

Appendix 5.2

IoT Road Health Monitoring Platform for Secure Urban Mobility in Smart Communities [Traveling to Field Test Sites: Bandung, Indonesia] Report Form



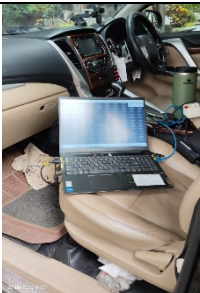
I. Proposer:






Name:	Hadyan Hafizh Anwar P.P. Abdul Majeed Rosdiadee Nordin Lihour Nov Febri Zukhruf
Position:	Senior Lecturer Associate Professor Professor Senior Lecturer Associate Professor
Institution:	Sunway University Cambodia Academy of Digital Technology Institut Teknologi Bandung

II. Objective:

- 1) To collect road roughness data using class 1 instrument and images of selected road defects for AI model training and development.
- 2) To conduct field validation of the developed Class 3 IoT instruments for International Roughness Index (IRI) measurement under real road conditions.
- 3) To perform correlation testing between Class 1 and the developed Class 3 instruments and evaluate system accuracy and reliability.
- 4) To test and refine the AIoT end-to-end data pipeline integrating IoT sensor data with AI-based defect classification models.

II. Schedule:

Date	Location	Work	Person in charge	
18/01/2026	Soekarno-Hatta International Airport, Jakarta, Indonesia	<p>Arrival of Hadyan Hafizh and Anwar P.P. Abdul Majeed from Sunway University</p> <p>Arrival of Lihour Nov from Cambodia Academy of Digital Technology</p>	N/A	
19/01/2026	Soekarno-Hatta International Airport, Jakarta, Indonesia	Arrival of Rosdiadee Nordin from Sunway University		
	Meeting Room of Center for Infrastructure and Built Environment (CIBE) Building, Institut Teknologi Bandung	<p>Briefing for field testing and data collection work. Lead by Febri Zukhruf. Attended by: Hadyan Hafizh, Anwar P.P. Abdul Majeed, Rosdiadee Nordin, and Lihour Nov</p>	Dr. Febri Zukhruf	
20/01/2026	Meeting Room of Center for Infrastructure and Built Environment (CIBE) Building, Institut Teknologi Bandung	Technical Meeting with road maintenance company, PT. NAJ for field testing and data collection	Febri Zukhruf	
	Institut Teknologi Bandung	Class 1 (ROMDAS) instrument calibration	Ibnu Syawal Kamil (PT. NAJ)	

	Institut Teknologi Bandung	Class 3 instrument installation and setup (smartphone and microcontroller)	Rosdiadee Nordin and Lihour Nov	 
	Selected Road Segment	Data collection; vibration for IRI measurement and images/video for AI-based defect detection	Anwar P.P Abdul Majeed and Lihour Nov	
21/01/2026	Seminar Room of Center for Infrastructure and Built Environment (CIBE) Building, Institut Teknologi Bandung	International seminar on Urban Mobility in Smart Communities. Speakers: Hadyan Hafizh, Rosdiadee Nordin, Anwar P.P. Abdul Majeed, and Lihour Nov	Febri Zukhruf	
	Meeting Room of Center for Infrastructure and Built Environment (CIBE) Building, Institut Teknologi Bandung	Data analysis and meeting for year 1 evaluation as well as year 2 planning	Hadyan Hafizh	
22/01/2026	Soekarno-Hatta International Airport, Jakarta, Indonesia	Departure of all members back to Malaysia and Cambodia	N/A	

(Note: describe the final schedule here)

IV. Participants:

No.	Name	Organization
1	Dr. Hadyan Hafizh	Sunway University
2	Assoc. Prof. Dr. Anwar P.P. Abdul Majeed	Sunway University
3	Prof. Dr. Rosdiadee Nordin	Sunway University
4	Dr. Febri Zukhruf	Institut Teknologi Bandung
5	Dr. Lihour Nov	Cambodia Academy of Digital Technology
6	Mr. Ibnu Syawal Kamil	PT. Nusa Antara Jayatama
7	Mr. Gunawan Wicaksono	PT. Nusa Antara Jayatama

8	Mr. Andrean Maulana	PT. Nusa Antara Jayatama
9	Mr. Fauzy Eryandi Putra	PT. Nusa Antara Jayatama

(Note: please add a participant list if there are a lot of people participating)

V. Summary of the activities corresponding to the objectives

This field visit to Bandung, Indonesia focused on coordinated technical, experimental, and capacity-building activities to support the development and validation of an AIoT-based road health monitoring platform. The activities were structured to correspond directly to the stated objectives and were conducted in collaboration with academic and industry partners.

