerous object detected, Confirmed as a Smoke
- Type of Alarm: BonFire

- Source: Tower camera 01
- Area Detection time: 2024-07-03 18:06:10
- Confirmation time: 2024-07-03 18:24:18
- Longitude: 42.8812362909
- Latitude: 41.606795036288
- Nearest cameras: Camera 01
- Distance: 18.7 KM
- Information: Nearest urban district and national park

9.5. Event Center

Early detection system for forest Smokes Collects information in incident register in text and video format for their further review and assessment



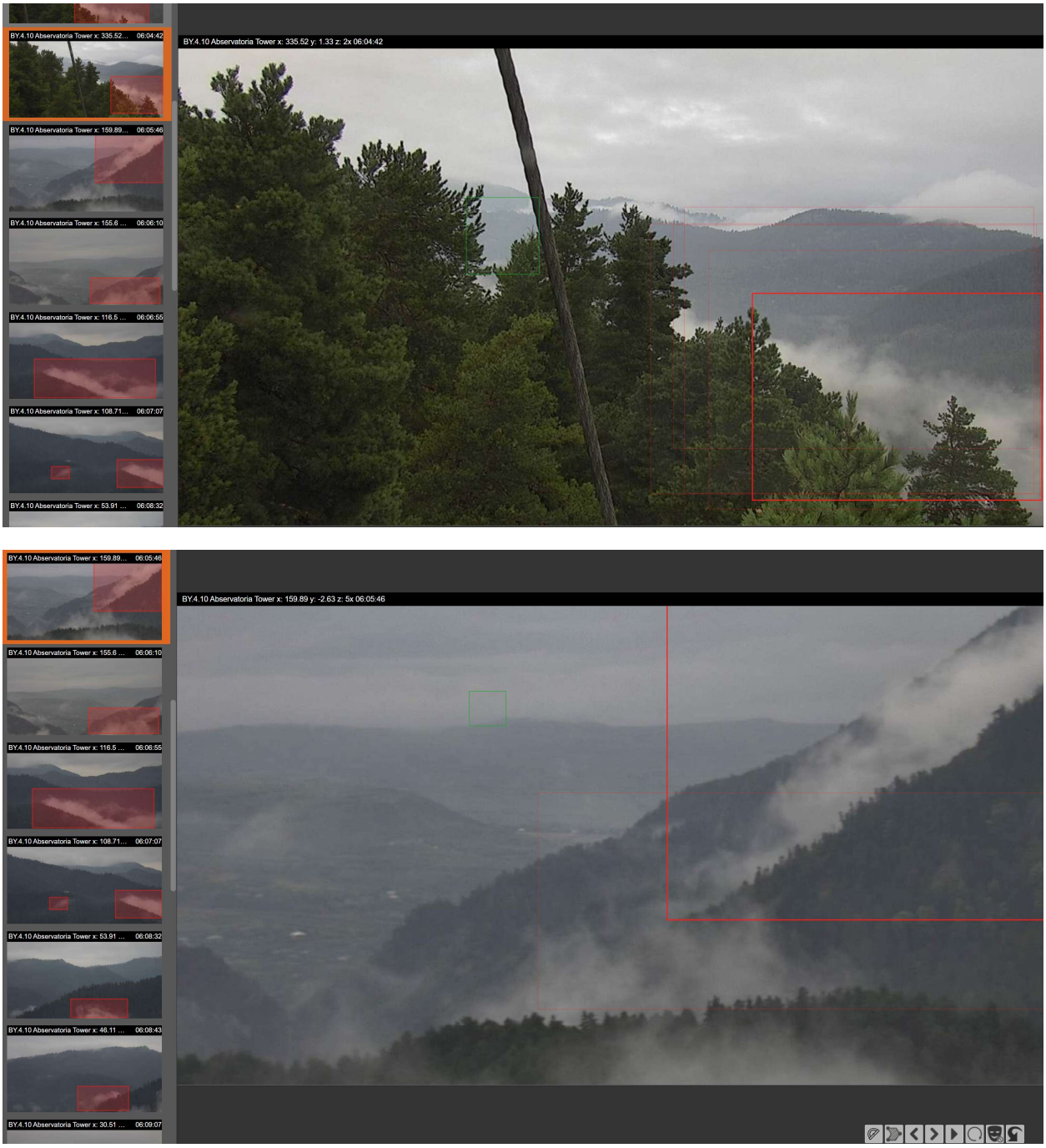


Figure 13 – Alerts Archive – Video Format

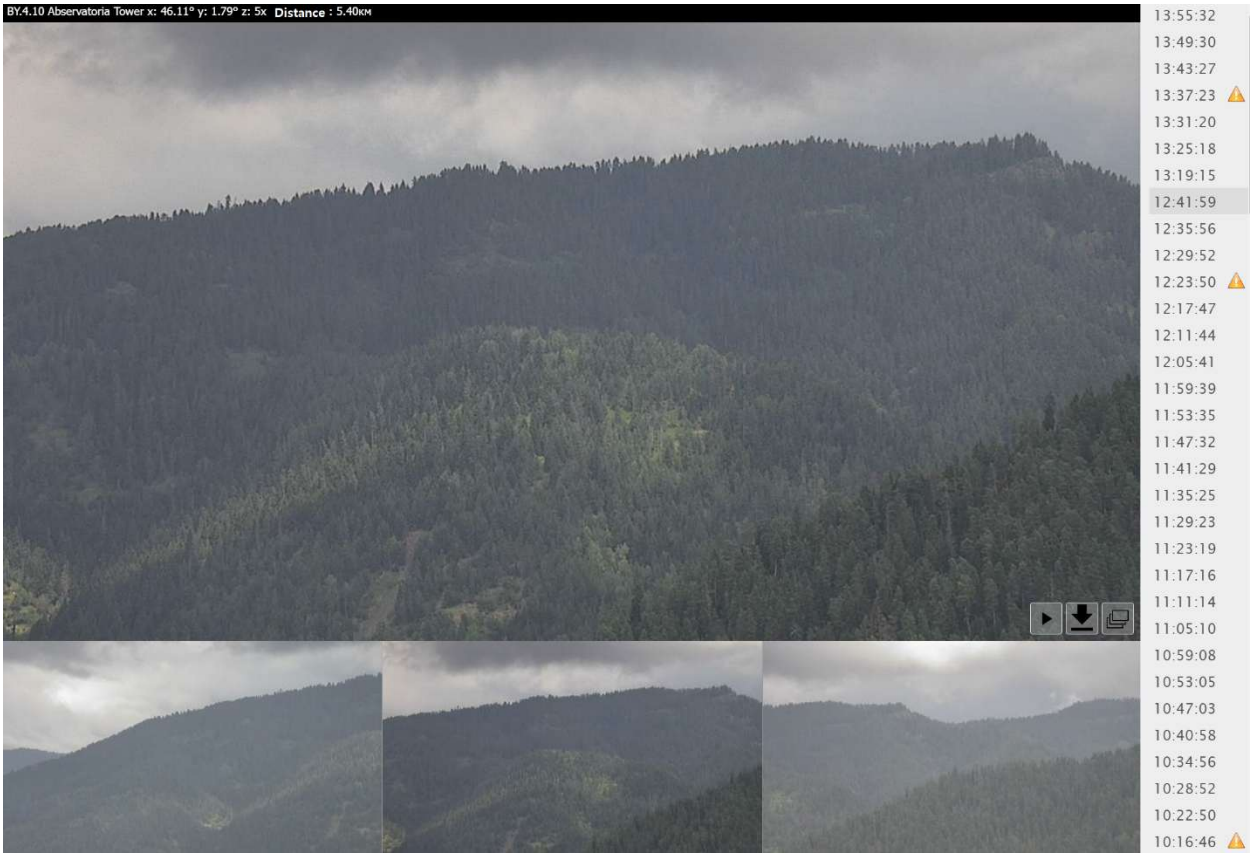


Figure 14 – Alerts Archive by time periods and Distance to the Object – Image Format

9.6. Internal System Communication

System Manages data flow between cameras, servers, and user interfaces. Ensure secure, encrypted communication within the system. Send automated alerts to relevant personnel via multiple channels (e.g., in-app notifications, SMS, email).

