Tribal Transportation Transitions: A Preliminary Study in California

Center for Efficiency, Resiliency, and Community Engagement in Transportation Research Report

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16. Abstract
The Tribal Sustainable Transportation Transitions study was conducted by faculty and graduate students in the departments of Native American Studies and Civil and Environmental Engineering at UC Davis, respectively, as part of the Center for Efficiency, Resiliency, and Community Engagement in Transportation (CERCET). The purpose of this study was to identify the challenges and opportunities facing Tribal Nations in California considering the transition to more sustainable transportation systems. This study began with a literature review on tribal sustainable transportation initiatives in California. A pilot survey was then distributed via email to tribal transportation, public works, and/or environmental directors at federally recognized tribes in California, conducted in-person with attendees at the 2026 UC Davis Big Time and Powwow, and conducted via interview with tribal public works and environmental staff. Thirty-eight individual survey responses were received, providing current perspectives and needs within tribal communities regarding implementing sustainable transportation initiatives. The results from the survey reveal that respondents view sustainable transportation as a contextual concept, dependent upon infrastructure capabilities, geography, and community preferences. While most respondents identify advanced transportation infrastructure and active transportation as primary sustainable transportation initiatives, these were identified predominantly as a means for addressing fundamental transportation challenges such as road construction and maintenance as well as public transit availability. The study further identified major transportation barriers including staff shortages, funding constraints, and difficulty receiving aid from regional and state agencies which make it challenging for tribes to pursue many transportation opportunities. This pilot study provides important methodological lessons for more comprehensive research on the definition of "sustainable transportation" and specific transportation needs in Indian Country in California.

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EXECUTIVE SUMMARY

Within the U.S., the largest Native population and the second largest number of tribal governments are located in California. These tribal governments have jurisdiction over land bases that range in size from a few acres surrounded by private and federal lands, to thousands of acres, in both rural and urban environments. Tribal lands in California are ecologically diverse, from southern deserts to northwestern temperate rainforests. Transportation issues are unfortunately common in Native communities, including limited paved roads, poor road conditions, limited public transportation options, high fuel costs, and limited pedestrian and cyclist facilities. Research and investments in transportation efficiency and infrastructure often do not reflect the specific context and needs in Indian Country. Similarly, opportunities to transition to "sustainable transportation," often defined as reduced fossil fuel modes of transport, are not necessarily linked to needs and feasibility in Native communities. Some tribes that have received funding for sustainable transportation initiatives such as public transit vehicles, active transportation infrastructure, and resilience planning use these grants to show what sustainable transportation looks like for them. Meanwhile, tribes that have not yet received such funding may need to first address basic transportation issues, such as expanding and paving the limited existing road network on their tribal lands.

This pilot study began with targeted semi-structured interviews with tribal environmental leaders in California from three tribes (two in northern California and one in southern California). These interviews informed the survey design and outreach. Graduate student researchers in Native American Studies and Civil and Environmental Engineering at the University of California, Davis led a comprehensive literature review and examination of funded tribal sustainable transportation projects in California. A survey on interest in, and barriers and opportunities facing tribes interested in sustainable transportation options was distributed to tribal environmental and public works staff via email between February and April 2025, and to tribal staff and citizens in person in April 2026. Our goals were to contribute to identifying the challenges and opportunities facing Tribal Nations in California considering the transition to more sustainable transportation systems, and to provide data that tribes might find useful as they work to fund and build sustainable transportation programs.

There is limited data available on why tribes choose to participate or not participate in sustainable transportation initiatives. The initial conversations with tribal staff indicated that tribal members and tribes rely on gas-powered vehicles to transport wood or other materials for personal or commercial use, and do not have the infrastructure in place to support sustainable transportation options. In our limited number of surveys and interviews, we found that respondents are potentially interested in sustainable transportation programs, however, implementation is hindered by the need to address basic mobility needs before being able to pursue larger sustainability goals.

From a methodological standpoint, a clear lesson is that face-to-face, onsite surveys and interviews with tribal members and staff are required. Distributing surveys by email simply does not reach people. However, face-to-face distribution is time-intensive, and would require additional project staff. Tabling in-person was more successful than distributing the survey online, but also did not reach tribal staff or leadership with experience implementing transportation projects. A preferred method would be visits to tribal transportation managers on-site throughout the state. It is also important to communicate and share with project participants (survey respondents, interviewees) the utility of participating – for example, sharing that the results will take the form of a set of recommendations that tribal staff can use in fundraising for transportation programs. It is also important to clarify how Indigenous data sovereignty will specifically be protected, before tribal members share goals and information about their specific transportation needs. In our approved Institutional Review Board documents completed for this study, we committed to maintain anonymity (unless otherwise requested by participants) and to only share aggregate data summaries, not individual data responses.

1 Introduction

Transportation is an essential service to communities, providing people with access to jobs, health care, and other key amenities. Transportation in rural areas is often less available and reliable than in urban areas (1, 2). In particular, rural communities possess lower population densities, require longer travel distances between destinations, and often possess poor public transportation infrastructure, which makes utilizing transportation for residents more limited (3). At the same time, these communities face increased pressures from extreme weather events, which can often cause road closures, storm damage, and flooding, making accessing essential services more difficult for current transportation systems (4). Figure 1 from the Hidden Disparities map shows the limited public transportation options in northern California, overlaid with areas with high Native populations, tribal land jurisdictional boundaries, and high fire risk (5). This shows the limitations on mobility for rural populations without a personal vehicle, and their vulnerability to catastrophic fire. The map may be visited at https://environment.ucdavis.edu/hidden-disparities-map, and further layers may be added, such as the number of health care providers, and the presence of toxic sites.

