

RESEARCH PROPOSAL: MICROCLIMATE IMPACT ON CONSTRUCTION PLANNING USING A MOBILE APP

CONSTRUCTION WEATHER DETECTIVE

We chose this topic because construction efficiency in Lithuania is often hindered by microclimate variability. The project was developed as an interdisciplinary collaboration between the Construction Department and the STEAM laboratory. In the "Robotics ECO Inventions" club, students act as "Data Detectives," using informatics skills to solve real-world industrial problems. This connection is highly relevant to our vocational community, as it prepares builders to use digital tools for better work quality.

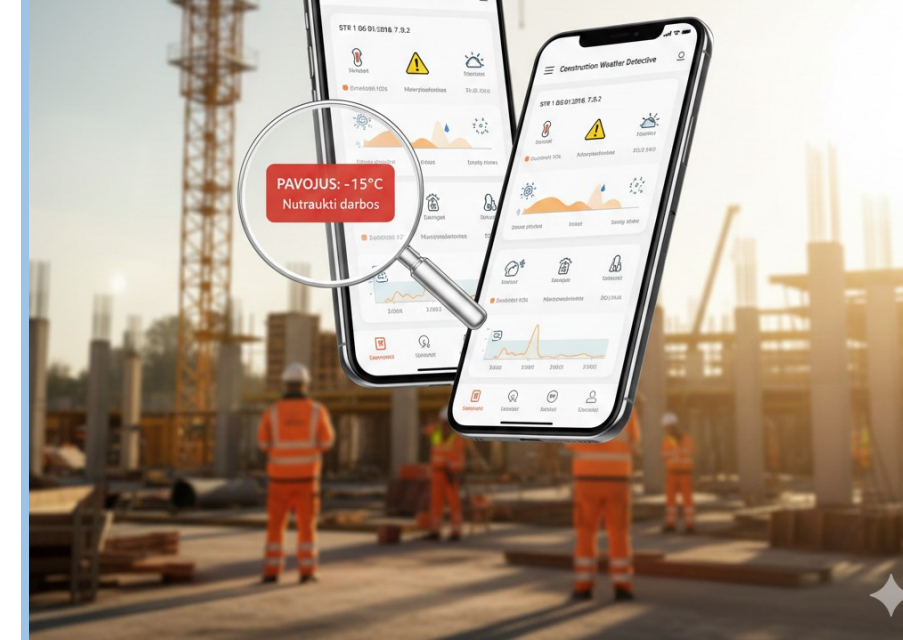


Construction safety regulations (STR) are complex and difficult to remember, especially for beginners or international students facing language barriers. This project introduces a technological solution that bridges the gap between scientific GLOBE data and practical site safety.

The **Construction Weather Detective** app serves as a real-time decision support tool for:

- Novice Workers:** Those who lack experience and need reminders of STR requirements.
- International Students:** Erasmus+ trainees and Ukrainian students who benefit from the multilingual interface.

The app "detects" invisible risks by analyzing data from the **KAUTECH MS** station. It automatically cross-references air temperature, wind speed, and humidity with official safety thresholds.



To ensure no "clues" are missed, the interface is available in **Lithuanian, English, and Ukrainian**. This ensures that war-affected students and EU trainees can work safely and confidently.

We hypothesize that the **"Construction Weather Detective" app** reduces safety risks by simplifying regulations into clear, multilingual visual alerts.

DATA COLLECTION PLAN

We use GLOBE Atmosphere protocols for Air Temperature, Barometric Pressure, Precipitation, Relative Humidity and Wind

The primary data source is the **KAUTECH MS** (Model YT60234), a professional 7-in-1 weather station.



The station (ID: **IKAUNA48**) is equipped with high-precision sensors for air temperature, relative humidity, wind speed, wind direction, precipitation, UV index, and solar radiation.

We developed the **Construction Weather Detective** app prototype to process raw data into actionable safety alerts.