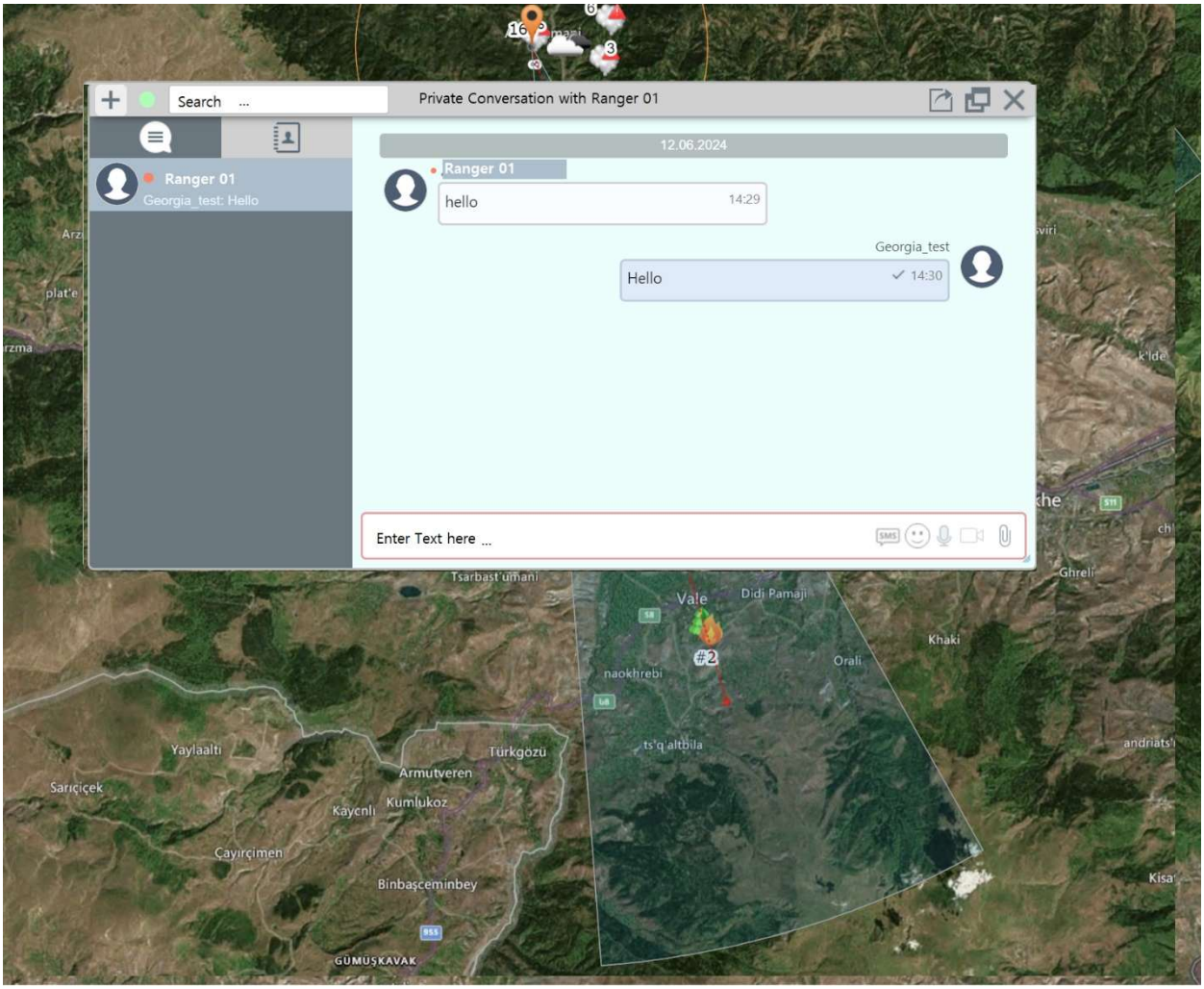


Figure 15 – Real Time Conversation between Operators

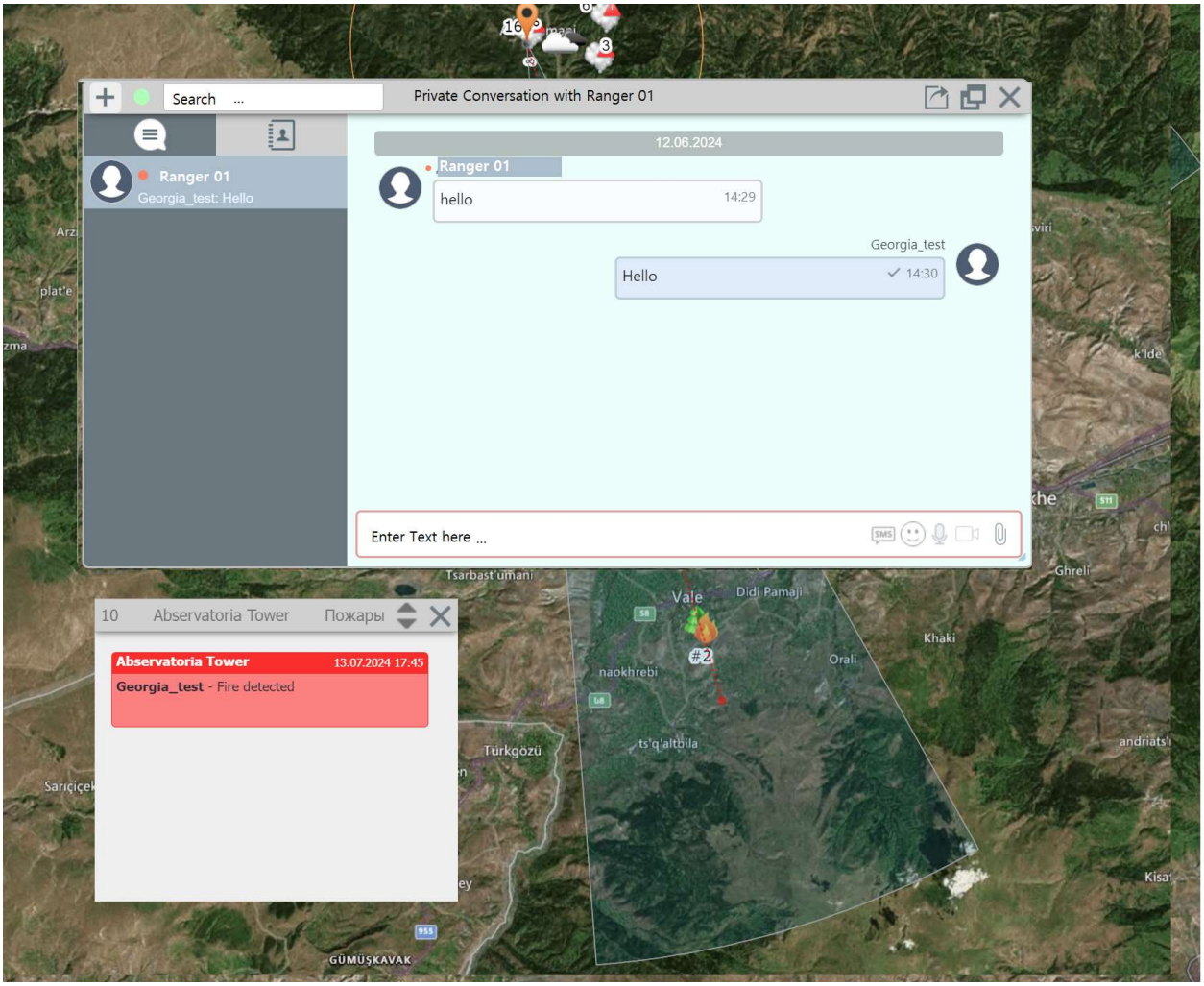


Figure 16 - Real Time Conversation between Operators and System – Smoke Detected Alert

9.7. Video Patrolling Representation Formats

Video patrolling displayed in the integrated Different Geoformation systems:

1. Free Map
2. Open Street Map
3. Open Topo Map
4. Bing Ortho photo
5. Base map – Yandel
6. ESRI Map Box Ortho Photo
7. Google Ortho Photo