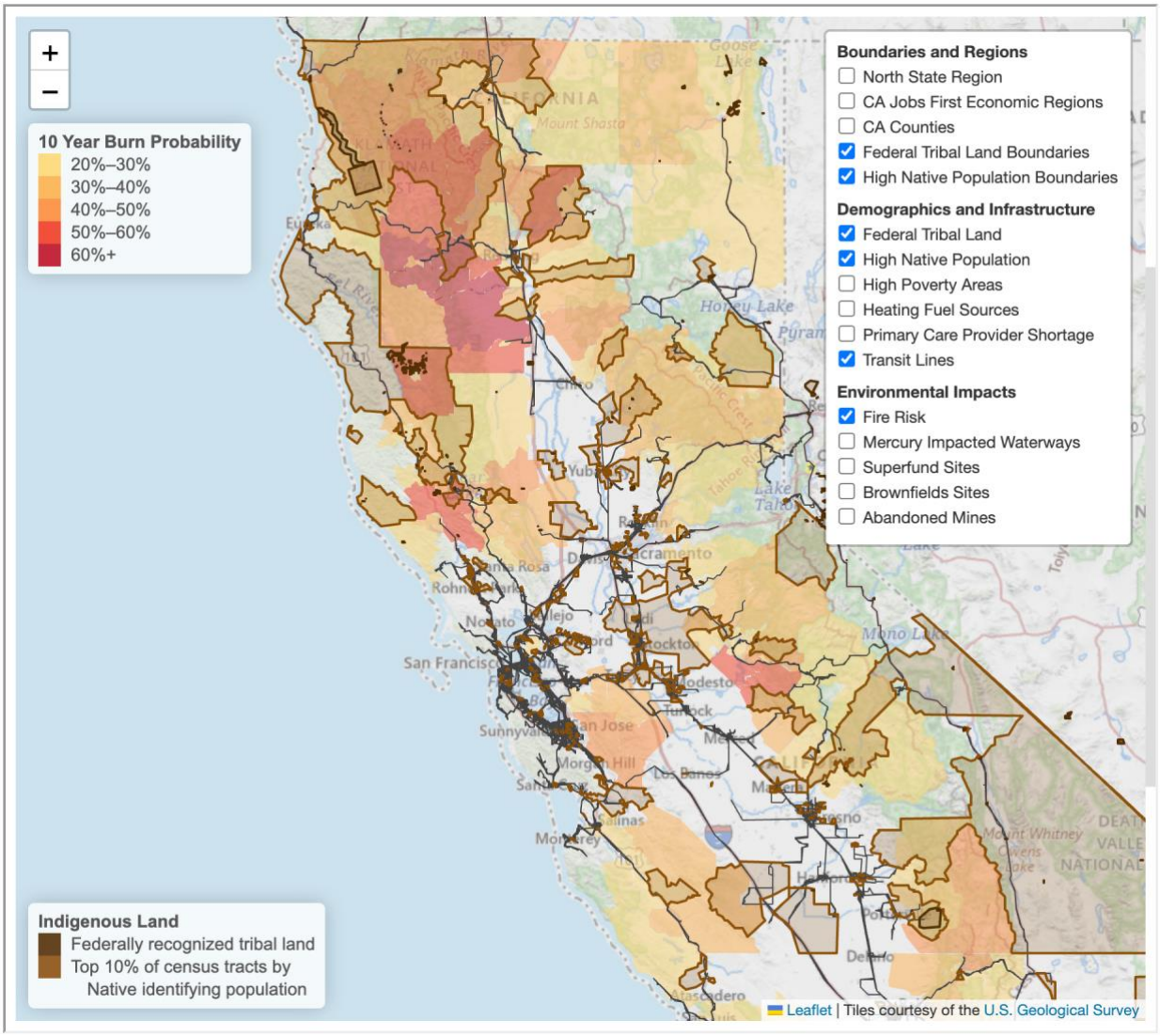


Figure 1. Map of California illustrates the widespread distribution of tribal lands across California, the high density of Native populations, the limited transportation routes, and the wildfire risk in these areas.

In terms of impacts on public health, transportation accounts for a significant source of air pollutants (6). As a result, there is a need to implement sustainable transportation solutions to not only improve mobility options, but to also manage the resilience and functionality of transportation systems, particularly in rural and other areas that face compounding challenges.

The concept of sustainability has a wide range of definitions and is highly context-dependent. As defined originally by the Brundtland report, sustainability was evoked as a policy concept that was used to ensure development had not compromised the needs of future generations (7). This has since changed to a broader interpretation that is recognized in practice; however, it is difficult to define because sustainability is often presented as a distinct context-based concept that may overlap with related environmental, social, or economic concerns (8–10). As a result, sustainability cannot be applied as a universal definition; its meaning(s) can change in different settings. Therefore, there is a need to define it based on the goals, values, and concerns that are at stake (9, 10). Indigenous Studies' engagement with the concept of sustainability centers nuanced Indigenous approaches to cyclical land, water, and fire stewardship, and attention to the relationships between human and nonhuman beings (11). Indigenous environmental philosopher Kyle Powys Whyte (Potawatomi) and co-authors Chris Caldwell (Menominee) and Marie Schaefer (Odawa) emphasize the concept of "continuance," defined as "Indigenous survival and flourishing in the face of change, including change stemming from oppression" (11). Whyte further points out that resilience efforts should not be built on extractive methods and instead should be based on empowering Indigenous communities through self-determination and consent, to allow them to determine the future of their lands (12). Together, these concepts indicate that sustainability is not just an environmental approach, but also a relational one.

Like the general definition of sustainability, the concept of sustainable transportation can be ambiguous. In early conversations with tribal environmental leaders, we were advised that "sustainable transportation" has different definitions for different tribes, depending upon their existing infrastructure, community values, community demographics, and the surrounding environment (i.e., urban, rural, forested, etc.). In an attempt to provide a global definition, the United Nations Development Programme defines "sustainable transportation" as "transportation that seeks to minimize environmental impacts, while ensuring safety and affordability and providing access to mobility for all" (6). In this instance, sustainability revolves around environmental, safety, and mobility goals, but it can fail in practice because it is difficult to measure achievement of these goals across contexts. For that reason, broad sustainability targets can overlook how transportation impacts don't exist in isolation (13). Further, the definition of sustainable transportation can continue to change throughout policy and frameworks as the scope can range from narrow to broad approaches (13). Narrow approaches tend to be driven by short-term goals that can be easy to measure but ignore the root issue, while broad goals can produce long-term outcomes but are difficult to measure success (14). For that reason, defining sustainable transportation matters because ambiguities in how it is defined can impact where resources are allocated, how well policies perform, and how achievable outcomes can be (14, 15).

In the context of the U.S., sustainable transportation is viewed as a pressing need which broadly addresses environmental, social, and economic issues, but there is no set definition at the federal level (14, 15). In California, the current Caltrans Fact Sheet for Sustainable Transportation Planning Grants underscores the need for projects that contribute to the State's air pollutant reduction targets (16). In recent years, sustainable transportation in the U.S. revolved around four categories: vehicle improvements, environmental transit development, human factors, and planning/regulation schemes (17). While some of these categories can overlap, the range of indicators, goals, and methods to define these projects as sustainable are distinct (14, 17). Projects across the U.S. and even individual state agencies, vary in what is defined as sustainable transportation. For example, the California State Transportation Agency defines sustainable transportation in a broad sense, covering access to transportation, safety, air quality, and resilient transportation (18). In contrast, other state agencies that support sustainable transportation

center next-generation vehicles, active transportation, and reducing vehicle miles traveled (16, 19–21). Clear and consistent definitions of sustainable transportation would help with monitoring the impact of investments in this arena (17).

1.1 Why Indian Country

Currently, many sustainable transportation projects and funding opportunities in the U.S. tend to be tailored to an urban environment, despite the significant transportation needs in rural areas (22). Approximately 97 percent of land in the U.S. is considered rural, with about 20 percent of U.S. residents, many including federally recognized tribes, living in these rural areas. Because lands recognized as Indian Country[1] are often located in more remote and rural areas, public transit programs in these areas are prone to face unique challenges (23). These challenges often include hazardous road conditions, lower ridership for fixed transit routes, complex and overlapping jurisdictional authority among federal, state, and tribal roadways, complications across long-distance travel, and accessibility issues (24). On average, 9 percent of households in tribal areas do not have a vehicle, which is more than twice the national rural average of 4 percent of households (25). Further, only 25.6 percent of individuals living in tribal areas were within walking distance of a grocery store, which is less than half the national average of 58.8 percent (24). In addition, the safety of rural community members is often at higher risk because of faulty or absent transportation systems (26, 27). Walking is often not an option, as there is a lack of pedestrian infrastructure which can result in higher fatalities (24). Both taking rural public transportation and walking along highways are less-desirable options for women and children because these tend to be hotspots for traffickers to target, contributing to the epidemic of missing and murdered Indigenous women (28, 29).

