Paving the Way for Tribal Lands
The Infrastructure Crisis Impact on Native Communities

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1 Introduction

Safe roads and bridges are essential components of a well-functioning infrastructure system, as they enable people to access various essential services and opportunities, such as healthcare facilities, shopping centers, recreational areas, educational institutions, and workplaces. A lack of well-maintained and properly paved roads can significantly restrict the mobility and overall quality of life for individuals, making it difficult for them to travel and commute efficiently.

In particular, the people living in tribal lands have long been facing the challenge of inadequate and deteriorating road networks. This issue has persisted despite the efforts of the government and other organizations to improve the situation. As a result, the road conditions in these tribal areas continue to be a major concern for the residents, as they struggle to navigate through poorly maintained and unsafe roads on a daily basis.

This article aims to explore the road networks in tribal lands, delving into their current state, the methods employed for maintenance and repair, as well as discussing potential solutions and recommendations for improvement. By examining these aspects, we hope to shed light on the pressing issue of inadequate road infrastructure in tribal areas and contribute to the ongoing efforts to address this problem.

2 American Indian Reservations: Definition and Background

The U.S. Department of the Interior defines a federal Indian reservation as "an area of land reserved for a tribe or tribes under treaty or other agreement with the United States, executive order, or federal statute or administrative action as permanent tribal homelands, and where the federal government holds title to the land in trust on behalf of the tribe".[2] These reservations serve as designated territories for Native American tribes, providing them with a degree of self-governance and autonomy.

The U.S. government currently recognizes 574 official American Indian tribes across the contiguous 48 states and Alaska.[3] These federally recognized tribes are eligible to receive funding and services from the Bureau of Indian Affairs (BIA), either directly or through grants, contracts, or compacts. This recognition and support are vital for the preservation and continuation of Native American cultures, traditions, and communities.

There are 2.5 million American Indian and Alaska Natives in the United States. American Indian reservations encompass over 56.2 million acres of land held in trust by the United States government for the various American Indian tribes and individuals.[4] There are 326 American Indian land areas in the U.S. administered as federal Indian reservations,

including different types of tribal lands such as rancherias, Pueblos, villages, and communities. These diverse territories reflect the rich cultural and historical heritage of Native American tribes and their ongoing relationship with the U.S. government.

3 The Native American Legacy in the United States: Transportation Infrastructure and Roads

Native Americans, also referred to as Indians, Indigenous Americans, or American Indians, have a rich and complex history in the United States.[5] Prior to the arrival of European settlers in the 15th century, the land was predominantly inhabited by diverse Native American communities, with an estimated population of over 100,000 people spanning from coast to coast. Each of these communities boasted its own unique culture, traditions, and way of life, including their transportation infrastructure and roads.

The transportation infrastructure and roads developed by Native Americans were crucial to the growth and development of the United States. The indigenous populations constructed an extensive network of trails and pathways that connected their communities and facilitated trade, communication, and cultural exchange. These early transportation systems were often built with natural materials and followed the contours of the land, reflecting the Native American understanding of and respect for the environment.

However, the arrival of Europeans in the Americas marked the beginning of a tumultuous period for these Indigenous populations and their transportation infrastructure. As European settlers expanded their territories and the United States grew in size and influence, Native American communities were subjected to significant upheaval. Many were forcibly relocated, dispersed, assimilated into other groups, or, in some cases, no longer exist.[6]

Despite these challenges, Native American transportation systems have left a lasting impact on the American landscape. Many modern highways and roads in the United States follow the same routes established by Indigenous communities centuries ago, and some, such as the Natchez Trace in the southeastern United States, have been preserved and maintained as historical landmarks.[7]

4 Conditions of Roads in Tribal Lands

The transportation infrastructure in tribal lands has long been a pressing issue that requires urgent attention. It is important to shed light on the current state of roads in tribal areas and discuss the potential impact of improved transportation infrastructure on the lives of American Indian and Alaska Native people.

According to a report by the Centers for Disease Control and Prevention (CDC), motor vehicle traffic crashes are a leading cause of death for most American Indian and Alaska Native people.[8] This alarming statistic is primarily due to the dangerous roads that connect tribal lands, which are heavily relied upon for transportation. The lack of proper maintenance and repair of these roads has led to hazardous conditions for buses, cars, and trucks alike.