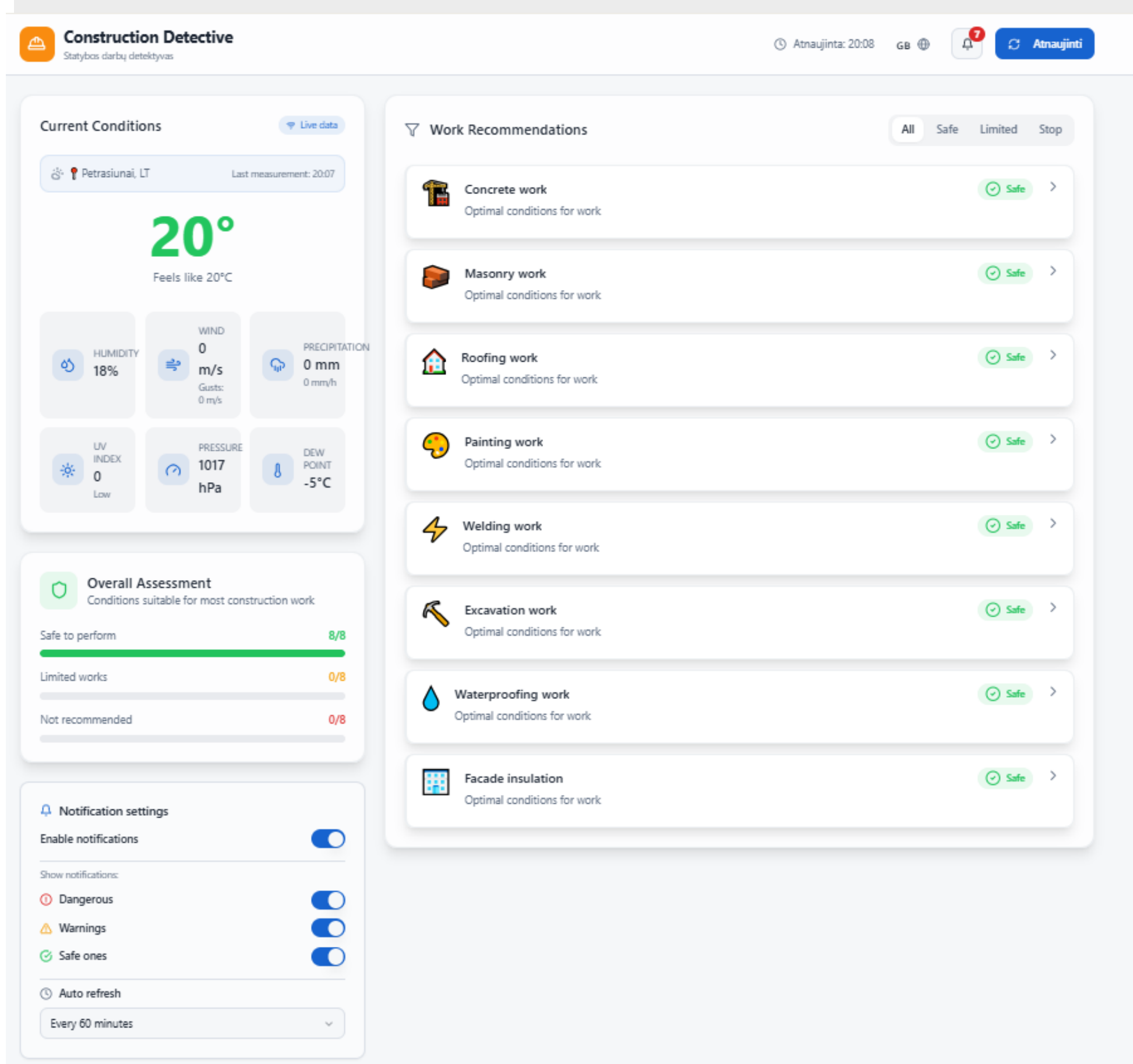
Safety thresholds are based on the latest Lithuanian **Construction Technical Regulations (STR 2.01.12:2024)**.

