

Research Stage 1 Problem Statement

PROPOSED TITLE: Statewide Investigation of Extreme Heat Impacts on Active Transportation

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

Climate change is already increasing the frequency, duration and extreme nature of high heat events in Oregon and this trend will continue to worsen over time. Exposure to extreme heat puts anyone who walks, bikes or rolls at risk of acute exposure and attending health consequences. It is already the deadliest natural hazard worldwide and has had deadly consequence here in Oregon. In June of 2021, at least [69 people lost their lives](#) in connection with an extreme heat dome event. Approximately 61% of those deaths occurred in areas identified as “heat islands,” where lack of shade and other cooling environmental factors lead to very extreme temperatures, relative to greener, more verdant locations. It is important to consider that over 120,000 households in Oregon do not own a personal vehicle and are therefore limited to walking, rolling or taking transit or other low-cost transportation options. Oregonians who depend on active transit, by choice or by circumstance, will face increasingly limited transportation access due to hazardously hot days. Despite these existing and future challenges, ODOT does not yet know how extreme heat events impact people’s propensity to walk and bike, or how more days of extreme heat may influence ODOT’s goal to divert more vehicular travel to walking and biking.

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

The proposed work maximizes existing data resources by leveraging traffic counts of bicycle and pedestrian to examine how and where active transportation is impacted by extreme heat events. It also leverages ongoing work from OHA's Regional Heat Thresholds study and Oregon Metro's Cooling Corridors Project by exploring, in parallel, if and how traveler behavior along cooling corridors is impacted by extreme heat events. This provides a unique comparison that could inform ODOT policy, standards and procedures. The results of this effort will provide high resolution traveler behavior data that characterizes and compares extreme heat impacts on pedestrian activity at specific locations. This allows for insight into street-level and neighborhood scale interventions that can protect human health and safety. OHA's Regional Heat Thresholds study will provide people in Oregon with timely, relevant information to help protect themselves and their communities from the health impacts of extreme heat—recognizing that heat risks vary across different regions of the state. Analyzing pedestrian activity during periods of extreme heat will help OHA staff better understand how and where Oregonians selectively reduce risks of exposures and how much seasonality affects risk reduction. Additionally, prolonged extreme heat events may result in reduced physical activity which can disproportionately impact communities with higher prevalence of chronic conditions like cardiovascular diseases and diabetes. Overlaying Metro's Cooling Corridors data with measured pedestrian data can show which communities are more resilient during extreme heat events.

In order to meet statewide Oregon Transportation Plan commitments to reduce vehicle miles traveled into the (hot) future, and to meet its mission to provide a safe and reliable *multi-modal* transportation system, ODOT must adapt policies, standards and procedures associated with bicycle, pedestrian and transit infrastructure to mitigate exposure to extreme heat. The solutions needed to avoid heat impacts on health and safety are known. The proposed study will better inform application of these solutions and clarify strategic applications for mitigation options across the state.

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.

Name	Title	Email	Phone
Paris Edwards	Adaptation and Resilience Program Manager	Paris.B.Edwards@odot.orgon.gov	971-446-8861
Cordelia Main	Epidemiologist 2	cordelia.k.main@oha.oregon.gov	971-258-5728
Eric Main	Research Analyst 4	eric.c.main@oha.oregon.gov	503-487-7080

4. Other comments:

Tasks to complete the research:

- 1) Examine active transportation traffic counts data during extreme heat events to observe changes in activity from normal. Researchers will define “extreme heat” as well as “normal” activity.
- 2) Examine pedestrian activity in designated “cool corridors,” comparing activity during extreme heat and normal conditions to gauge impact of heat mitigation measures. Researchers will highlight heat mitigation features

associated with cooling corridors.

- 3) Apply “heat region” boundaries designated by OHA and relevant chronic disease prevalence data to characterize risk of heat exposure and/or transportation access loss/cost increases for specific higher risk populations.
- 4) Examine existing shade access within urban growth boundaries. Tree cover is known to be one of the most important heat exposure mitigation assets. Canopy cover status helps to characterize gaps and strategic leverage opportunities for state and local entities to consider.

The final product from this study will be a report detailing the results of the study, along with summary findings specifically targeting key decision makers and practitioners within ODOT and OHA.

Citations

Batur, Irfan, et al. "Understanding how extreme heat impacts human activity-mobility and time use patterns." *Transportation Research Part D: Transport and Environment* 136 (2024): 104431.

Heger, Monica. "Equitable adaptation to extreme heat impacts of climate change." *UCLA J. Envtl. L. & Pol'y* 39 (2021): 283.

Karner, Alex, David M. Hondula, and Jennifer K. Vanos. "Heat exposure during non-motorized travel: Implications for transportation policy under climate change." *Journal of Transport & Health* 2.4 (2015): 451-459.

Li, Rui, et al. "Effectiveness of travel behavior and infrastructure change to mitigate heat exposure." *Frontiers in Sustainable Cities* 5 (2023): 1129388.

Voelkel, Jackson, et al. "Assessing vulnerability to urban heat: A study of disproportionate heat exposure and access to refuge by socio-demographic status in Portland, Oregon." *International journal of environmental research and public health* 15.4 (2018): 640.