While there is still need for improvements to transportation access for tribal communities, support in these areas has increased over the last 20 years in particular. The Tribal Transportation Program (TTP) was first created in 1928 under the Federal Highway Administration (FHWA) to provide broad funds for surveying, construction, and maintenance of reservation transportation infrastructure for tribal communities (30). In 1999, the Community Transportation Association of America reported that only 18 of the then 562 federally recognized tribes received any funding from the Federal Transit Administration's (FTA) program for rural transit (31). The Tribal Transit Program was later established in 2006 under the FTA to provide critical funding for federally recognized Indian tribes to improve the mobility and transportation infrastructure in public transportation to help meet community needs (31). The Tribal Transit Program offers both formula-based and competitive grants which provide support to improve access to public transportation infrastructure as well economic development within Indian reservations (32). Since 2012, the TTP has gained more transportation funds through the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act which has increased funds to $505 million for 2020 (33, 34). In the 25 years since, the number of tribes served has grown, with well over 100 tribes now having implemented successful transit programs, due to an increase in funds and programs that tribes are eligible to apply for (35). In 2020, the Department of Transportation (DOT) created the Tribal Transportation Self Governance Program (TTSGP), which provides federally-recognized tribes and tribal organizations with greater control, flexibility, and decision-making authority over DOT funds used to carry out tribal transportation programs, functions, services, and activities (PFSAs) in tribal communities (24).

[1] See 18 U.S. Code § 1151, " a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government…(b) all dependent Indian communities within the borders of the United States…and (c) all Indian allotments, the Indian titles to which have not been extinguished…."

2 The State of the Field

This literature review aims to investigate barriers and opportunities for sustainable transportation in Indian Country, particularly looking at what sustainable transportation projects have been implemented in Indian Country, what current and forthcoming issues there are in Indian Country regarding sustainable transportation, and what survey responses share about transportation projects, focusing specifically on California tribes. The review further looks into funding awards related to sustainability from the Sustainable Transportation Planning grant and the Clean Mobility Options award to better understand what tribes are utilizing grant funds for in relation to transportation needs.

2.1 Overview

Within this literature review, there were two reports identified that looked at transportation planning within tribal communities, which help to explain the current state of sustainable transportation in these communities. These reports are "Tribal Transit Study: Demographic Needs Indicators, Funding Needs and Livability" and the "California Tribal Nations Transportation Planning Needs Assessment" (25, 36). While there is no specific mention of implementing "sustainable" transportation initiatives in these reports, both of these reports highlight the insufficiencies of transit in rural tribal communities, while providing insight into the barriers and challenges these communities face.

2.1.1 Why is transportation an issue?

The most thorough report on travel behavior and mobility in tribal communities was the National Tribal Transit Study done by researchers at North Dakota State University (25). This report from 2021 looked at the role of mobility in rural tribal communities throughout the U.S., evaluated current public transportation programs and funding, and investigated how much public transportation affects livability in these communities. The article frames transportation as a necessity because it plays a key role in connecting tribal communities to essential services such as education, employment, and healthcare. While the article does not explicitly mention implementing sustainable transportation initiatives, it does highlight why tribal communities are at a disadvantage in pursuing sustainable transportation options when compared to rural areas that face similar issues.

According to the report, the biggest problems tribal communities face include lack of transit coverage (low-density populations require more routes and service options to use), higher costs (driving longer distances with fewer passengers), and lower transit mobility (travel less often for essential services). Current transportation funds for tribal communities only serve about 66% of those living on reservations with some reservations having no public transit systems. This is due to the fact that 75% of federal funds are based on high revenue miles that actively transport passengers, therefore prioritizing funding tribes with existing transit routes to maintain and grow those services rather than addressing gaps in transportation needs for tribal communities that already lack transportation options. At the same time, tribal transit typically costs 41% more in comparison to rural transit due to difficult terrain and longer commutes, which makes use of public transportation harder, as about 28% of tribal populations live below the poverty line. With a significant portion of residents being dependent on transportation in order to access essential services, this puts increasing transportation infrastructure availability at a higher priority than implementing sustainable transportation initiatives. In the case studies conducted within Standing Rock and Makah, most individuals use public transit for work, school, or medical appointments, and, without public transit, they would not be able to reach these essential services. This mobility gap shows that transportation preferences are not necessarily by choice; they are a product of geographic isolation and insufficient transit.

While the report does not explicitly mention sustainable transportation, it indicates why a transition to sustainable transportation is currently infeasible. In order to move toward sustainable transportation, tribes would need adequate transportation systems, funding for transportation projects, and planning departments large enough to address current mobility challenges. Based on the case studies within Standing Rock and Makah, the tribes voiced a need to prioritize better transit infrastructure, more walkable/accessible areas, expanded transit services, and higher route frequencies, showing that existing needs are unmet. The report recommends improving funding formulas to account for demographic needs along with support for data collection to support tribal planning to better equip tribes to apply for funds to create more accessible transportation in their communities. With existing gaps in their basic transportation infrastructure, it is difficult to consider a shift to more sustainable modes of transport.

2.1.2 Transportation outlook in California

A report by the Mineta Transportation Institute sponsored by the California Department of Transportation (Caltrans) examined current planning capacities, gaps, and infrastructure needs in the 109 federally recognized tribal nations in California (36). California in particular poses a unique outlook on transportation in tribal communities because of the geographic variations and varying population sizes within each tribe, which makes transportation planning very unique from tribe to tribe. The state also possesses a significant number of transportation organizations and agencies that are working towards sustainable initiatives, which can aid in supporting tribes to adopt sustainable transportation initiatives. Within the report, the Mineta Transportation Institute lists “sustainable transportation and land use” as a core research area, because it finds that this is a critically underserved area for tribes. While California agencies are required to support transportation planning in tribal communities, tribes are still faced with unmet transportation needs.

The Mineta Study received responses from 49 of the 109 tribes. Responses centered tribal needs, planning status, and funding sources. Like the nationwide report, many tribes in California stressed a need for more roads, safety features, and better access to jobs and medical facilities because current transit connecting to essential services is poor, expensive, and largely unavailable. Road safety in particular was the highest concern in these communities, with 87.7% of respondents ranking it as a high-priority need, showing that transportation is not just limited, but also unsafe. This aligns with the national report, in which road conditions are consistently identified as a major barrier in transportation. Challenges in road conditions include narrow roadways, inadequate lighting, signage, and improper pedestrian infrastructure. In terms of transit service awareness, about 75% of survey respondents did not have their own transportation, with about 57% sharing that they have access to local transit, and 53% unaware of local paratransit services in their communities. This means many tribal communities rely on outside transit systems rather than having local services, while also lacking awareness of options that could help disabled or elderly tribal members better access transportation modes. This aligns with the national study, because California‘s widespread transit networks do not go into rural areas, leaving many tribes without any public transportation options. Because sustainable transportation initiatives are dependent upon alternatives to individual driving, this makes implementation more difficult in rural communities which already lack rideshare options.