FINAL CONCLUSIONS: THE DETECTIVE'S VERDICT

The **Construction Weather Detective** successfully "solves the mystery" of invisible weather risks at construction sites. By translating raw data into Lithuanian, English, and Ukrainian, the project acts as a safety mentor for students who lack experience or face language barriers. Our "detective" ensures that the Lithuanian Construction Regulations (STR) are no longer a barrier but an accessible safety guide for the whole KAUTECH community.

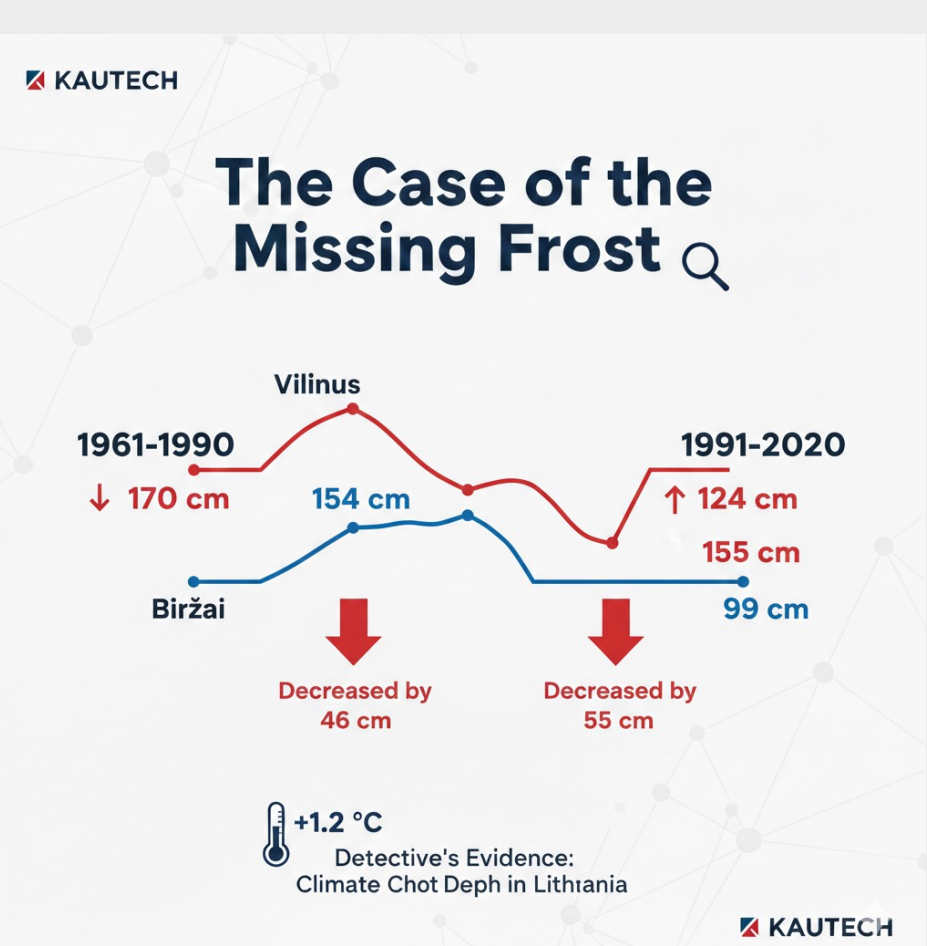
INTEGRATION OF CONSTRUCTION PROCESSES AND GLOBE PROTOCOLS

Construction Field	Regulation (STR / KTR Requirements)	GLOBE Data Type (Protocols)	Integration with Research Proposal & App
General Works (STR 1.05.01:2017)	Works must be suspended if quality cannot be ensured due to environmental conditions. Working in sub-zero temperatures without special measures is a violation.	Air Temperature (Atmosphere)	The app notifies the manager in real-time about critical temperature thresholds when work must be stopped or heating implemented.
Concreting (STR 2.05.04 / 1.05.05)	Concrete temperature during curing must be at least +5°C. Concreting on frozen surfaces or ice is prohibited.	Air Temperature, Precipitation (Atmosphere)	The algorithm predicts safe pouring windows to ensure proper material curing and prevent structural defects.
Masonry Works (STR 2.05.09 / 1.05.06)	Masonry is prohibited when outdoor temperature is <0°C without special additives. Mortar temperature must be ≥+5°C.	Air Temperature, Humidity (Atmosphere)	The app evaluates whether anti-freeze additives are required for the mortar based on local station micro-forecasts.
Road Construction & Asphalt (KTR 1.01:2019)	Mandatory compliance with minimum air and mixture temperature norms. The base must be free of snow and ice.	Air Temperature, Precipitation (Atmosphere)	The asphalt paving schedule is optimized to prevent pavement delamination caused by moisture or cold.
Interior Finishing (Painting, Plastering)	Proper conditions for plaster/mortar drying must be ensured. Humidity fluctuations cause surface cracking.	Air Humidity, Temperature (Atmosphere)	Determines optimal drying times for tile adhesive or plaster, classifying the environment as "high quality" or "risky."
Occupational Safety (STR 1.07.03:2017)	Mandatory suspension of works during dangerous meteorological conditions (wind, storms).	Wind Speed, Gusts, Precipitation (Atmosphere)	Generates urgent alerts for crane operators and high-altitude workers when safe wind gust limits are exceeded.



BACKGROUND & SCIENTIFIC CONTEXT

The Lithuanian Ministry of Environment is updating the STR **"Construction Climatology"** because the climate is warming. Data shows that the average annual temperature in Lithuania rose by 1.2°C from 6.2°C to 7.4°C, and the soil frost depth in Vilnius decreased from 170 cm to 124 cm.



