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Volunteering for the future – Geospatial excellence for a better living

Mobile Laser Scanner Technology to Detect Road Settlement in Sodong Bridge, Trans Sumatera Toll Road

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Background

Goverment Assignment

PT Hutama Karya (Persero) received an assignment to accelerate the construction of the Trans Sumatra toll road, **the assignment consist of funding, technical planning, construction implementation, operation, and maintenance.**

Trans Sumatera toll road
Total Length of ± **2770 km**

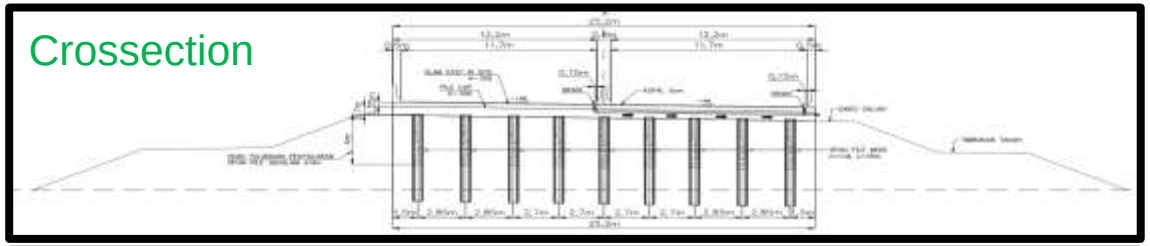
546 km of Trans Sumatera toll road already operational

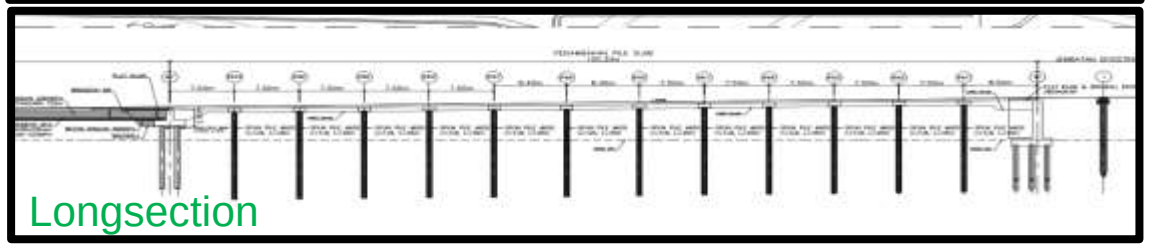
Responsibility to carry out the **monitoring** and **maintenance process**

? How MLS can handle the detection process road surface settlement

Toll Road Minimum Service Standards, which consists of monitoring the International Roughness Index (IRI), cracks, potholes, and **monitoring road surface settlement**