There are over 145,000 miles of roads owned by federal, state, tribal, and local governments that provide remote connections within tribal areas.[9] However, the poor condition of these roads has far-reaching consequences on the lives of the people who rely on them. A report by the Government Accountability Office (GAO) highlights the negative impact of bad roads on school children's attendance in tribal schools.[10] The report also includes a video that offers a glimpse into the harrowing experience of riding a school bus on tribal lands (https://youtu.be/RSc-R6Fg6Q4).[11]

The distressing state of roads in American Indian tribal areas is a major contributing factor to the troubling statistics we see today. Furthermore, the lack of proper road maintenance in tribal lands is not only underfunded but also lacks comprehensive data for appropriate analysis. This infrastructure crisis plays a significant role in hindering the economic growth of Indian tribes in tribal lands, making it difficult for these communities to flourish. Improving the transportation infrastructure can enhance the safety, accessibility, and economic growth of tribal communities, ultimately contributing to a better quality of life for American Indian and Alaska Native people.

5 Agencies Involved in Tribal Land Transportation Planning and Maintenance

The Tribal Transportation Program (TTP) plays a crucial role in addressing the transportation needs of tribes across the United States. This program provides essential funding for planning, designing, construction, and maintenance activities for all public roads within tribal lands.[12] The TTP is jointly administered and overseen by the Bureau of Indian Affairs (BIA), Division of Transportation, and the Federal Highway Administration's Federal Lands Highway Office (FHWA), operating under an interagency agreement.

Tribal Transportation Facilities primarily include public roads that enable access to and within Indian reservations, restricted Indian land, Indian trust land, and Alaska Native villages. The National Tribal Transportation Facility Inventory (NTTFI) states that there are approximately 31,400 miles of BIA system roads and 26,000 miles of Tribal system roads. The rest are state and local government roads.[13]

In recent years, the federal government has allocated significant funds to support the construction and repair of tribal roads. According to a Congressional Research Service report, the TTP received an average of $464 million in 2016.[14] This funding has continued through FY2020 as part of the Fixing America's Surface Transportation (FAST) Act.[15]

More recently in 2021, the Infrastructure Investment and Jobs Act, a bipartisan infrastructure bill recently signed into law, has allocated an unprecedented $1.2 trillion in funding to improve various aspects of the nation's infrastructure. A portion of this funding will be directed towards the Tribal Transportation Program, which aims to address the critical needs of tribal communities by improving their transportation systems and enhancing connectivity.

This investment in tribal infrastructure will help to create jobs, promote economic growth, and improve the quality of life for tribal communities across the United States. With the support of the Infrastructure Investment and Jobs Act, the federal government has reaffirmed its commitment to strengthening and modernizing tribal infrastructure, ensuring that these communities have access to the resources and opportunities necessary for success.

Despite the substantial financial commitment from the federal government, funding challenges persist for tribal communities. The allocation of funds for transportation infrastructure within tribal lands remains a pressing concern, as many roads and transportation facilities require ongoing maintenance and improvements.

6 Roadway Priorities

Fatal crashes in tribal areas have numerous causes, and to address these issues, the Tribal Transportation Safety Management System (SMS) Steering Committee (http://www.tribalsafety.org)[16] was established under the leadership of the Bureau of Indian Affairs Division of Transportation and the Federal Highway Administration Office of Tribal Transportation. This committee identified seven major concerns in tribal areas

based on the documentation and data collected. These seven topics guide the planning, design, construction, and evaluation of roads in these regions.[17]

The seven priority topics used in tribal roads planning and construction include:

1. Decision-making process: The success of any safety program relies on the decision-making process of the stakeholders involved. This topic encourages tribes to develop SMART plans that can be used in coordinating the safety of the program.

2. Crash Data Availability and Limitations: The quality of crash data collected in many tribal areas is poor and unreliable. An improved and enhance standard of crash data needs to be collected by the Tribal and Bureau of Indian Affairs law enforcement. Additionally, understanding the condition of the roadway network is important to correlate accident type and severity to help prioritize maintenance.

3. Occupant Protection/Child Passenger Seats: In a report about the study of tribal areas, almost half of the victims of fatal crashes failed to use safety restraints. The lack of public awareness campaigns and law enforcement to regulate and check drivers on these roads contributes to this issue. Poor road conditions may be a factor in more severe accidents and associated injuries.

4. Roadway Departure: Reckless drivers leaving the proper roadway or lane represent a significant portion of motor crashes in tribal areas. Poor road conditions exacerbate the issue. Improving roadway conditions, public awareness campaigns and law enforcement could help alleviate the problem.

5. Impaired Driving: Fatal crashes can be reduced by disallowing drivers with impairments, which are often rare in larger cities. Advanced driver assistance systems (ADAS) have been identified as a potential solution; however, the poor condition of roadways and road markings pose a significant challenge to the use and effectiveness of automated safety features on vehicles.

6. Pedestrian Safety: Many Native Americans walk great distances regularly due to the nature of tribal areas and roads. There have been reports of collisions between vehicles and pedestrians at locations other than intersections or crosswalks. That's why pedestrian safety has been added to the list of priorities in tribal transportation safety plans. Improved pavement and road marking conditions have the potential to reduce the incidence of pedestrian strikes.