Our "Detective" project uses GLOBE protocols to help users adapt to these changing norms, which now require climate data updates every 10 years.

The new regulation is mandatory for all construction participants to ensure buildings are resilient to extreme hydro-meteorological events like heatwaves and heavy rains.

Construction Weather Detective simplifies these complex statistical parameters for novice workers and international students, helping them calculate wind, snow, and rain loads in real-time.

We expect that using the app will help students better understand **"Construction Climatology"** and select appropriate protective measures against negative climate impacts during their practical training.

The **multilingual interface** ensures that even students from other regions can understand Lithuania's specific climatic characteristics.

DECODING THE CLIMATE "CRIME SCENE"

Our findings confirm that the local microclimate is shifting, directly impacting the relevance of historical building standards.

GLOBE DATA DETECTIVES

STUDENT RESEARCHERS (Grade 12 Finishing Specialists)

Lead student researcher and primary mobile app developer. He is responsible for analyzing microclimate datasets, creating the app's predictive logic, and integrating STR regulations to automate construction site alerts.

DEIVIDAS VAITEKŪNAS - Lead Researcher & Developer

Focuses on evaluating the physical behavior of construction materials (concreting, masonry) in relation to microclimate data. He assists in data analysis and ensures accurate technical documentation of observations.

POVILAS GRYBOVAS - Researcher

STUDENT RESEARCHERS (Grade 10 Data Monitoring Team)

Dedicated to managing and entering atmospheric data into the GLOBE database. He contributes to the research by gathering scientific context and ensuring consistent monitoring of the weather station readings.

ROKAS GRIVAČIAUSKAS - Researcher

Focuses on data accuracy and research support. He plays a vital role in field observations and the documentation of hourly meteorological readings during the practical training period.

JUSTINAS KULIKAUSKAS - Researcher

TEACHING TEAM (MENTORS):

<p>EGIDIJUS MAČIULSKAS</p> <p>English Language Mentor. Provided crucial support in international communication, ensuring the project's reach to the global GLOBE community and guiding the team English language usage.</p>	<p>RITA SENKEVIČIENĖ</p> <p>VSS Coordinator, Informatics Teacher-Methodologist, Head of STEAM Lab & 'Robotics ECO Inventions' club. Provided expert guidance on data research, technical integration of the weather station with the app, and overall project leadership.</p>	<p>KASTYTIS SKRUPSKIS</p> <p>Vocational Teacher and Engineering Expert. Acted as the engineering consultant, helping to interpret complex construction regulations (STR) to ensure the mobile app's logic is professionally sound and practical.</p>
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ACKNOWLEDGEMENTS

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