8. Google Height Map

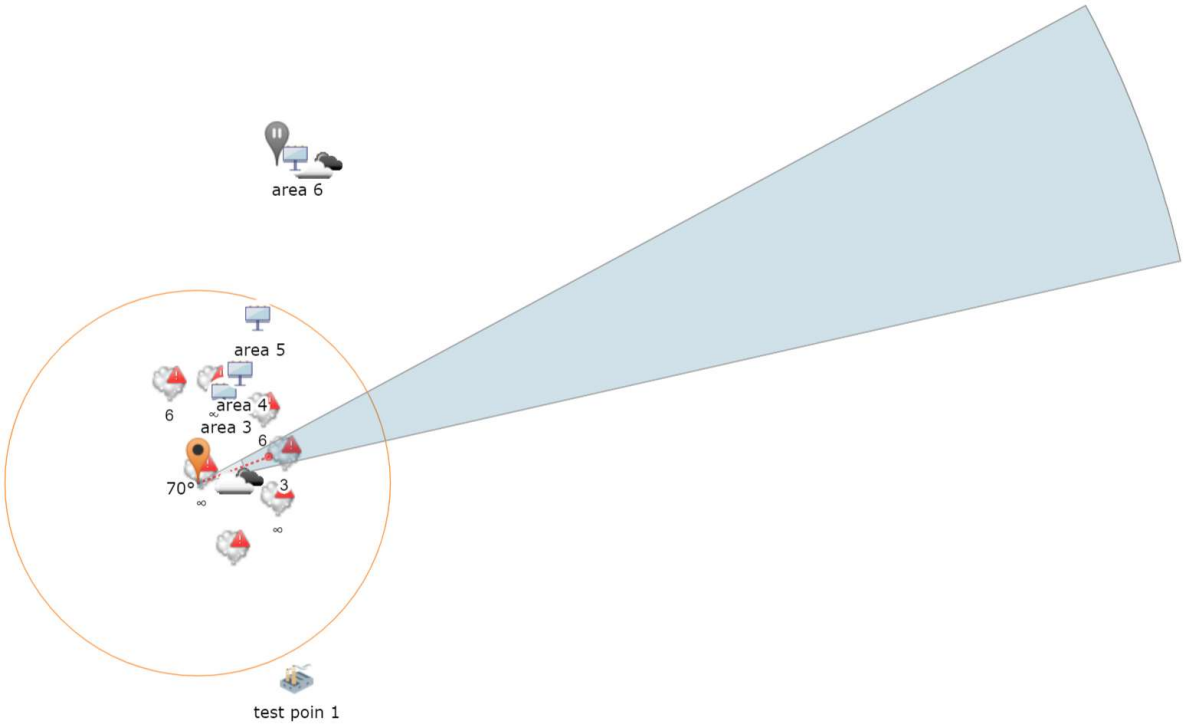


Figure 17 – Free Map

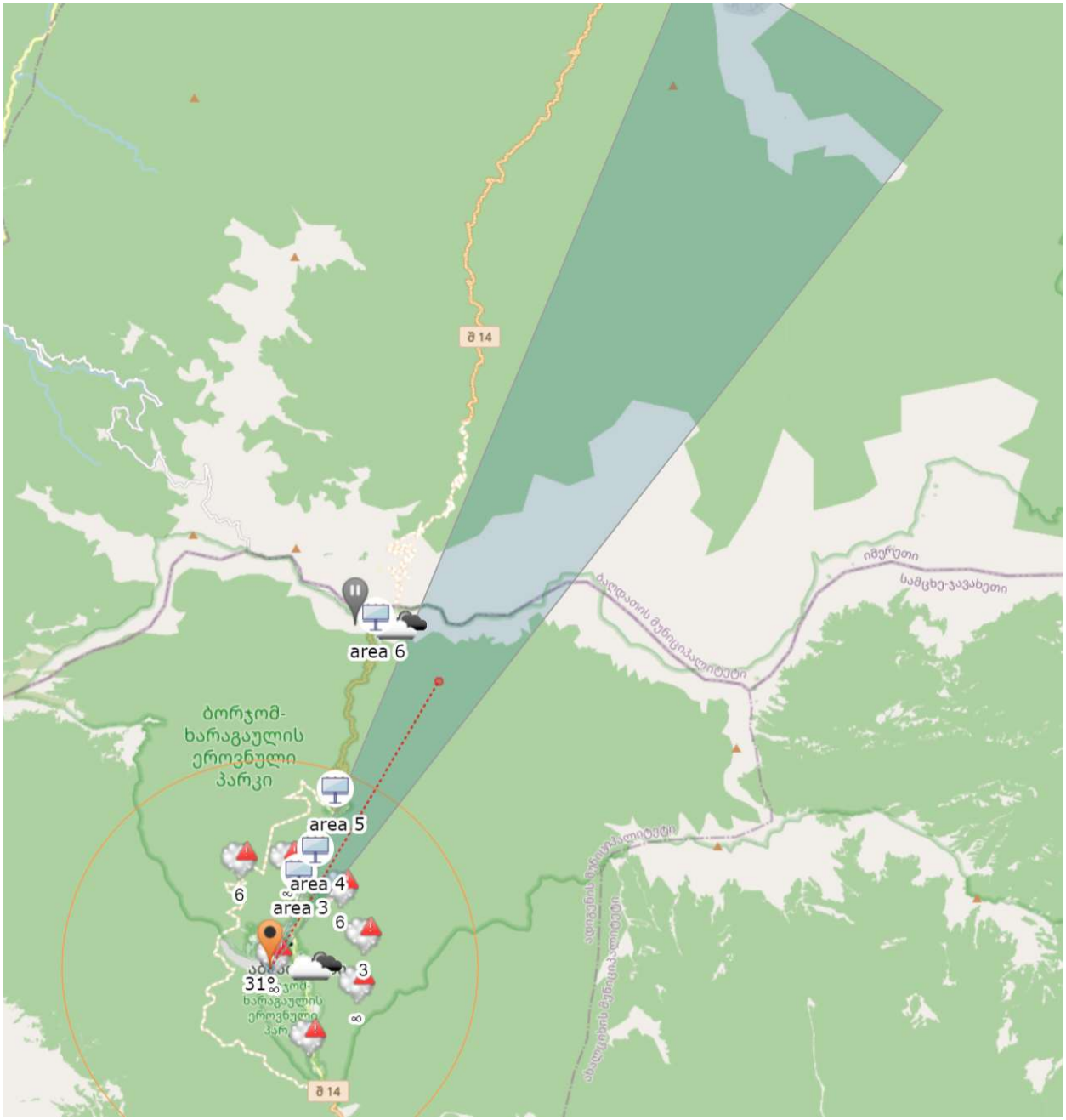


Figure 18 – OpenStreet Map

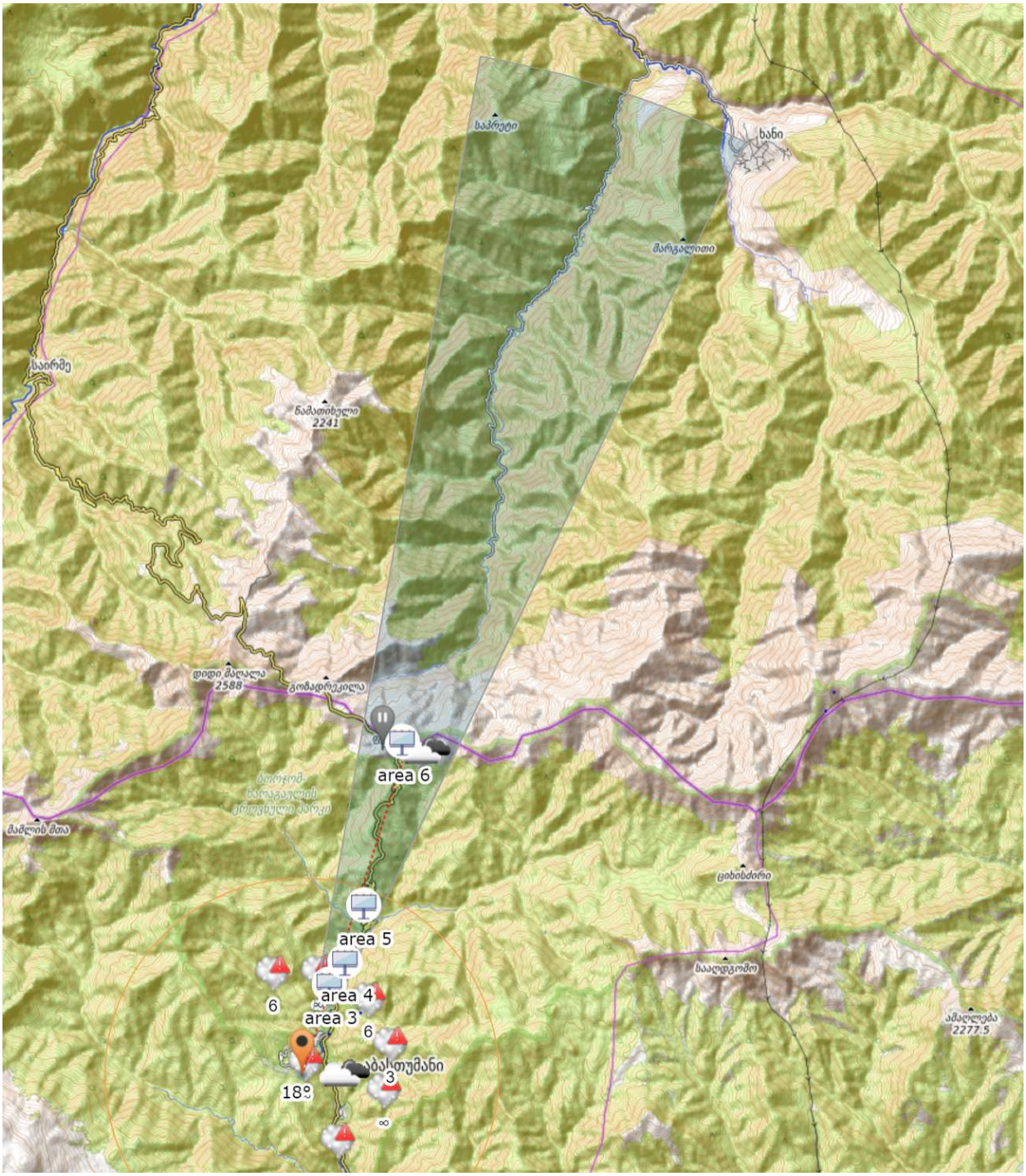


