

USAf 2025 Impact Case Study Submission

Title of the Impact Case Study:

Transforming Road Safety and Community Livelihoods through the Pothole Eradication Programme (PEP)

Submitting University:

Central University of Technology, Free State (CUT)

Summary of the Impact

The Pothole Eradication Programme (PEP), a partnership between CUT and the Free State Department of Community Safety, Roads, and Transport (FSDCSRT), has achieved tangible improvements in road infrastructure and community livelihoods. Since its launch in November 2023, the programme has repaired over 300,000 m² of roads across all five districts of the Free State, directly enhancing safety, decreasing accidents, and lowering vehicle operating costs for motorists. At the same time, it has created more than 650 jobs, prioritising women-headed households, youth, and individuals with disabilities. Through accredited training programmes, participants have gained nationally recognised skills in road maintenance, supporting poverty alleviation and long-term employability. The programme exemplifies a model of integrating academic research, technological innovation, and community empowerment to tackle urgent infrastructure issues in South Africa.

Underpinning Academic Work

The foundational work originates from the CiviLab@CUT within the Faculty of Engineering, Built Environment and Information Technology. Researchers at CUT developed innovative asphalt technologies (Asphalt@CUT), including polymer- and bitumen-emulsion-based cold mix asphalt (CMA) and specialised slurry formulations. These innovations were refined through laboratory testing, field trials, and applied research projects in collaboration with local municipalities. Research findings were incorporated into accredited Construction Education and Training Authority (CETA) modules, ensuring the transfer of advanced technical knowledge to unskilled labourers. Academic expertise in quality assurance, material testing, and road condition assessment (using TMH9 and TRH3 methods) contributed to programme design and maintained technical rigour.

Narrative Description of the Impact

1. Addressing a Critical Societal Challenge

South Africa is facing a national crisis due to deteriorating secondary roads, which have led to increased accidents, fatalities, and transportation inefficiencies. Many provincial teams lack the capacity to address the extent of road damage. CUT and FSDCSRT responded by creating a

labour-intensive pothole eradication model under the Expanded Public Works Programme (EPWP), aligning infrastructure repair with skills development and job creation.

<https://civilabcut.co.za/pep/>

<https://www.facebook.com/PotholeEradicationProgramme>

2. Road Repairs and Infrastructure Improvement

Between April and August 2025, CUT-led teams repaired over 115,000 m² of pothole-damaged road surface across all Free State districts. Repairs were georeferenced, photographed, and monitored through a digital database for accountability and transparency. Quality assurance processes included sieve analysis, binder content, density testing, and Marshall stability assessments in line with SANS and TMH standards. These rigorous measures provided a 12-month durability guarantee, setting the PEP apart from traditional patching methods. District-level interventions enhanced mobility for thousands of daily road users, including taxi operators, farmers, and small businesses. Improved roads shortened travel times, reduced vehicle damage and accidents, and supported more dependable agricultural and commercial transport.



3. Skills Development and Employment Creation

A key element of the PEP has been the accredited “12-Week Practical Road Skills Programme”. By July 2025, 650 learners had completed the training. The training combined classroom theory with practical fieldwork, covering safety, asphalt manufacturing, pothole repair, surface sealing, and plant operation. Participants will receive SAQA-accredited qualifications, enhancing their employability beyond the programme. The PEP focused on marginalised groups, with a strong emphasis on women and youth. Many young women reported increased confidence, financial independence, and improved career prospects following their

participation. Beyond temporary EPWP employment, these learners now form a skilled labour pool capable of supporting future infrastructure projects.



From Hustling to Stability

Age: 31

Location: Ladybrand

Before the Program: Struggling to Make Ends Meet

"Before EPWP, I was hustling—selling whatever I could just to survive. I had no steady income, and I was constantly worrying about money."

When he heard about the program, he saw an opportunity to learn something new. *"I had never worked in road maintenance before, but I thought, 'Why not?'"*

Challenges and Growth

Mile faced several difficulties, including poor communication on-site and a lack of necessary tools. *"Sometimes we didn't have enough equipment, and there were safety concerns. But we found solutions—we held toolbox talks and made sure we were heard."*

Despite the challenges, he gained crucial skills in road maintenance, teamwork, and leadership. *"I learned things I never knew about potholes—the causes, techniques, and prevention. Now, when I look at a road, I see more than just tar—I see the science behind it."*

A New Lease on Life

The program helped Mile support his family. *"Now, I can put food on the table and pay my child's crèche fees. I can even afford to see a doctor when needed."*

Building a Future in Construction

With his newfound knowledge, Mile is considering studying project management and one day starting a roadworks company. *"This program empowered me. Now, I see a future for myself in construction."*

Words of Wisdom

"Never underestimate any job—each one has skills to offer. Be humble, respect time, and always be willing to learn."

4. Social and Community Impact

The societal impact extends well beyond road repair. Taxi operators benefited from safer routes and lower maintenance costs, while farmers reported reduced vehicle wear and more efficient transport of produce. SMMEs were engaged in supplying materials and services, stimulating local economies. Communities experienced improved access to schools, healthcare facilities, and markets. During Mandela Month in 2024 and 2025, CUT teams repaired roads at hospitals, schools, and old-age homes, demonstrating community service and visible improvements in public spaces. These initiatives strengthened community trust in government-university partnerships.

