Oregon Department of Transportation

Research Stage 1 Problem Statement

Number 26-61 – "Tree Inventory for Road Safety"

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

Trees adjacent to roadways can pose significant safety risks such as older or weak trees falling into the highway during windstorms or after wildfires, potential visibility obstructions, and icy road conditions during winter from shade. While trees offer environmental and scenic benefits, they contribute to safety hazards, particularly when they are located too close to roads or block critical visibility points. According to the Insurance Institute for Highway Safety ([IIHS Website](#)), trees are the most common fixed objects struck in fatal crashes, accounting for about 47% of fatalities involving fixed objects. Currently, Oregon Department of Transportation (ODOT) lacks an automated system to inventory and analyze roadside trees for safety hazards. Although ODOT collects mobile lidar data on highways, no efficient system exists to extract and assess tree-related risks from this data. This project proposes developing an automated, sustainable tool to utilize lidar data for identifying hazardous trees and prioritizing safety-related maintenance, all while minimizing potential long-term technical debt by ensuring compatibility with ODOT's IT infrastructure.

2. What **final product or information** needs to be produced to enable this research to be implemented?

This research focuses on developing an automated tool designed to extract and analyze tree-related data from ODOT's existing mobile lidar system. ODOT currently owns two mobile lidar systems, which capture extensive geometric and radiometric data across the state's road network. However, this rich data is underutilized for analyzing tree-related hazards and environmental factors. By creating a tool that leverages these systems, the research will extract key parameters such as tree proximity to the road, height, canopy spread, trunk diameter, and tilt (specifically if a tree is tilting toward the roadway). These parameters are essential for evaluating safety risks, such as visibility obstruction and tree encroachment on roadways, as well as identifying environmental risks like shade-induced icy conditions in winter.

In addition to safety, the tool will help ODOT meet regulatory requirements, particularly those set by the Oregon Department of Environmental Quality (DEQ) for managing tree shade near waterways to control stream temperatures. The research will not only identify hazardous trees but also suggest interventions that balance the need for road safety with environmental preservation. To ensure sustainability and minimize technical debt, the tool will be designed to align seamlessly with ODOT's existing IT infrastructure, featuring a user-friendly interface for straightforward operation and maintenance. This tool will automate the extraction process, allowing ODOT to prioritize maintenance efforts efficiently, while reducing the need for manual inspections. It will also include an intuitive interface to ensure ease of use by ODOT staff, along with detailed training materials to support implementation. The outcomes of this

research will provide ODOT with the framework to update their policies and procedures for roadside tree management, optimizing both road safety and environmental stewardship.

3. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

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Chris Harris	Automation Engineer	Christopher.Harris@odot.oregon.gov	(503) 302-9390
Rhonda Dodge	Lead Remote Sensing Surveyor	Rhonda.k.dodge@odot.oregon.gov	(503) 986-3775
Christina McDaniel-Wilson	State Traffic Safety Engineer	Christina.A.MCDANIEL-WILSON@odot.oregon.gov	(503)-986-3568

4. Decision making lenses

Please complete the following three sections. Your answers to these questions will be applied on a programmatic basis to support agency decisions. Answering yes to the questions below is not required. Resolving a narrowly focused technical research problem may meet agency needs without answering yes to any of the following questions. The ODOT Research Section will seek a balanced portfolio some projects will answer yes to one of the three categories below (e.g. climate, equity, and/ or safety) and other projects in a different category.

We are looking for an overall program balance and no one project is expected to balance all categories. Generally, a research problem statement is expected to be able to answer yes with clear and verifiable information in only one of the three categories below, some projects may be able to answer yes in two or even three categories. Some projects (i.e. needs focused on specific elements of infrastructure design), may have no yes answers but may still be high value research need.

Climate
Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. Every mile driven in Oregon is powered by a clean source of fuel. We seek research that supports construction and maintenance operations are carbon neutral and investments in mobility that support travel by low and no emission modes. While every research project may not result in a reduction in emissions, transportation investments overall support emission reductions to achieve state goals. Oregon envisions a transportation system that is resilient in the face of seismic and climate events and impacts to the degradation of the natural environment are reduced. Our vision includes a transportation infrastructure is built in a way that avoids impacts on key habitat and results in better environmental conditions for wildlife and native vegetation. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4f. Will addressing the **transportation issue** identified as a need in Question 1 develop, or validate methods for the estimation, measurement, or monitoring of transportation generated greenhouse gasses (GHG)?

☐ Yes   ☒ No   ☐ Unsure

4g. If climate or GHG is not the focus of this **transportation issue** identified in this problem statement, will the research apply a GHG analysis to transportation infrastructure, planning, operations, maintenance, or materials?