Figure 19 – Open TopoMap

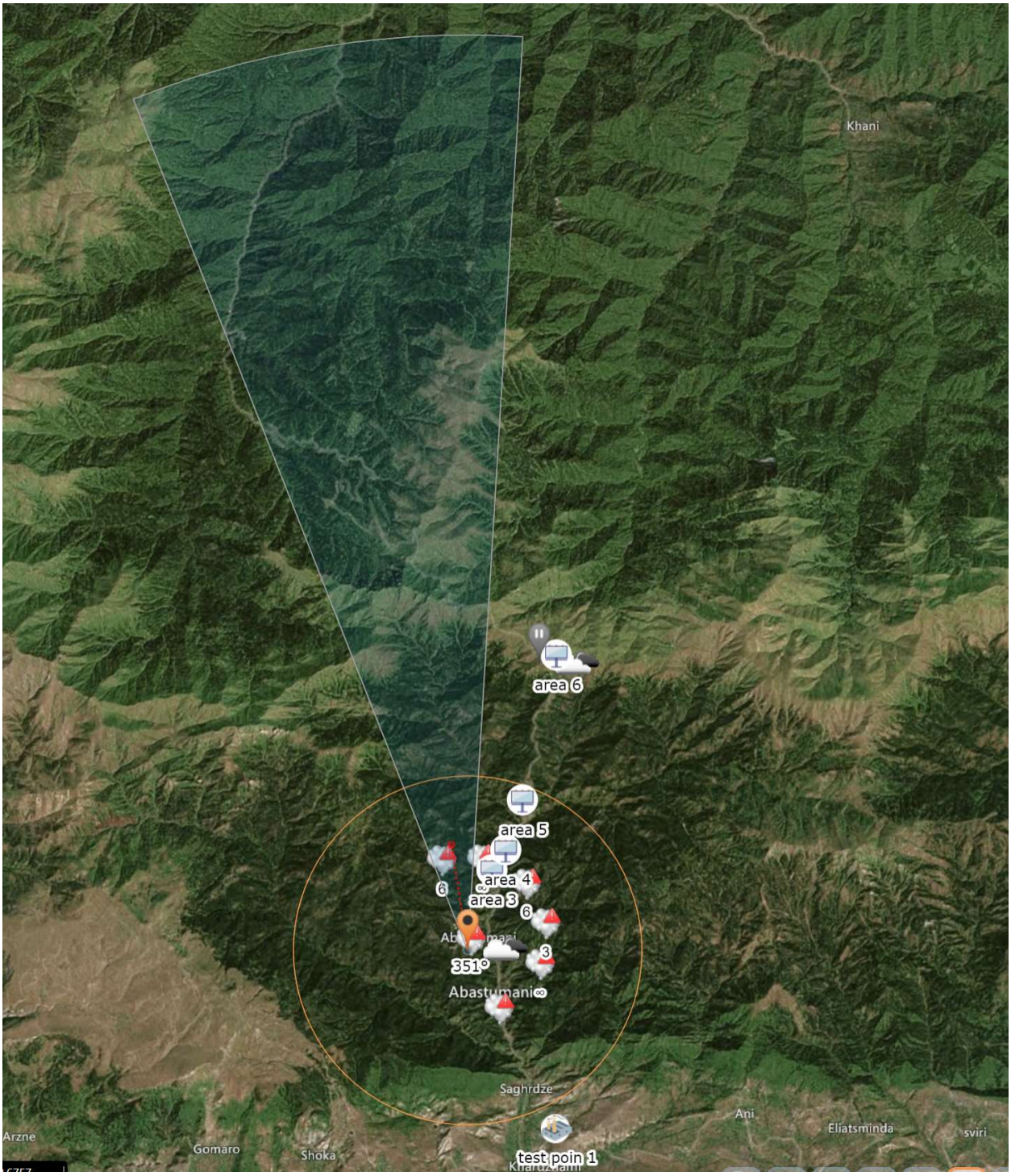


Figure 20 – Bing OrthoPhoto

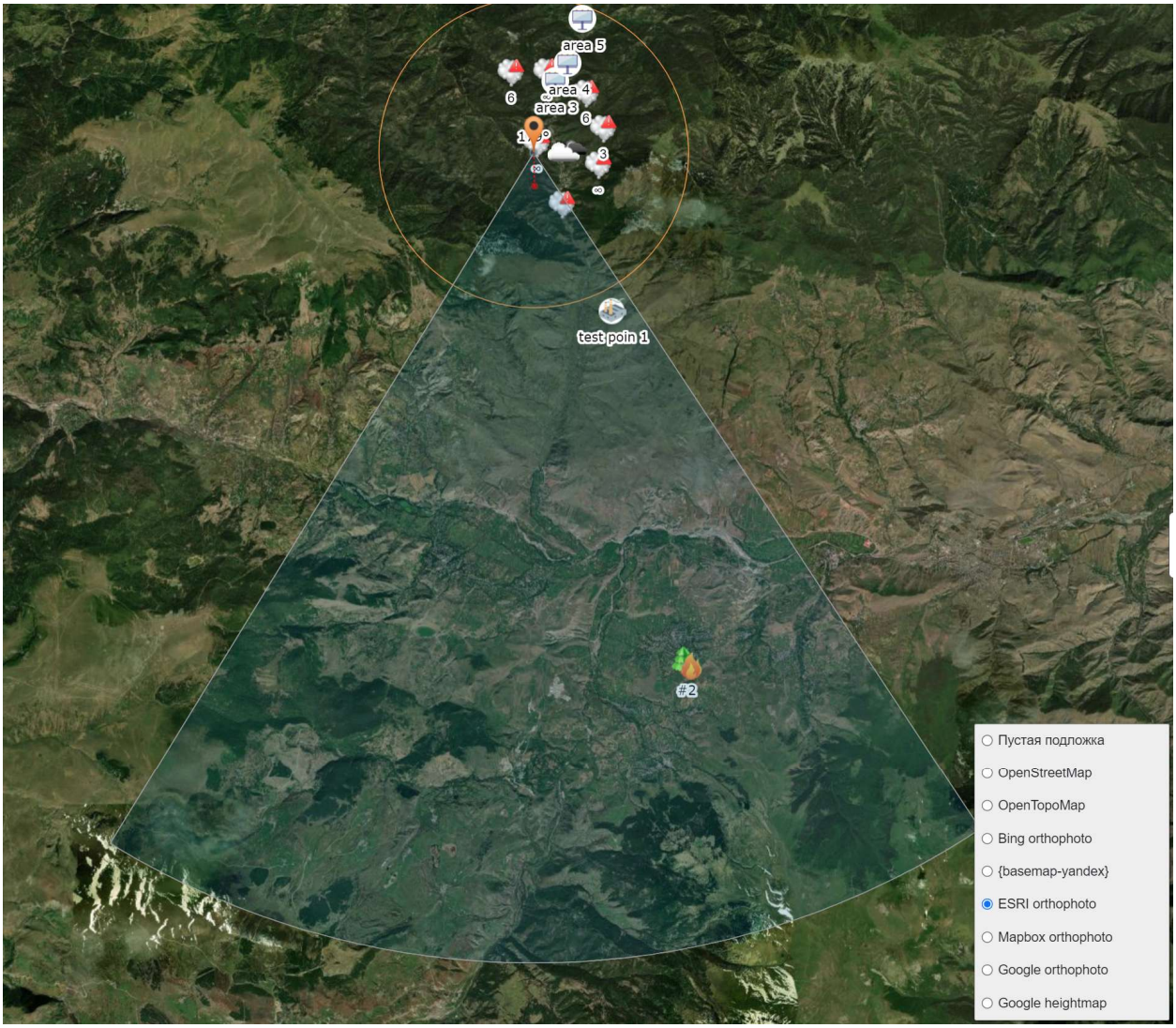


Figure 21 – ESRI OrthoPhoto

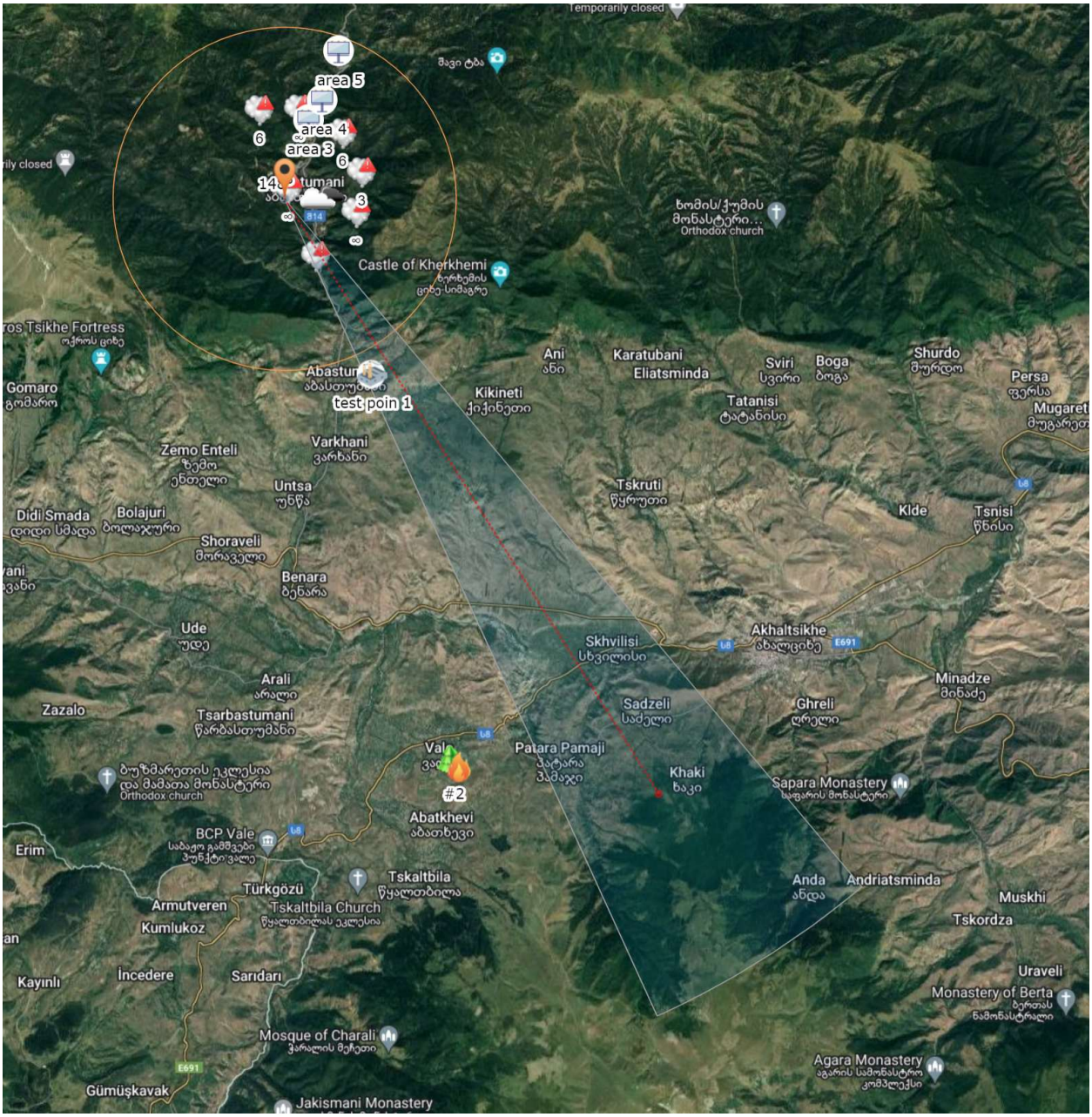