7. Availability of Public Safety Services: The road network in tribal country lands makes it difficult for proper medical attention in cases of medical emergencies and vehicle crashes. The time between notification of a crash and the response by emergency medical services is often greater than an hour, based on available data.

By focusing on these priorities, the committee aims to improve the overall safety and well-being of the communities living in these regions. Specifically, to the transportation infrastructure, US Tribal lands are actively working to maintain and repair their roadway networks through various programs and initiatives. These efforts are aimed at improving transportation infrastructure and enhancing the quality of life for residents in these areas.

One of the primary programs supporting these efforts is the Tribal Transportation Program (TTP), which is administered by the Federal Highway Administration (FHWA) and the Bureau of Indian Affairs (BIA). The TTP provides funding, technical assistance, and resources to tribes for the planning, design, construction, and maintenance of transportation facilities and infrastructure. In 2020, the TTP allocated more than $500 million to tribal transportation projects across the country.[18]

In addition to the TTP, several other federal programs and initiatives are helping tribal lands maintain and repair their roadway networks. The Federal Lands Access Program (FLAP) provides funding for transportation projects that improve access to or within federal lands, including tribal lands.[19] The Tribal Transit Program, administered by the Federal Transit Administration, offers funding for public transportation projects on tribal lands, which can include roadway improvements and maintenance.[20]

Tribal governments are also working collaboratively with state and local agencies to address transportation needs. For example, the Navajo Nation has partnered with the Arizona Department of Transportation (ADOT) to develop the Navajo Nation Long Range Transportation Plan, which outlines priorities for roadway maintenance, safety improvements, and capacity enhancements on the reservation.[21]

Furthermore, many tribes are focusing on innovative approaches to maintain and repair their roadway networks. For instance, the Confederated Salish and Kootenai Tribes have implemented a pavement preservation program that uses data-driven decision-making to prioritize and schedule roadway maintenance projects. This approach has resulted in more efficient use of resources and better outcomes for the tribes' transportation infrastructure.

7 Impact of Poor Roads

Native tribes across the United States are grappling with the negative consequences of poor road conditions on their lands. Cracked, bumpy, and unpaved roads, coupled with

poor road markings and a lack of critical safety infrastructure such as traffic lights and stop signs, continue to hamper economic development and the overall well-being of these communities.[22]

Leroy Gishi, chief of the Bureau of Indian Affairs (BIA) Division of Transportation, has highlighted the importance of transportation infrastructure in tribal and rural communities. He stated, "One of the many barriers to economic development in Native communities is the lack of physical infrastructure". The absence of well-maintained roads, bridges, and buildings in these areas has significantly affected the economy and livelihood of Native tribes, leading to a reduced standard of living.

In a recent Senate hearing committee, witnesses shared their experiences of how poor road conditions have impeded children's access to education.[23] Heavy rains often render roads impassable, preventing school buses from navigating the treacherous terrain. As a result, Bureau of Indian Education schools are forced to allocate extra, hard-to-come-by funds to maintain buses that must operate on these dangerous roads.

The substandard roads on tribal lands also limit tribal members' access to essential services and amenities. Healthcare facilities, shopping centers, recreational areas, educational institutions, and workplaces are often difficult to reach due to the poor state of the roads. Gila River Governor Stephen Roe Lewis noted, "You drive on a road and all of a sudden you cross over to a road on a reservation, then all of a sudden it's falling apart." This lack of accessibility further hinders the economic growth and development of Native tribes.

Moreover, the unreliable nature of BIA report forms and the variation in data collection across different reservations have made it challenging to accurately assess the extent of the problem. Governor Lewis emphasized the need for up-to-date, consistently collected data on road-related fatalities and accidents, stating, "The data collection is not there so you don't have those numbers of those fatalities and those accidents that happen on those roads".[24]

8 Underreporting of Crashes in Tribal Lands

Safetrec, a Tribal Road Safety Program developed by UC Berkeley, has identified several factors that contribute to the underreporting of crashes in tribal areas. These factors not only hinder accurate data collection but also impede efforts to improve road safety in these regions. The factors include:[25]

- **Insufficient expertise in traffic collision investigation and reporting:** The individuals responsible for gathering crash data in tribal areas often lack the necessary experience and tools to collect high-quality, real-time data. This deficiency hampers the investigation of motor vehicle crashes and the development of effective safety measures.
- **Desire to maintain data confidentiality:** Some tribal members choose to keep their crash data private, making it difficult for researchers and safety organizations to access comprehensive information on collisions in these areas.
- **Inadequate infrastructure:** The absence of usable infrastructure, such as well-maintained road networks, poses a challenge for data collection in tribal areas. Poor road conditions can also contribute to the occurrence of crashes in the first place. Additionally, comprehensive, accurate roadway data is critical in developing efficient and effective transportation plans.
- **Greater distance to trauma centers:** In tribal areas, the distance from crash sites to the nearest trauma center is often more than double the distance in other parts of California. This disparity can lead to delays in emergency medical care and may also impact the reporting of crashes.
- **Limited resources:** Tribal areas often face a shortage of resources, including a sufficient number of law enforcement officers, necessary equipment, and software. This lack of resources can hinder the timely and accurate reporting of crashes, as well as impede efforts to improve road safety.