Objective 1: Collection of road roughness data and road defect images for AI model development

A Class 1 road profiling instrument (ROMDAS) was calibrated and prepared in collaboration with PT. Nusa Antara Jayatama. The calibration process followed standard operating procedures to ensure measurement accuracy and repeatability prior to data collection. Selected road segments were identified jointly by the research team and local experts to represent realistic urban road conditions with varying surface characteristics.

During field deployment, the Class 1 instrument was used to collect high-resolution road roughness data. In parallel, images and video of road defects such as cracks, disintegration, and surface deformation were captured using smartphones camera. These datasets are intended for supervised AI model training, enabling accurate defect classification and future benchmarking against international datasets.

Objective 2: Field validation of Class 3 IoT-based IRI measurement instruments

The Class 3 IoT instruments, consisting of smartphones and microcontroller-based sensing units, were installed on test vehicles (ROMDAS) following a standardized mounting configuration. Installation activities included secure sensor placement, orientation alignment, and power management setup to ensure stable operation during data collection.

System functionality was verified through test runs before full deployment. The instruments were monitored throughout the data collection phase to assess stability, data continuity, and robustness under real traffic and road conditions. Maintenance procedures, including sensor inspection and system restart protocols, were demonstrated to ensure reliable long-term operation.

Objective 3: Correlation testing between Class 1 and Class 3 instruments

Simultaneous data collection using both Class 1 and Class 3 instruments was conducted on the same road segments. Timestamp synchronization and location alignment were implemented to enable accurate correlation analysis. Preliminary comparisons were performed to evaluate consistency in IRI measurements, identify noise patterns, and assess the reliability of the developed Class 3 system.

The collected data will be further analyzed post-deployment to quantify correlation strength, measurement deviation, and overall system accuracy. These results are essential for validating the feasibility of cost-effective IoT-based IRI monitoring.

Objective 4: Testing and refinement of the AIoT end-to-end data pipeline and capacity building

An end-to-end AIoT data pipeline was tested, covering sensor data acquisition, local storage, data transfer, preprocessing, and integration with AI-based road defect classification models. Data integrity and transmission reliability were evaluated under field conditions.

In parallel, local researchers and collaborators were trained on equipment installation, operation, troubleshooting, and data collection protocols. Knowledge transfer sessions emphasized best practices for field deployment, data labeling, and maintenance procedures to support sustainable and repeatable data collection in future phases.

In summary, the field activities successfully integrated instrumentation, data acquisition, system validation, and researcher training, laying a strong foundation for Year 2 deployment and crowd-sensing urban road monitoring.

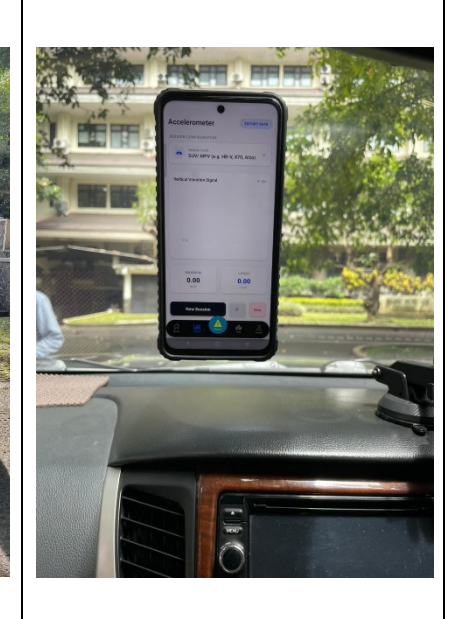
(Note: Describe, in detail, the activities, e.g. how to install the equipment, maintain the equipment, train local researchers for data collection, etc.)

VI. Others

pictures here







Link to all documents and photo/video:
[Appendix 5.2 and 5.3 \(2025-5\)](#)