When it comes to transportation planning, the Mineta report demonstrates that tribes in California are not in a position to adopt sustainable transportation initiatives despite being within a state that possesses transportation initiatives geared towards supporting tribal communities. The main challenges tribes in California are facing include insufficient funds, limited planning capacity, and gaps within agency collaboration. As reflected in the national study, funds for tribal communities are scarce when it comes to meeting basic transportation needs. For tribes in California, many are seeking financial assistance to expand staffing capacity, in order to be able to invest the time in developing transportation plans. Many tribes noted the challenge of identifying trained staff to create transportation plans, which shows a lack of adequate resources. Of all the tribes that had been surveyed, only 20% of respondents had a

transportation planner, with 95% of those planners having multiple responsibilities outside of transportation planning. In addition, only 6% of those planners had formal training in transportation planning. Potential projects to address transportation needs were constrained by skill gaps and limited staff, limiting the number of projects that reached the funding and implementation stages.

While California law requires agencies to consult with tribal communities, the report reveals this is not always experienced (and not experienced equally) by tribes. In particular, the California Transportation Commission guidelines and Assembly Bill 52 require regional transportation agencies and metropolitan planning organizations to consult with tribal communities to help address tribal needs. However, 59% of survey respondents said they had no involvement with regional agencies when developing transportation plans. In particular, some tribes voiced that they felt their agency requests were ignored or delayed. This resulted in a lack of tribal participation in regional planning, funding delays, and coordination challenges. In addition, only about 10% of tribes surveyed had transportation performance measures in place, indicating that the majority of tribes were unable to demonstrate to funders how current transportation systems were not meeting their needs. This lack of data further placed tribes at a disadvantage when applying for transportation grants or creating transportation plans that include sustainable transportation initiatives. The report offers specific recommendations to address issues with staff capacity through the implementation of a "Rent a Planner" program through Caltrans or regional agencies at no cost to the tribes. This program would aid in training staff in transportation planning, assist with funding applications, build capacity for data collection, and act as a point of contact for tribes to communicate with agencies. This could be an important step in addressing deficiencies in the planning process.

Overall, the main takeaway from these two reports is that sustainable transportation initiatives are difficult to achieve for Tribes because of unmet basic transportation needs. Across both reports, it is clear that current transportation modes are unsafe, inconsistent, and limited for many tribes, which makes travel to essential services difficult. At the same time, receiving funds to address these issues becomes even harder due to federal scales favoring funds toward existing infrastructure, while in places like California, these challenges become intensified as tribes may have limited staff to push projects through funding opportunities. With all of these major issues, Tribes are more focused on creating projects that address urgent needs before being able to pursue sustainable transportation solutions.

2.1.3 Types of projects currently funded in California

The different sustainable transportation funding pools from 2021 to 2026 capture a range of priorities that center on ensuring the reliability, safety, and availability of transportation systems in tribal communities. The largest share of funding has gone toward low-pollutant transportation services along with microgrid feasibility studies, which frame sustainability as pollutant reduction and energy sovereignty (20, 21). Many of these projects include deploying low-pollution transit systems for the public while assessing the feasibility of renewable infrastructure to address the limited infrastructure and access challenges tribes face with transportation (21). Other sustainability initiatives included resilience planning for transportation infrastructure, expansion of active transit routes, and increases in long range transportation availability (20). Within resilience planning, many of the projects seek to create vulnerability assessments, mitigation plans, and adaptation strategies to understand the harms of extreme weather events on essential transportation infrastructure (20). Projects that are centered around active transportation programs define sustainability through a social lens of boosting community access to essential services when motorized options are unavailable (20). These projects work toward developing pedestrian and bicycle routes that improve the safety of shared pathways while expanding mobility options for those without vehicle access. The last major category includes long-range transportation planning (20). Because many existing transit routes are limited, some tribes request funds to devise feasibility plans, rideshare programs, and other regional mobility options to provide tribal communities with more options for travel based on place-specific constraints (20, 21).

3 Research Design and Methods

Given the very limited information on the potential and needs for sustainable transportation transitions among California Native Nations, this pilot project aims to understand:

- What sustainable transportation means to different tribal communities in California
- The state of sustainable transportation in tribal communities in California
- Current burdens and benefits within tribal transportation
- Status of transportation planning and funds within tribal communities
- Tribal perceptions on sustainable transportation on tribal lands

As of October 2024, with funding from the U.S. Department of Transportation through CERCET, a faculty member and a graduate student in the University of California, Davis (UC Davis) Native American Studies Department (joined in 2025 by a graduate student in Civil and Environmental Engineering) began conducting a literature review to understand the opportunities and barriers that exist for tribal communities when it comes to participating in sustainable transportation initiatives, with an emphasis on California. While the literature review provides background information on the challenges and opportunities tribal communities face when it comes to transportation, this project further seeks to understand the barriers tribes are currently facing in order to inform potential federal, state, and private funders on ways to design opportunities tailored to tribal interests and needs on a local and statewide level in hopes that the results may be used by tribes to advocate for tribal transportation needs. This research is of particular interest in California because it possesses the largest number of federally recognized tribes, and the state has a signficant number of sustainable transportation policies.

This study employed a mixed methods approach using online surveys and informational interviews with tribal members to understand their interest in implementing sustainable transportation initiatives. This allows for broad and in-depth insight to better understand the specific needs and barriers these tribes are facing when it comes to pursuing sustainable transportation initiatives.

For the literature review, articles were filtered based on the relevance to tribal transportation planning and sustainable transportation. The search query used to retrieve relevant articles based on terms within the title, keywords, or abstract included the following: “tribal”, “native american”, “indian”, “tribes”, “transportation”, “sustainable”, or “sustainability”.

3.1 Data Collection

The study invited tribal government employees and tribal members who live on or near tribal lands in California to share their views on the relevance, challenges, and opportunities of implementing sustainable transportation initiatives in their jurisdictions. Participants were initially recruited via email, and after researching job titles and contact information, we invited 47 transportation directors and relevant tribal staff affiliated with federally recognized tribes in California to participate in an online survey. We also asked these contacts to share the invitation with other members of the tribe. The email included a link to the online survey as well as an invitation to participate in a follow-up interview. Interested tribal members could choose to participate in both components, though most respondents opted for just the online survey. The survey was conducted online from February 28, 2025 through April 16, 2025. On April 16, 2025, the study was paused by the federal government. The study was authorized to resume on September 29, 2025, but the faculty member in the Native American Studies Department was on sabbatical. Upon the faculty members’ return, she and a new graduate student researcher in the Department of Civil and Environmental Engineering reviewed existing data and decided to re-open the survey in-person at a Native American event April 3 to 4, 2026, and attempt to schedule follow up interviews.

The challenge of reaching tribal partners via an email distribution of survey (February 28, 2025 to April 16, 2025) and the limited amount of partners engaged with during in-person distribution (April 3 to 4, 2026) resulted in a relatively low response rate, but responses are still helpful in illuminating interest in, barriers to, and opportunities for expanding sustainable transportation initiatives in California Indian Country. A total of 38 individuals participated in the online survey. No follow-up interviews were conducted with survey respondents, in part due to the difficulty of reaching them after the survey. Three semi-structured informational interviews were conducted with experts from three different tribes at the onset of the project, and informal dialogues were held with representatives from other tribes, all of which informed project design, questions, themes, and analysis.