☐ Yes   ☒ No   ☐ Unsure

4h. Will the addressing the **transportation issue** include development or testing of construction practices, methods, or materials to establish potential reductions in greenhouse gas emissions?

☐ Yes   ☐ No   ☒ Unsure

4i. Will the solving the **transportation issue** in question 1 study or support the reduction of vehicle miles traveled and single occupancy vehicle travel or support transition to electric vehicles (or other types of zero emission vehicles) or low-carbon alternative fuels?

☐ Yes   ☒ No   ☐ Unsure

4j. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☒ Yes   ☐ No   ☐ Unsure

4k. Will the solving the **transportation issue** in question 1 lead to work that may result in better environmental conditions for wildlife and native vegetation ?

☒ Yes   ☐ No   ☐ Unsure

4l. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:
Additional Information: While climate is not the primary focus of this research, the project could positively impact the environment by improving tree management along roadsides. By identifying hazardous trees and assessing tree cover that affects riparian areas, this project may contribute to better environmental conditions for both native vegetation and wildlife, supporting state climate goals indirectly. Additionally, by addressing shade-related issues like icy conditions caused by tree cover, the research could help enhance road resilience in the face of adverse weather, potentially reducing maintenance demands caused by climate events.

Equity
Equity can have many dimensions and impacts relating to communities, and transportation. It is important that problem statement proposals clearly explain in what capacities are equity dimensions or impacts being examined within problem statements. It is a goal of the OTP to "Improve access to safe and affordable transportation for all, recognizing the unmet mobility needs of people who have been systemically excluded and underserved. Create an equitable and transparent engagement and communications decision-making structure that builds public trust". Proposed research may have the intent of studying elements of this goal or apply analysis to specific transportation topics to ensure the

resulting research recommendations is consistent with our equity goals. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4a Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

    ☐ Yes   ☒ No   ☐ Unsure

4b If the **transportation issue** is not focused on transportation equity, will the primary topic be assessed for equity benefits or impacts within the research project?

    ☒ Yes   ☐ No   ☐ Unsure

4c Is the implementation of potential findings from this research likely to directly involve participation from an identified group that would benefit from an equitable process or outcome?

    ☒ Yes   ☐ No   ☐ Unsure

4d Is the intended final product or information expected to support ODOT's equity efforts (Including but not limited to supporting one of the equity related objectives of the ODOT's Strategic Action Plan or Oregon Transportation Plan) ?

    ☒ Yes   ☐ No   ☐ Unsure

4e If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

Additional Information: This research aligns with ODOT's Strategic Action Plan by promoting equitable access to safe transportation for all Oregonians. By addressing hazardous conditions, such as shade-caused icy roads in rural and underserved areas, the project ensures that road safety interventions are applied consistently across regions. This supports ODOT's goal of removing systemic barriers and providing equitable transportation services statewide. The project also contributes to improving environmental conditions by assessing tree cover impacts.

Safety
Research outcomes may include interventions and countermeasures to prevent or reduce the frequency of crashes or other causes of transportation-related injury or death; or may include measures to reduce severity of injury (including prevention of death) after a crash or other injurious event. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan, Oregon Transportation Safety Action Plan and Oregon Transportation Plan.

4m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

    ☒ Yes   ☐ No   ☐ Unsure

4n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

       ☒Yes   ☐No   ☐Unsure

4o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

       ☒Yes   ☐No   ☐Unsure

4p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

       ☒Yes   ☐No   ☐Unsure

4q. Will the solving the **transportation issue** support improving safety through **investing strategically**?

       ☒Yes   ☐No   ☐Unsure

4r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

Additional Information: The primary focus of this research is improving road safety by using mobile lidar technology to identify hazardous trees along roadsides, such as those that obstruct visibility or cause shade-related icy conditions. The project directly addresses the safety of the traveling public by reducing the likelihood of accidents in hazardous areas. It uses the best available technologies (mobile lidar) and fosters communication and collaboration between ODOT teams (e.g., traffic safety, environmental, and maintenance). This research supports strategic investments in safety interventions that protect both rural and urban communities.

5. Other comments:

This project builds on ODOT's existing efforts to utilize lidar data for transportation asset management but extends the scope to include roadside tree hazards, an area that remains underutilized. The proposed research aligns with ODOT's safety and climate goals by enhancing road safety and addressing environmental concerns such as shading.

The findings of this research can also be expanded into other areas, such as wildfire recovery and landslide monitoring, where tree and vegetation management play a key role. Collaboration with ODOT teams who specialize in traffic safety and environmental management as well as Engineering Automation ensures that the results of this study can be implemented across various departments.

6. Corresponding Submitter's Contact Information:

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