Figure 22 – Google Ortho photo

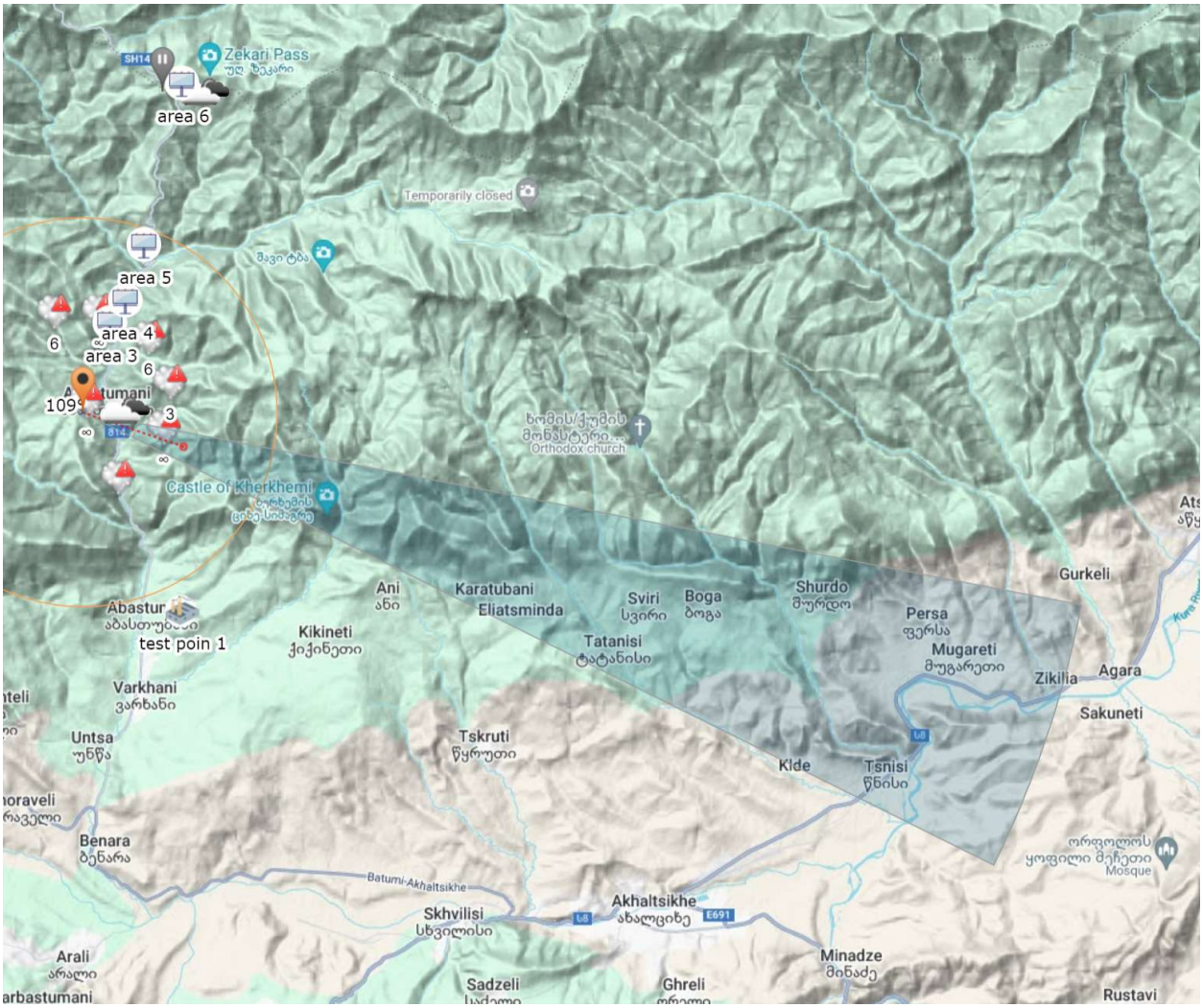


Figure 23 – Google Height Map

9.8. Real Time Measurement

The system can measure the following parameters in real time:

- Measure Distance
- Measure Area
- Measure Coordinates
- Vector of Direction

Figure 24 – Types of measurement in the system

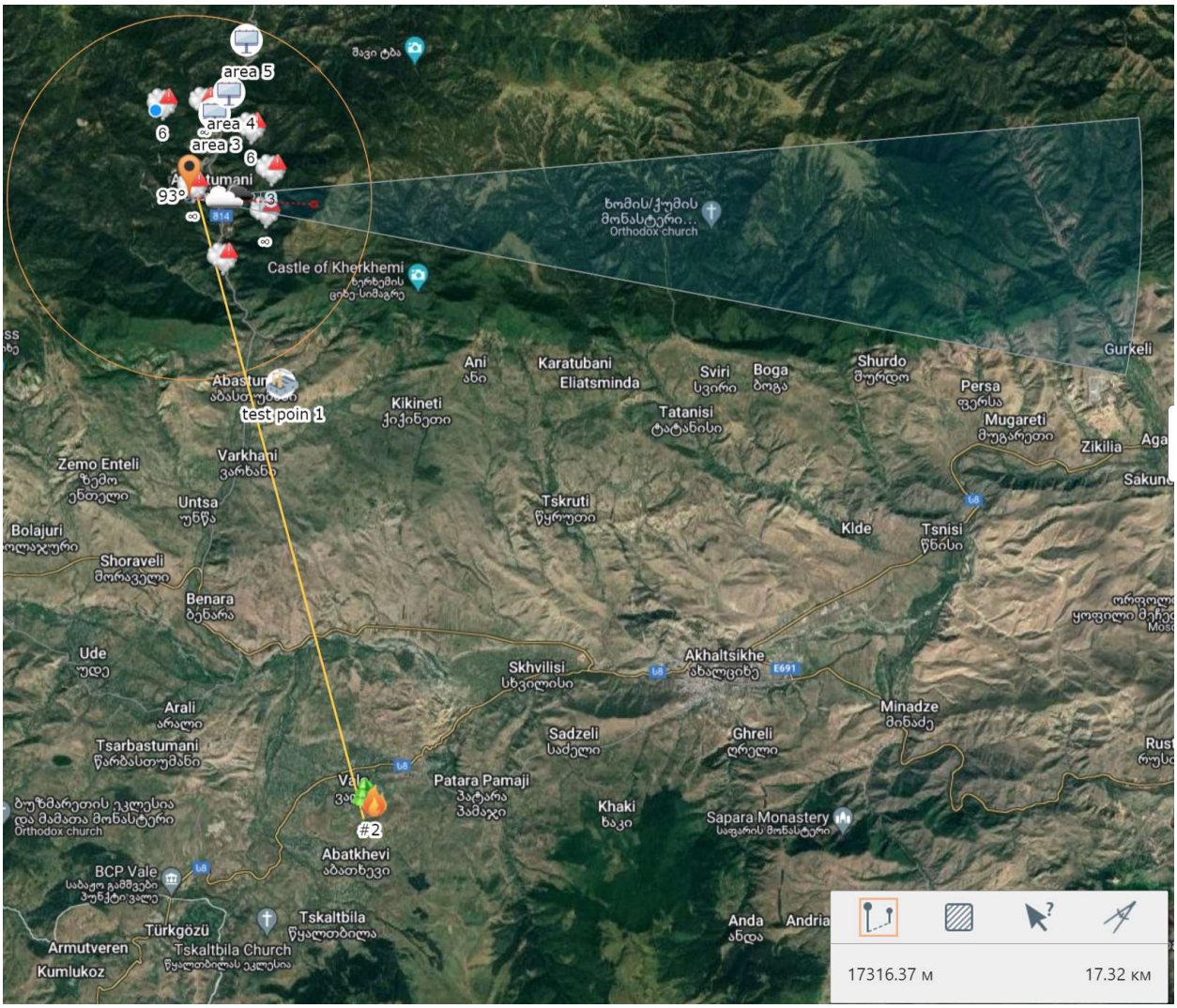


Figure 25 - Measure Distance to the potential Smoke Alert

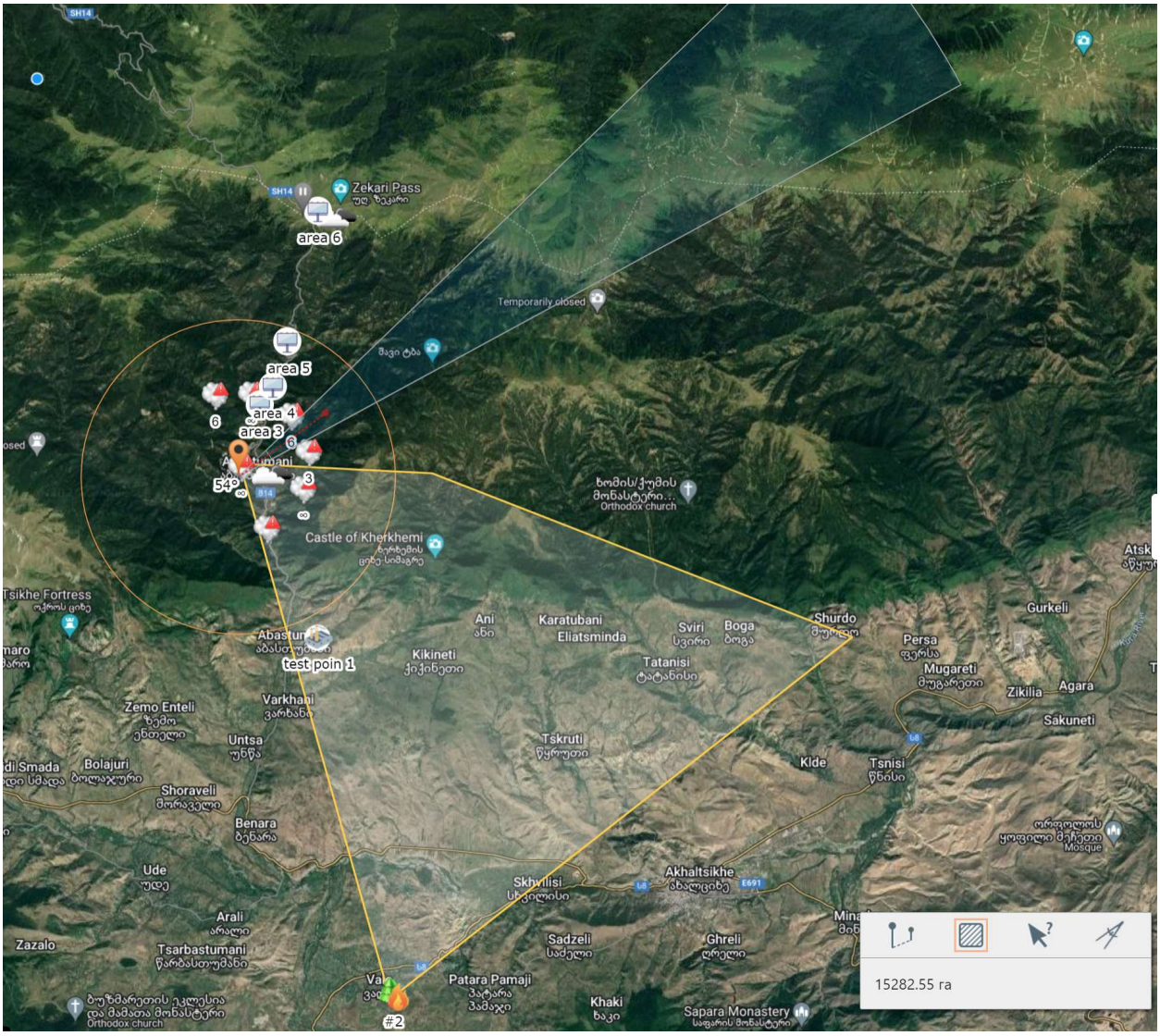


Figure 26 - Measure Area under the risk from the potential Smoke Alert

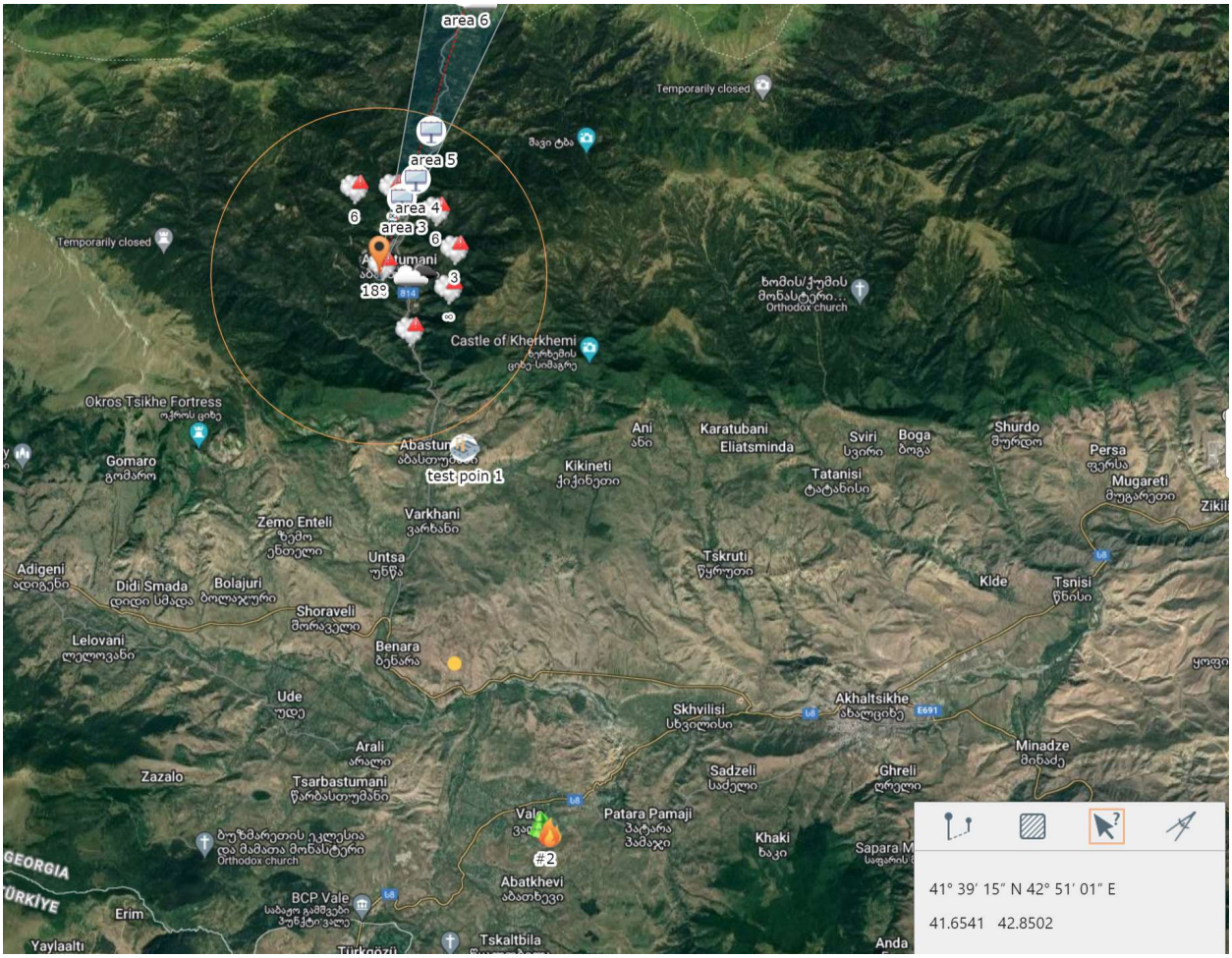


Figure 27 - Measure Coordinates of the potential Smoke Alert

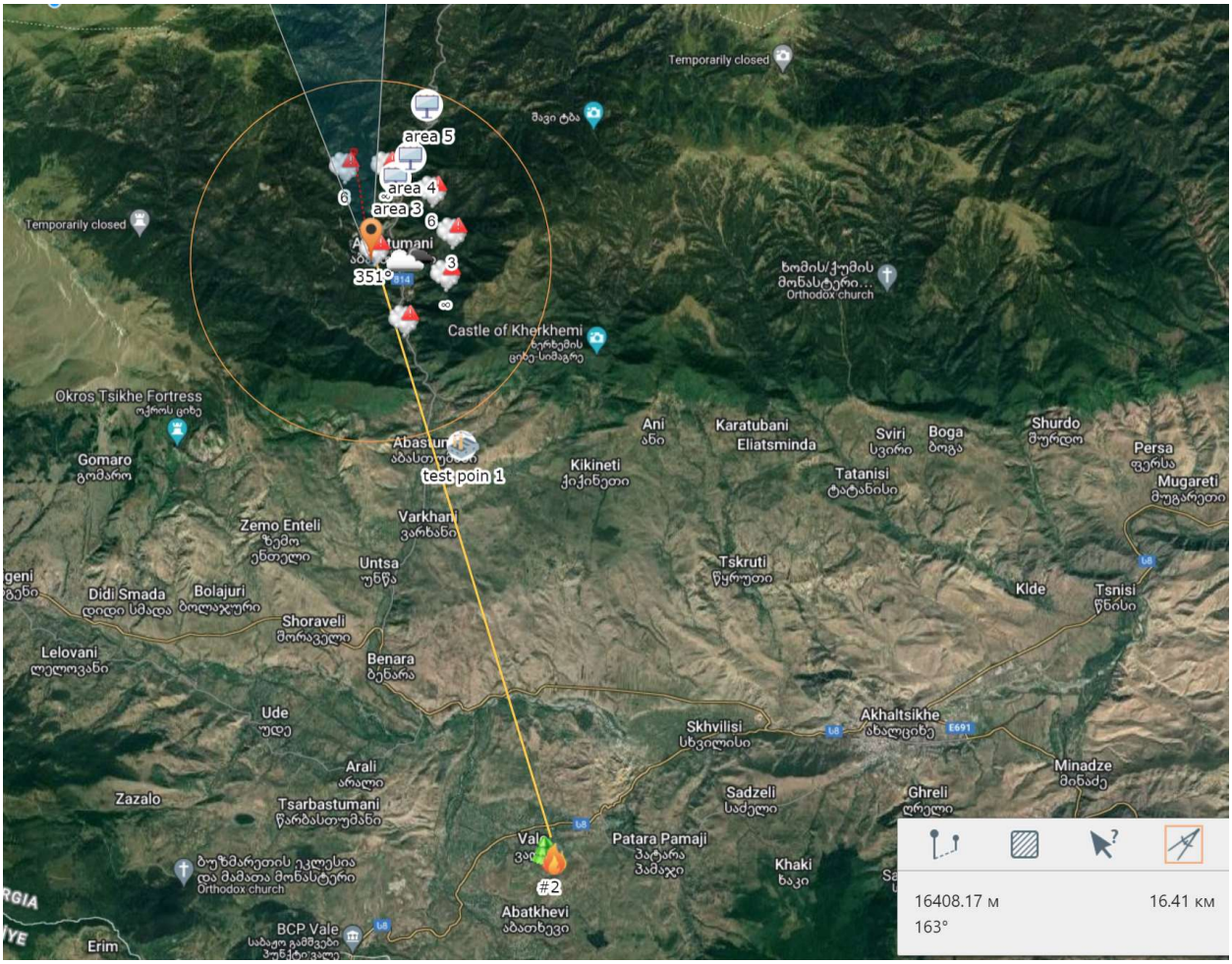


Figure 28 - Vector of Direction to the potential Smoke Alert

10. Train the future users and administrators of the system during a 2-days workshop

Report on Activity 3.3: Internal test the system by the implementer

10.1. Workshop Overview

Activity 3.4 Train the future users and administrators of the system during a 2-day workshops he ld onsite .

Two-days workshop was conducted by IBEDC team for the responsible employees of the Agency for Protected Areas and the Emergency Situations Service.

A demonstration workshop was organized in the selected area in presence of the future users and administrators of the system to

A. Explain the way the system works,
B. let the future users and administrators test the system by their own,
C. Explain the operational procedures that should be implemented based on the responses generated by the system,
D. Answer and clarify any questions the future users and implementers may have.
E. 27 persons atendeed

System preparation for Workshop:

Before Workshop ***"Activity 3.3: Internal test the system by the implementer" was*** completed (Testing Strategy and plan, Testing Scenarios and Procedures, Test Summary Conclusion and Recommendations, System Testing Report. Conclusion and Recommendations described above).

Workshop Scenario:

A system test Workshop was planned by IBEDC in collaboration with the responsible employees of the Agency for Protected Areas and the Emergency Situations Service. During the test workshop, the following activities were carried out:

- **Installation & Configuration:** The smoke and Fire detection software for the Control and Management Center was installed and configured on the test servers, and corresponding user accounts were created.
- **Hardware Setup:** A video camera was mounted on a mast, connected to the management system, and properly configured.

- **System Implementation:** The video camera control functionality, GIS tools, object mapping, and user rights distribution were successfully set up.
- **Smoke Detection Testing:** Three locations at different distances from the camera were selected for controlled smoke release. Below are recorded incidents of automatic smoke detection at the mentioned locations and times.

During the testing and Training process, smoke detection was automatically triggered as soon as the designated geographical area entered the camera's field of view. The system identified smoke as a **Potentially Dangerous Object (PDO)** and notified the operator. The operator could then analyze the detected PDO using photo and video materials, manually adjust the camera to focus on the object, and confirm whether the detection was indeed smoke.

Workshop Date:

- 27-28.01.2025

Workshop Venue:

- 17e Chavchavadze ave. Tbilisi 0179, Georgia

list of participants disaggregated by gender

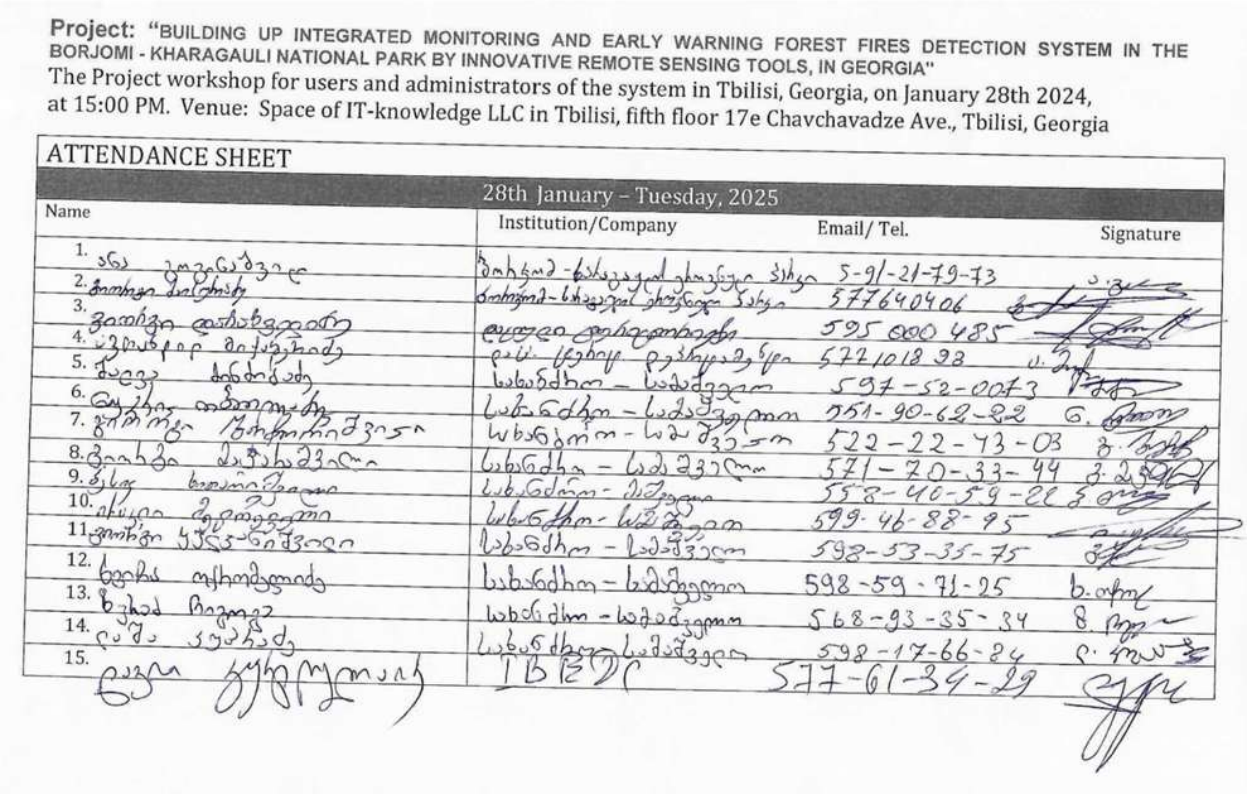
- 27 Attendee - (Participants was selected by Agency for Protected Areas and the Emergency Situations Service:

Project: "BUILDING UP INTEGRATED MONITORING AND EARLY WARNING FOREST FIRES DETECTION SYSTEM IN THE BORJOMI - KHARAGAULI NATIONAL PARK BY INNOVATIVE REMOTE SENSING TOOLS, IN GEORGIA"
The Project workshop for users and administrators of the system in Tbilisi, Georgia, on January 27th 2024, at 15:00 PM. Venue: Space of IT-knowledge LLC in Tbilisi, fifth floor 17e Chavchavadze Ave., Tbilisi, Georgia