3.2 Data Analysis

The surveys were analyzed following the Institutional Review Board protocols to ensure participants' confidentiality and identity were protected. Surveys were analyzed through thematic analysis using the Qualtrics TextIQ function to group segments of text which was then manually analyzed to gain insight in patterns, themes, and relationships between responses.

4 Findings

The results of the survey responses reveal how multifaceted the implementation of sustainable transportation initiatives are for many tribal communities in California. While there was widespread interest amongst tribes, there are persistent challenges including financial limitations, structural inadequacies, staffing shortages, and geographical constraints, all of which make sustainable transportation adoption less of a priority.

Across survey responses, sustainable transportation was rarely discussed as a standalone environmental objective. Instead, respondents tended to connect sustainable transportation to more immediate mobility needs: safe roads, access to services, public transit availability, emergency preparedness, and staff capacity. This suggests that sustainable transportation programs may be most effective when they are framed as tools for meeting basic mobility and resilience needs, rather than as technology-first or environmental-only interventions.

4.1 Current Initiatives

A pie chart drawn from individual survey response data shows that respondents believe their tribal governments are investing in or interested in investing in electric vehicle (EV) infrastructure and public transit (about 25% each), and less interested (about 12% each) in investing in active mobility and low-pollutant vehicles. A significant number of respondents (23%) were unaware of what their tribal government was investing in in terms of sustainable transportation infrastructure.

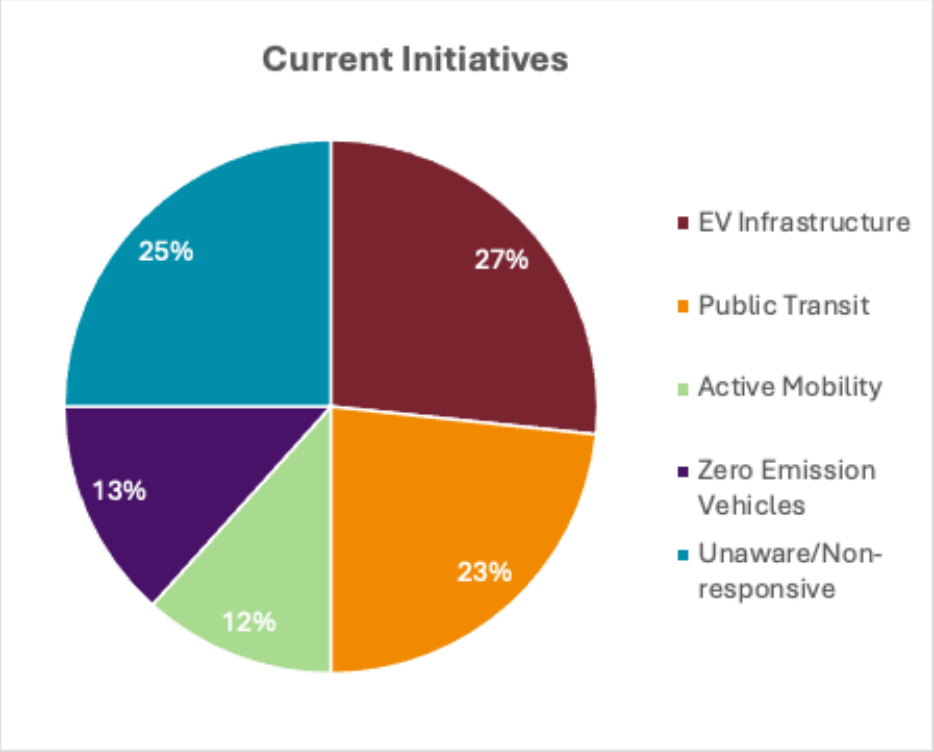


Figure 2. Current initiatives either being implemented or strived for in Tribal Nations in California.

When asked if participants had any knowledge of current sustainable transportation initiatives their tribe is working on, the results displayed no dominating themes. As shown in Figure 2, respondents were aware of initiatives including the development of low-pollutant transit and infrastructure, followed by the expansion

of public transit systems, and the addition of active transportation infrastructure, though a few respondents mentioned that these are still within the early stages of development. There were also a number of respondents that were unaware of any sustainable transportation initiatives in their tribe or left this section blank, which could indicate that these plans are either not openly known to tribal members/staff, or are not yet being developed. At the same time, it was not always apparent from respondents what developmental stages these sustainable programs were in, since responses were generalized. This means that the number of existing programs underway may be lower than indicated by respondents.

The way sustainable transportation is interpreted by tribes does seem to impact where investments are made. The prevalence of low-pollutant infrastructure in responses suggests that some tribes view sustainable transportation as electrification of their transportation systems, which could stem from the structure of grant programs or be influenced by California's push toward low-pollutantvehicles. Active mobility also came up as a way tribes are implementing sustainable transportation initiatives, which for some tribes can stem from limited transportation infrastructure. Addressing mobility through low-pollutantvehicles can allow for accessible and affordable options that also achieve sustainability goals.

4.2 Interest in Development

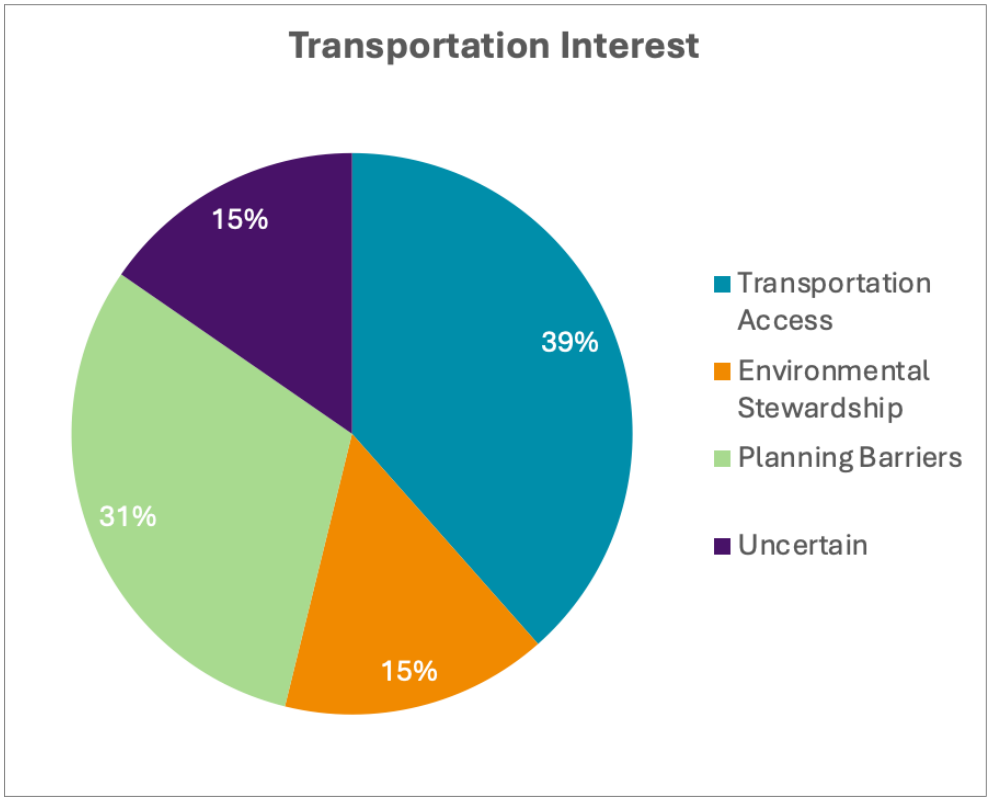


Figure 3. Interest in implementing sustainable transportation systems within their tribes.

