Climate change is causing more frequent and severe weather events, posing significant challenges to urban areas. Cities need to adapt to these changes to ensure the well-being and sustainability of their communities. One promising strategy is using nature-based solutions (NBS), particularly tree-based solutions (TBS), which feature the benefits provided by urban trees to combat climate change and improve urban resilience.

Urban trees play a crucial role in this effort by providing essential benefits (ecosystem services (ES)) such as air purification, carbon storage, and reduction of stormwater runoff. However, these trees face various climate-related stresses, including higher temperatures, intense rainfall, and droughts, which can impair their health and ability to provide these benefits. Ensuring that urban trees remain resilient to these pressures is vital for maintaining their positive impact on cities.

Moreover, the resilience and benefits of urban trees are not distributed equitably across all city areas, often leaving vulnerable socio-economic groups at a disadvantage. Addressing this imbalance is essential for promoting social equity and environmental justice in urban planning.

However, the resilience of urban trees to these stresses and whether this resilience is equitably distributed among different socio-economic groups in cities remains largely unexplored.

This project aims to fill the knowledge gaps by exploring how resilient urban trees are to climate-related disturbances and how this resilience and ES are distributed across different socio-economic groups in the city. The research will be conducted in Rzeszow, Poland, a city actively working on climate change adaptation. The study has two main goals: This project aims to fill the knowledge gaps by focusing on two main goals: 1) Assessing how well urban trees can withstand climate-related stresses and continue to provide ES, and 2) Evaluating how the resilience and ES of these trees are distributed among different socio-economic groups within the city.

The project is structured into five interconnected work packages:

WP 1: Assessing Urban Trees: Tree species and their structural characteristics across the city will be quantified and mapped by analyzing LiDAR and hyperspectral data using advanced remote sensing methods.

WP 2; Quantifying ES: Key ES provided by urban trees, such as air pollution removal, carbon sequestration, and runoff reduction, will be quantified and mapped using the i-Tree Eco model.

WP 3: Developing a Conceptual Resilience Framework: A comprehensive framework will be improved to understand and assess the resilience of urban trees to various climate-related disturbances

WP 4: Assessing Tree Resilience: Tree species traits associated with resilience will be reviewed to develop relevant tree trait indicators for specific disturbances. Then, using these indicators and the refined framework, the ecological resilience of urban trees to the disturbances will be assessed and mapped.

WP 5: Evaluating Environmental Justice: The distribution of tree resilience among different socio-economic groups will be analyzed and mapped to identify and address potential environmental injustices.

The results of this project offer valuable insights for urban planners and policymakers. The project highlights the importance of integrating resilience and equity into urban tree management and helps design more effective and fair strategies to enhance urban sustainability and resilience. The project aims to inform urban decision-making processes to better allocate resources and implement tree-based solutions, ultimately contributing to developing more resilient and equitable urban environments.