5. Research and Innovation in Practice

CUT's research broadened its impact by tackling challenges in asphalt performance. For instance, when fluctuations in bitumen supply reduced cold mix tackiness, researchers performed forensic testing, identified binder inconsistencies, and adjusted mix designs accordingly. In road sections where cold mix repairs proved inadequate (e.g., R103 Warden-Vrede), CUT recommended full reconstruction or polymer/nano-stabilisation, demonstrating evidence-based influence on provincial decision-making. Such adaptive innovations highlight the importance of academic expertise in delivering sustainable infrastructure solutions.

6. Reach and Significance

The programme's reach covers all five districts of the Free State province, directly benefiting over 650 EPWP participants, hundreds of taxi operators and farmers, and tens of thousands of road users. Its importance lies in clear reductions in road accidents, improved mobility, greater employability of disadvantaged groups, and the creation of a model that other provinces can replicate.

Evidence and Sources to Corroborate the Impact

1. Quantitative Evidence:

- Over 300,000 m² of potholes repaired by August 2025.
- More than 650 jobs created, with 650 learners trained by July 2025.
- Repairs documented through georeferenced photos and a digital database.

<https://pep-web-app-f5f6d5462606.herokuapp.com/pep/map/>

https://civilabcut.co.za/lejweleputswa/?album=7726&album_ses=1#aigpl-album-gallery-1

https://civilabcut.co.za/thabo-mofutsanyana-district/?album=7650&album_ses=1#aigpl-album-gallery-1

https://civilabcut.co.za/mangaung-district/?album=7552&album_ses=1#aigpl-album-gallery-1

SUMMARY OF POTHOLE REPAIRS

REGION / DISTRICT	QUANTITIES ACHIEVED FOR JUNE 2025 FOR BLACKTOP REPAIRS (SQUARE METERS)
MANGAUNG DISTRICT	8038,7
XHARIEP DISTRICT	3496,89
FEZILE DABI DISTRICT	1244,12
LEJWELEPUTSWA DISTRICT	6944,39
THABO MOFUTSANYANA DISTRICT	10159,04
<u>TOTAL SQUARE METERS ACHIEVED FOR JUNE 2025</u>	29883,14m²

2. Documentary Evidence:

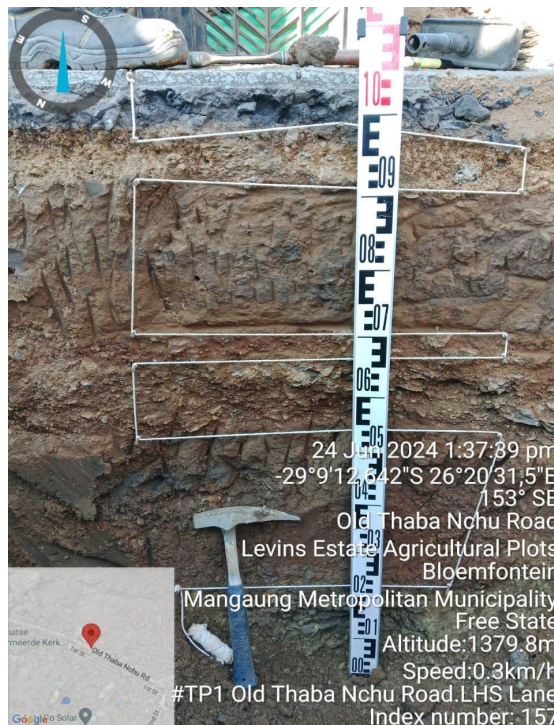
- Technical reports (R59, R103) demonstrating structural analysis and CUT's recommendations adopted by FSDCSRT.
- Adoption of Asphalt@CUT products across multiple districts.

3. Independent Testimony:

- Farmers and taxi drivers are reporting reduced vehicle damage and enhanced efficiency.
- Formal acknowledgements by provincial leadership during Mandela Month activities.

4. Detailed site investigations and laboratory testing:

- SANS/TMH testing protocols validating mix designs and repair durability.



Test Parameter	Sample B380	Sample B381	Typical Specification / Comments
Sieve Analysis (% Passing)	Meets <u>gradation</u> requirements with slight variation between samples; consistent with 10 mm nominal maximum particle size (NMPS) mix.	Passes typical gradation limits for medium 1b mix, ensuring good aggregate distribution.	
Binder Content (%)	4.6	4.4	Within typical range (4.0% - 5.5%) for adequate binder coverage and durability.
Bulk Relative Density (BRD) (kg/m³)	2401	2393	Values are reasonable and close between samples, indicating consistent compaction.
Maximum Theoretical Relative Density (MRTD) (kg/m³)	2528	2553	Slightly higher than BRD as expected; indicates good <u>compactability</u> potential.
Marshall Voids (%)	5	6.3	Within normal range (3% - 8%) ensuring adequate void space for durability and resistance to deformation.
Marshall Stability (kN)	14	13.7	Above typical minimum limits (~8 kN), indicating good load-bearing capacity.
Flow (mm)	3.9	3.9	Within acceptable flow range (2 mm - 4 mm), showing good flexibility without excessive deformation.
Stability/Flow Ratio	3.6	3.5	Indicates balanced strength and deformation characteristics, typical of quality mixes.
Indirect Tensile Strength (ITS) (kPa)	962	925	ITS values are high, suggesting good resistance to cracking and tensile stresses.

Any Other Relevant Information

The PEP aligns with South Africa's infrastructure development priorities outlined in the National Development Plan and directly supports Sustainable Development Goals (SDGs) related to decent work (SDG 8), industry and infrastructure (SDG 9), and sustainable cities and communities (SDG 11). Its integrated approach of academic research, government collaboration, and community empowerment positions it as a standard for tackling infrastructure backlogs while promoting inclusive socio-economic growth.

Date: 12 September 2025