To gauge interest in sustainable development, respondents were asked if their tribe had any interest in developing sustainable transportation programs and infrastructure. As shown in Figure 3, many of these responses were positive; respondents indicated a desire to develop more sustainable transportation programs, linking this to accessibility challenges of living in remote areas, and safety issues.

Survey respondents stated: “Our tribal land bases are about 2 hours apart so sustainable transportation would be helpful,” and “Infrastructure in rural areas is often overlooked but very necessary for day-to-day activities as well as during times of emergency.”

While there is interest, a majority of respondents focused on increasing transportation as a necessity, rather than for sustainability reasons. Because of this, tribes may be more receptive to transportation programs if they are offered primarily as solutions to transportation needs, perhaps with ancillary benefits of sustainability.

The rest of the responses were uncertain about interest due to planning barriers which are impacted by funding constraints and lack of transportation staffing which make other priorities more pressing. One response in particular revealed that a tribe had stopped applying for funds, signaling that participation is not interest-driven, but rather administrative. The survey respondent stated: “We have stopped applying for transportation grants sometime in the last 5 or 10 years due to the amount of workload it added.”

4.3 Key Needs

A pie chart drawn from individual survey response data shows that 38% of respondents identified investment in transportation infrastructure as a key need, followed by 33% focused on planning, and 26% on infrastructure repair. Only 3% felt that clean vehicles were a significant need.

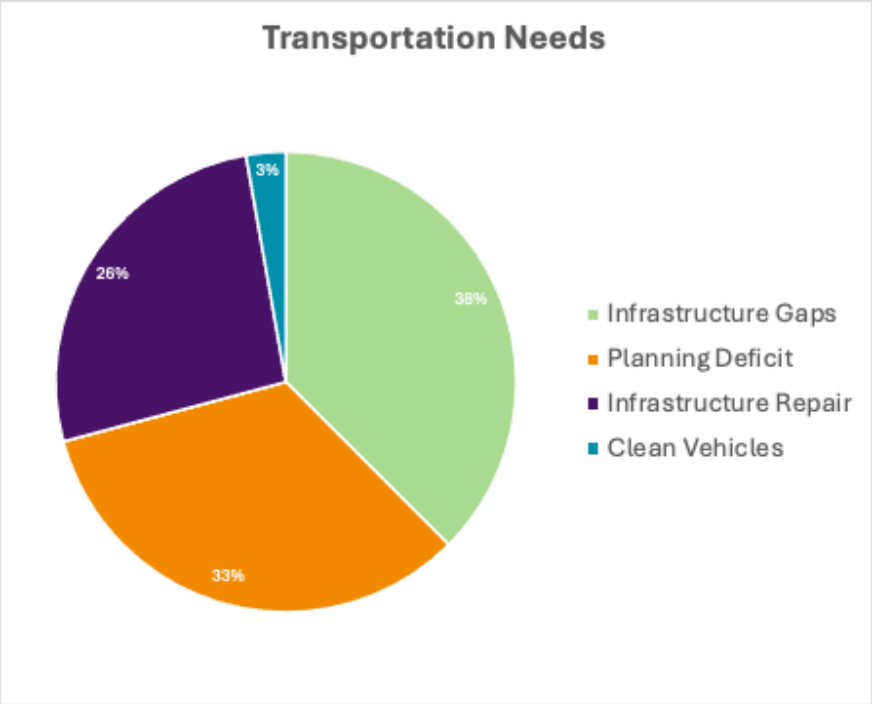


Figure 4. Key transportation needs that have been identified by respondents

Respondents were then asked what they perceived as unmet transportation needs in their communities, to understand how these may be similar or different from the literature review. The three main needs identified in Figure 4 were increases in infrastructure, improved planning, and maintenance of existing transportation systems. These categories were often selected together, suggesting that tribal members and staff experience multiple transportation deficiencies rather than a singular issue. The open-ended responses in particular describe tribal lands lacking paved roads, connections to bus networks, and electricity, which show that many respondents are lacking basic transportation and other infrastructure.

Other responses added that more affordable transportation is also needed since current systems do not fully serve their tribal lands, and many tribal members cannot afford an individual car.

A survey respondent stated: “No roads on reservation, county bus system does not serve reservation, tribal members cannot afford cars.”

In this context, the prevalent gap in sustainable transportation adoption is the basic need for transportation itself. Transportation planning is the prerequisite to transportation infrastructure, and without it, even tribes with resources will face challenges in addressing these needs.

4.4 Priorities

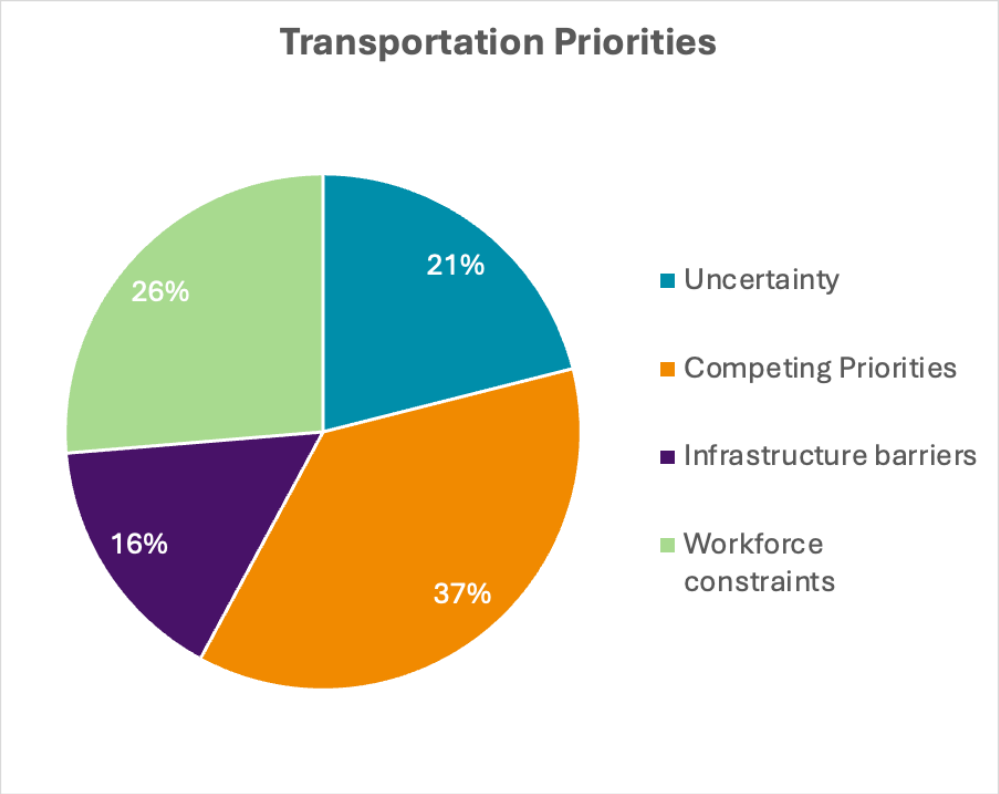


Figure 5. Implementation priorities that would be desired within their tribe such