ATTENDANCE SHEET

27th January – Monday, 2025

Name	Institution/Company	Email/ Tel.	Signature
1.		598-53-35-75	
2.		598 59 71 25	
3.		598-17-66-84	
4.		568-93-35-34	
5.		597-52-00-73	
6.		551-90-62-22	
7.		522-22-43-03	
8.		571-70-33-44	
9.		558-40-59-28	
10.		599-46-88-95	
11.		577-10-18-98	
12.		595 000-485	
13.		5-91-21-79-73	
14.		577640406	
15.	IBEDC	577613429	



Project: "BUILDING UP INTEGRATED MONITORING AND EARLY WARNING FOREST FIRES DETECTION SYSTEM IN THE BORJOMI - KHARAGAULI NATIONAL PARK BY INNOVATIVE REMOTE SENSING TOOLS, IN GEORGIA"
The Project workshop for users and administrators of the system in Tbilisi, Georgia, on January 28th 2024, at 15:00 PM. Venue: Space of IT-knowledge LLC in Tbilisi, fifth floor 17e Chavchavadze Ave., Tbilisi, Georgia

ATTENDANCE SHEET

28th January – Tuesday, 2025

Name	Institution/Company	Email/ Tel.	Signature
1.		5-91-21-79-73	
2.		577640406	
3.		595 000 485	
4.		577101898	
5.		597-52-0073	
6.		551-90-62-82	
7.		522-22-73-03	
8.		571-70-33-44	
9.		558-40-59-21	
10.		599-46-88-95	
11.		598-53-35-75	
12.		598-59-71-25	
13.		568-93-35-34	
14.		598-17-66-84	
15.		577-61-34-29	

Figure 29 - List of Atendees

Materials developed for the workshop and Future use:

- მომხმარებლის სახელმძღვანელო (ოპერატორის) - სისტემის მონიტორინგი და ტყის ხანძრების ადრეული აღმოჩენის სისტემა (Operators Manual - Integrated monitoring and early warning forest Smokes detection system). File: **(FDD-Operators User Manual_GE v 2.2.pdf)**

Role Based Cases / User Roles:

An appropriate room was arranged for the workshop, equipped with computer equipment. The following was created in advance for the training:

1. **Demonstration system, link**: https://demo.Firepost.ge
2. Appropriate accounts were created in the system, which were given to the trainees. The trainees of these accounts entered the system:

- ge_oper1 and ge_oper2 - full access to the system; - **System Administrator Role;**
- ge_oper3 and ge_oper4 - smoke detection and confirmation functionality – **System Operator Role;**
- ge_oper5 and ge_oper6 - **viewing only - System Monitoring Role.**

6 Groups – 4-5 Participants in Each Group with Different Roles. (27 Attendees).

10.1.1. Workshop syllabus

Day 1: System Introduction and Practical Exercises:

The first day of workshop followed this structured plan:

1. Explanation of system capabilities and interface menu items
2. Detailed overview of camera management features
3. Roles and privileges of employees within the system
4. GIS system tools and map functionality
5. Working with photo and video galleries
6. Internal chat functionality within the system
7. Hands-on system access for trainees with assigned tasks:
   - 7.1. Manual camera operation
   - 7.2. Smoke detection and confirmation
   - 7.3. Measuring distances and determining object coordinates using the GIS system

The workshop was conducted interactively, allowing trainees to ask questions. The trainer provided real-time demonstrations on the trainees' computers in response to their inquiries.

Day 01 Key trainee questions:

A. Manual camera control, including differences between hardware and digital zoom

B. Enabling and disabling automated patrol mode

C. Identifying potential smoke points, reviewing detected objects, and using confirmation and false alarm functionalities

D. Measuring and displaying distances on the map

E. Managing photo and video galleries

F. Employee role and permission distribution

G. Determining coordinates and distances of objects on the map

Day 01 outcome:

1. All questions were discussed and participants were able to study and practice all the listed functionalities in the system.
2. The integrated monitoring and early warning forest Smokes detection system is operational
3. The integrated monitoring and early warning forest Smokes detection system is functioning efficiently without bugs
4. Operators Manual – Prepared for Attendees
   4.1. მომხმარებლის სახელმძღვანელო (ოპერატორის) - სისტემის მონიტორინგი და ტყის ხანძრების ადრეული აღმოჩენის სისტემა (Operators Manual - Integrated monitoring and early warning forest Smokes detection system) File: (FDD-Operators User Manual_GE v 2.2.pdf)

Day 2: Advanced Features and Practical Applications

The second day covered:

1. Archive functionality
2. Adding objects to the map
3. Displaying weather information on the map
4. Review and application of functionalities covered on the first day

Day 02 - Trainees' questions focused on:

A. Locating archived Smoke and Fire detections and displaying them on the map

B. Exporting photo and video materials from the archive

C. Adding additional objects to the map (e.g., Fire watchtowers, water towers, Fire hydrants, etc.)

D. Managing map layers

Day 02 outcome:

1. All questions were discussed and participants were able to study and practice all the listed functionalities in the system.
2. The integrated monitoring and early warning forest Smokes detection system is operational
3. The integrated monitoring and early warning forest Smokes detection system is functioning efficiently without bugs
4. Operators Manual – Prepared for Attendees
   4.1. მომხმარებლის სახელმძღვანელო (ოპერატორის) - სისტემის მონიტორინგი და ტყის ხანძრების ადრეული აღმოჩენის სისტემა (Operators Manual - Integrated monitoring and early warning forest Smokes detection system) File: (FDD-Operators User Manual_GE v 2.2.pdf)

10.2. Workshop Media

Site Logistics:

- Venue: 17e Chavchavadze ave. Tbilisi 0179, Georgia
- **Demonstration system, link**: https://demo.Firepost.ge
- *Test the system in the area of the Borjomi - Kharagauli National Park of Georgia (Causacus)* – Abastumany Tower.

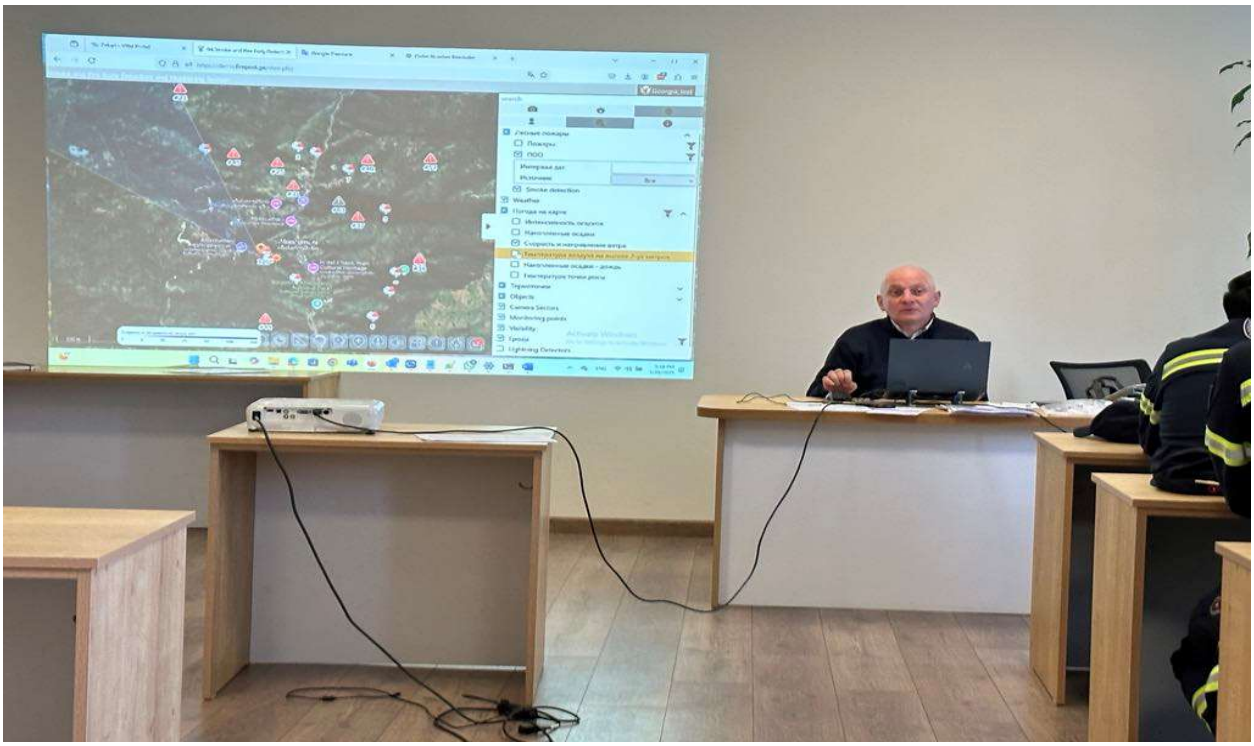


Figure 30 – System Presentation –Real system OnLine Mode

Figure 31 – Workshop Participants Group photo

Figure 32 – System Presentation

Figure 33 – Workshop, Discussions …

Figure 34 – Workshop, Discussions …

Figure 35 - Workshop Summary, Final Discussion, Key Takeaways …