Links

[Oregon's Tri-County Extreme Heat Dashboard](#)
[Metro's Cooling Corridors Study](#)

5. State of Oregon Decision Making Lenses

State decision making lenses are a part of the state of Oregon's policy structure. State policy and federal policy are not always aligned. The state will prioritize research according to state policy, however ODOT may be required to skip prioritized proposals based on constraints placed on the use of federal funds. If state funds are available ODOT will attempt to fund prioritized research that is deemed ineligible for federal funding.

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 a high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. To that end, we seek research that reduces carbon emissions from construction activities and materials, and from maintenance equipment and operations. Oregon envisions a transportation system that is resilient, this means a system that is durable in the face of seismic events and extreme weather to avoid negative impacts, withstand them or bounce back quickly to resume system function. We seek research that improves the ability of the transportation system to adapt or cope with more frequent and extreme weather events. This may include innovations in data and data sharing, construction materials and project design, communication, emergency planning and response, and more. Similarly, we seek research that avoids negative impacts on key habitats and ecosystems that can buffer or reduce damage to infrastructure and improve 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](#).

5a. 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 gases (GHG)?

☐ Yes

☒ No

☐ Unsure

5b. 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

5c. Will 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

5d. Will 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

5e. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, or monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☒ Yes

☐ No

☐ Unsure

5f. Will 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

5g. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

Climate change is a primary driver of increased frequency and duration of extreme heat events. ODOT and OHA need to better understand if and how extreme heat is influencing active transportation behavior and where. This information can be used to improve a variety of safety measures to improve short and long-term impacts related to the frequency, timing and/or curtailment of active transportation choices. The benefits of this work would most directly benefit those with limited alternative transportation options that may also limit safety during hazardous heat events.

ODOT has committed to reducing vehicle miles traveled by 20% by 2050. Active transportation is one important component of reaching this goal. This study leverages existing data to locate where safety and comfort improvement options overlap with high use and/or high curtailment of use during extreme heat events. That is, the information from this study can help us understand if and where active transit usage decreases in association with extreme heat events. This information can be used to make targeted changes to the system that intend to preserve and promote active transportation modes.

Equity

Equity can have many dimensions and impacts relating to communities and transportation. It is important that problem statement proposals clearly explain the equity dimensions or impacts being examined. Oregon commits to social equity in the OTP, specifically 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.* We seek research that studies elements of this goal or applies analysis to specific transportation topics to ensure the resulting research recommendation is consistent with agency equity goals. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#) and [Oregon Transportation Plan](#).

5h. Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐ Yes

☒ No

☐ Unsure

5i. 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

5j. 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

5k. 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

5l. If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

ODOT's mission is to provide a safe and reliable *multi-modal* transportation system to *all Oregonians*. The proposed study will shed light on the safety and equity of active transportation, with a focus on active transportation access extreme heat events. Extreme heat events and climate change generally disproportionately impact communities of color. Many of Oregon's population centers, Portland in particular, have a legacy of discriminatory housing policies that have led to increased temperatures in predominantly non-white neighborhoods as compared to white neighborhoods. Barriers to wealth accumulation and credit access disproportionately impacts access to personal vehicles and homes in neighborhoods with convenient transit access. Without targeted interventions, systemic racism in combination with climate change, will exacerbate risk for Oregon's non-white active transportation users. It is vital that ODOT develop equity-based solutions to extreme heat exposure that take into account how discriminatory practices have shaped how and where the system is used.

Real time traffic counts of bicycle and pedestrian activity across the state highway system will allow researchers to examine baseline activity, higher and lower rates of activity during high heat events, and to examine surrounding demographics. There are challenges with associating active transportation and points of origin (linked to household level demographic data), however similar efforts using innovative approaches have been carried out at ODOT and elsewhere that improve demographic associations. In this case, precision is not required in order to draw meaningful conclusions about equitable exposure risk to extreme heat and potential beneficiaries of interventions.

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](#).

5m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☒ Yes

☐ No

☐ Unsure

5n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☒ Yes

☐ No

☐ Unsure

5o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☐ Yes

☒ No

☐ Unsure

5p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☐ Yes

☒ No

☐ Unsure

5q. Will solving the **transportation issue** support improving safety through **investing strategically**?

☒ Yes

☐ No

☐ Unsure

5r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

Ensuring safe and reliable transportation access is a primary focus of this study and supports the mission of the agency. We know that exposure to extreme heat is unsafe and sometimes lethal, however ODOT does not yet know how extreme heat events impact the safety or health of its active transportation users. Nor does the agency know where safety improvements could be targeted for equitable, climate change durable improvements. This study will improve agency awareness regarding active transportation safety in the face of climate change, and provide insights into the most and least safe locations. This information can support local plans, design standards and safety databases, such as the ATNI, to support policy and funding decisions where safety improvements are needed most.

6. Corresponding Submitter's Contact Information:

Name:	Paris Edwards
Title:	Adaptation and Resilience Program Manager
Affiliation:	ODOT
Telephone:	971-446-8861
Email:	Paris.B.Edwards@odot.oregon.gov

7. ODOT Sponsor Contact Information (Required if Submitter is not an ODOT employee)

Name:	
Title:	
Crew Number:	
Telephone:	
Email:	

This form is not a grant application or contract document. Please do not include proprietary information on this form. Once this form is received ODOT may revise and publish the problem statement. If selected, ODOT will assign investigator(s) of the department's choosing to conduct research.