In trying to understand current transportation priorities, respondents were asked if developing sustainable transportation infrastructure was a priority in their tribe. The responses were split, with about half of respondents saying yes, while the other half said no, and a few were unsure if it should be a priority. In most cases, those that wanted sustainable transportation to be a priority said it was a means to improve access to essential services. This was mentioned with the caveat that it would require repairs to existing systems and improvements to plans in order for the implementation of sustainable transportation programs to be feasible. For those that said no, many of the reasons revolved around more urgent priorities like recovering from existing natural disasters, addressing housing issues, and increasing economic development. This suggests that, from a tribal context, while there can be a desire to implement these programs, they compete with core obligations that are more pressing for tribal governments.

Another relevant point was that surrounding infrastructure that crosses or borders tribal lands are not owned by tribal governments and are in need of repairs. This brings up another issue that, while some

tribes may have some transportation systems in place that they depend on, they may lack the authority to repair them and the relevant agencies with this authority can potentially place these rural roads at a lower priority.

A survey respondent stated: “Most of the transportation infrastructure is owned and maintained by other organizations such as the county, state, and USFS. Those routes need to be repaired and maintained a lot better.”

4.5 Anticipated Popularity

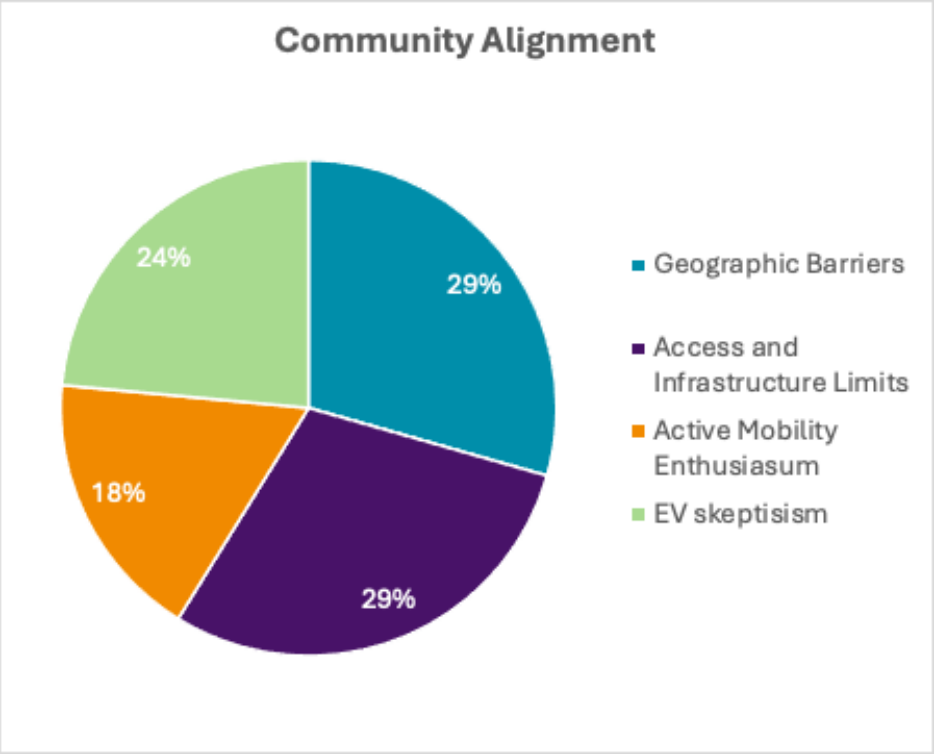


Figure 6. Perception respondents have when it comes to implementing sustainable transportation programs in their communities

To understand if sustainable transportation infrastructure would be well-received in these tribal communities, respondents were asked if they thought sustainable infrastructure would realistically be applied and accepted. A majority of respondents believe sustainable transportation infrastructure would be beneficial in equipping their reservations for natural disasters, while improving transportation options that are already currently limited. In particular, e-bikes and pedestrian pathways emerged as popular options by respondents because they could help create more access in reservations that require pedestrians and drivers to share the same pathways. E-bikes in particular require less infrastructure, are lower cost, and are generally accessible for both adults and youth, making navigation through rough road conditions and significant distances more feasible. Public transit services were also mentioned frequently since some tribal members expressed difficulty accessing existing systems.

Those that were less in favor of sustainable transportation mentioned skepticism directly toward low-pollutant infrastructure, since this infrastructure is often seen as unreliable in rural areas. A few respondents specifically mentioned the challenge of low-pollutant infrastructure when their tribal lands currently don't have electricity for charging infrastructure. Another concern was the lack of large low-

pollutant vehicles that could be used for hauling bulky supplies. Other issues in regard to the implementation of EVs were that they can be unreliable for long-distance travel, and mountainous terrain limits the infrastructure that can be built. Additionally, skepticism was expressed toward the environmental tradeoffs of EV batteries, and particular impacts on tribal lands. Overall, some of the skepticism toward low-pollutant vehicles was reflective of feasibility and impact concerns regarding existing technology, rather than the idea of reduced pollution itself.