9 Recommendations and Solutions

The poor condition of roads in tribal lands has significantly impacted the economic and social activities of Native American communities. To address these issues, it is crucial for the relevant agencies, such as the BIA and FHWA, to adopt advanced technologies for accurate and efficient data collection. By prioritizing the improvement of road conditions and infrastructure, the lives of tribal community members can be positively transformed, leading to better access to education, healthcare, and economic opportunities.

The US Government Accountability Office (GAO) report highlighted the challenges faced in maintaining and repairing roads on tribal lands, citing inconsistent, incomplete, and outdated data on road conditions.[26] To address these issues, it is crucial for the Bureau of Indian Affairs' (BIA) Division of Transportation and the Federal Highway Administration's Federal Lands Highway Office (FHWA) to adopt advanced roadway assessment tools that provide better data at a lower cost and leverage AI and Machine Learning technologies.

One such vital solution is Road Triage (www.RoadTriage.com[27]), an AI-powered assessment tool that offers numerous benefits for efficient and effective data collection and analysis. With Road Triage, government agencies and tribal land stakeholders can access current and actionable intelligence on road conditions, enabling them to make informed decisions on infrastructure maintenance and resource allocation.

Some of the key advantages of using Road Triage and similar AI assessment tools include lower costs and simplified data collection processes, accurate and comprehensive data support, and the facilitation of ADAS and autonomous vehicle planning and deployment. The data gathered can also be used to improve resource allocation efficiency, conduct root-cause analysis, and carry out predictive asset decay studies.

By embracing advanced AI technologies like Road Triage, government agencies and stakeholders can significantly address the challenges of maintaining and repairing roads on tribal lands. This modern approach to data collection is not only cost-effective but also more efficient than traditional methods like Lidar and manual data collection.

Incorporating AI-based road assessment tools is an essential step towards resolving the issues surrounding the repair and maintenance of tribal lands. As the world moves beyond outdated data collection methods, it is crucial for decision-makers to utilize the insights provided by these advanced tools. By doing so, they can effectively address the seven priority topics outlined in the GAO report and ultimately improve the quality of life for those living on tribal lands.

10 About the Author

Jeffrey Barghout is an accomplished Technology Developer and Business Strategist with over 25 years of experience in technology evaluation and strategic planning. As the CEO of Robocist, he is dedicated to developing and accelerating the adoption of emerging transportation technologies, including connected, autonomous, and electric vehicles, as well as utilizing artificial intelligence (AI) to quantify the driven environment.

Jeff's extensive background includes serving as an engineer and strategic planner at Chrysler, assessing technologies for NASA, and holding the position of Vice President of Transportation Initiatives at a leading research and consulting firm. He has been a successful serial entrepreneur, launching and growing businesses in various industries.

He participates in numerous advisory groups and serves on the Board of Directors for organizations like E4 Carolinas. With a proven track record of delivering results in both technology and business strategy, Jeff has navigated the complex intersection of technology, market forces, regulation, and stakeholder opinions, perceptions, and needs.

11 About Robocist and Road Triage

Robocist (www.Robocist.com) is a North Carolina-based technology company with strategic partners across the United States and India. We specialize in providing cutting-edge technology solutions in artificial intelligence, machine vision and learning, AI based roadway assessment, and connected, autonomous, and electric vehicles. Our team members have extensive experience working with notable organizations such as Chrysler, Nissan, Michelin, DOT, DOD, DOE, NASA and the EPA – to name a few.

Road Triage (www.RoadTriage.com), by Robocist, is a better approach to roadway assessments, providing accurate, objective, and low-cost updates on pavement and lane line conditions. Get the data you need to make decisions and keep roadways in top condition - maximizing your roadway investments.

We are committed to helping our clients understand, plan for, design, and integrate emerging technologies in an economical and efficient manner. Our proficiency in advanced technology solutions, coupled with our unwavering dedication to customer service excellence, makes us the go-to choice for transportation organizations, engineering firms, technology development companies, and venture capital firms. Trust in Robocist and Road Triage's expertise to guide you through the ever-evolving technological landscape.

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