4.6 Barriers

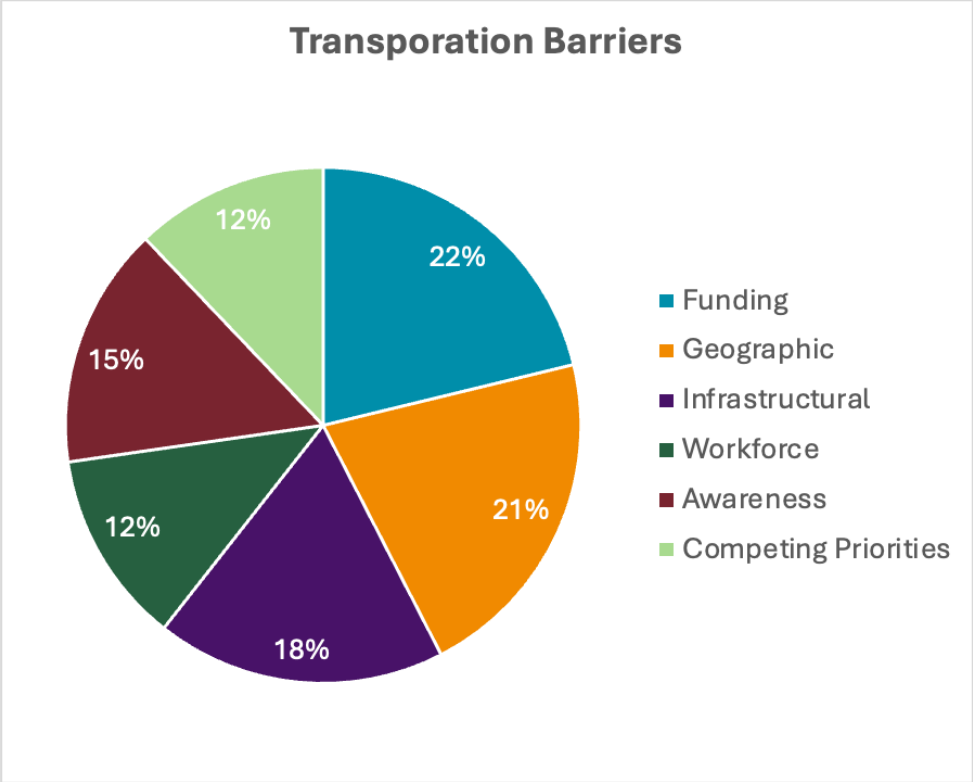


Figure 7. Barriers respondents have faced with transportation in their tribal communities.

When asked if there were any specific barriers their tribe faced when it came to developing sustainable transportation projects and initiatives, a combination of four major factors persisted: infrastructure capacity, lack of funding, geographic constraints, and workforce gaps. In particular, multiple respondents emphasized that, while funds exist for tribes, the demands required to access them are infeasible with their current staff capacity. Competitive grant programs in particular typically require detailed applications, ongoing data reporting, and compliance paperwork, but many tribes do not possess the staff required to pursue these opportunities.

A survey respondent stated: “Need actual people to assist with the work as cumbersome grant reporting requirements bog down our time, making it not worth the effort to pursue certain pots of funding.”

The need to hire more staff was a common challenge raised by respondents, linked to both funding and capacity issues. There is a cycle of trying to improve transportation infrastructure (which requires adequate staff to obtain and sustain funding and to physically maintain projects), but these staff positions can only be maintained when there is adequate funding. Geographic challenges compound this issue as

rural tribes are inevitably more expensive to serve, less connected to regional planners, and face issues that are less visible in regional transportation decisions.

It is noteworthy that a few responses said community engagement could help with sustainable transportation adoption barriers. This suggests that the delivery of sustainable transportation initiatives can matter. Sustainable transportation options that are chosen with community input are more likely to be supported over ones that are predetermined at the administrative level.

4.7 Synthesis

Across all of the responses, it is clear that sustainable transportation was not pursued as just an environmental goal. Respondents were generally seeking sustainable transportation options to address broader transportation issues like road safety, access to services, emergency readiness, and staffing capabilities. For this reason, efforts to promote sustainable transportation may need to be geared toward achieving other mobility goals before moving toward new sustainable technologies or infrastructure alone.

5 Recommendations

Our final recommendations center funding, basic infrastructure, attention to varied contexts, and building workforce capacity.

Survey respondents indicated awareness of available funding for sustainable transportation projects and programs, but a lack of staff to apply for, manage, and sustain transportation projects. To address this, we recommend reducing procedural barriers that currently prevent tribes from pursuing grant funds, including improving assistance for grant reporting and interagency coordination. Specific efforts at the agency level to simplify reporting schemes and requirements could encourage tribal staff to pursue existing funds. Establishing technical assistance hubs could support the data collection and planning efforts that are necessary to lay the groundwork for larger projects. Making funding opportunities truly accessible also involves direct investments in building workforce capacity, such as funding training programs, partnerships, and supporting long-term staffing positions within tribal agencies. This recommendation is also based on the Mineta study, which revealed that a small percentage of tribes have official transportation planners, as well as on the survey responses from our study, in which respondents indicated that the lack of staff is a major challenge (36).

Survey respondents also clearly articulated a need for fundamental transportation infrastructure. Investments in tribal transportation must be attentive to the often rural and rugged geographies of tribal territories and emphasize options that are affordable, practical, and durable. This includes investments in active transportation access and safety. Improving mobility, access, and infrastructure resilience simultaneously can be more successful than pursuing individual sustainable goals one at a time. This coincides with the interest expressed by survey respondents in sustainable transportation to meet their basic needs rather than for solely environmental purposes. Finally, community input for place-specific recommendations should be implemented to better support the needs of the local communities. This is based on the overall response where communities view sustainable transportation differently depending on geography and infrastructure.

6 Conclusion

This study reveals that the idea of sustainable transportation is not a fixed concept; rather, it varies based on the needs, context, and values of those communities interpreting it. For many Tribal Nations in California, sustainable transportation was mainly interpreted as pollutant reductions; however, in application, many tribes sought to utilize various modes of sustainable transportation to address basic transportation needs that are currently not being met in their communities. Both the literature review and survey findings demonstrate that many tribes are unable to meet sustainable goals if they currently lack reliable roads and transit options to support daily travel.

In this case, one of the biggest challenges tribes face is barriers in funding limits, staff deficiencies, infrastructure absence, and geographic isolation within their transportation systems. While people are interested in sustainable transportation, basic transportation access, infrastructure, and safety are often lacking within tribal territories. Because of this, many existing sustainable transportation initiatives that are pursued by tribes are often framed to boost reliable and accessible transportation rather than for environmental purposes. At the same time, the pilot study reveals opportunities that could help address challenges of access and safety for their remote communities. The sustainable options most suggested were active transportation modes because they were affordable and improved access more practically than solely implementing low-pollutant vehicles. For that reason, a one-size-fits-all approach to sustainable transportation may not be favorable in communities that require more practical and affordable options for their rural communities.

Overall, this project demonstrates that tribal transitions to sustainable transportation initiatives (as they define them) will require basic needs to be met before new technology can be implemented. Increased support from federal, state, and regional agencies can contribute to addressing foundational infrastructure gaps, and lay the groundwork for tribal staff to define and pursue sustainable transportation options.

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Data Summary

The survey gathered data from 38 respondents about their views on sustainable transportation efforts, interest, barriers, and knowledge. The respondents were primarily California Indian tribal members or tribal staff working in transportation, environment, or public works. Respondents were asked to answer eight questions which were both open ended and had a multiple selection format. Open-ended responses were coded using the Qualtrics TextIQ function to group segments of text which was applied consistently across all respondents. It should be noted that no personally identifiable information was collected, and any mention of tribal affiliation was voluntarily given by respondents. Aggregate data from interviews and surveys is available in the report, and on the Dryad Server: https://doi.org/10.5061/dryad.m63xsj4jh

Products of Research

The survey data set is comprised of one file which includes the data collection results and the TextIQ codes. The pilot interview data is presented in aggregate format in the report.

Data Format and Content

The survey data set is comprised of one file which includes the data collection results and the TextIQ codes. The pilot interview data is presented in aggregate format in the report.

Data Access and Sharing

Aggregate data from interviews and surveys is available in the report, and on the Dryad Server.

Reuse and Redistribution

Aggregate data from surveys is available on the Dryad Server. Users must acknowledge the original data creators and funding sources in any publications, presentations, or derivative works resulting from the use of this dataset.