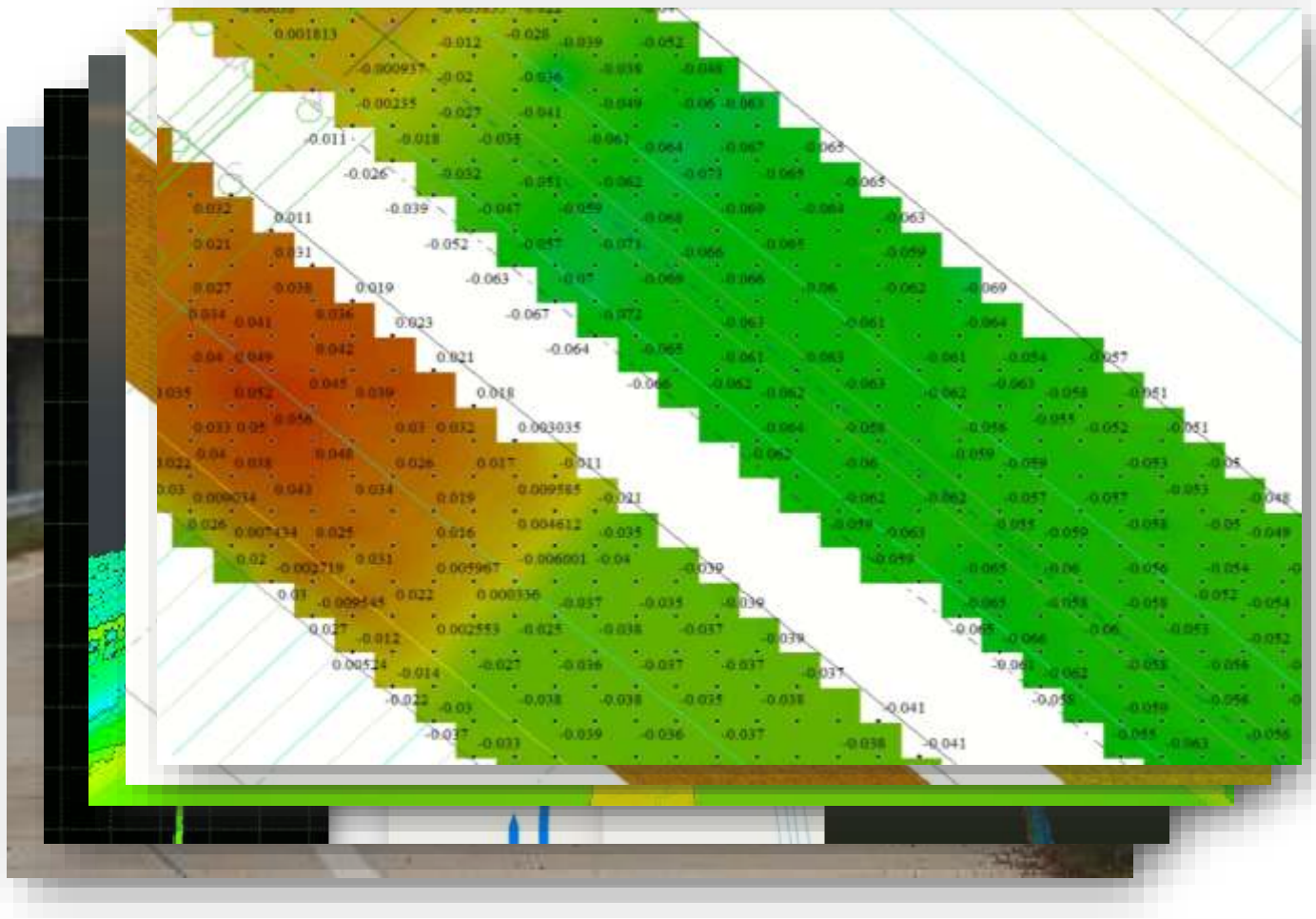
Study Area - Sodong bridge





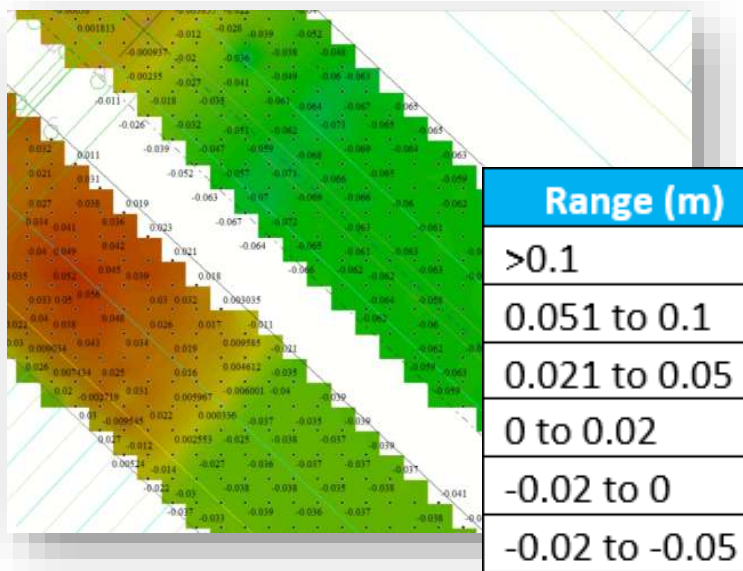
1. The study area is 500 m section of Sodong bridge
2. Type of Soil soft clay type with a depth of 6-8 m
3. Construction methods were Prefabricated Vertical Drain and Vacuum method
4. Overlaid with asphalt 4 times, in periods 2020 - 2021
5. Indicated there was settlement on road surface

Detail Work Flow



1. **Two Periods Acquisition ,**
   Nov 2020 and Oct 2021
2. **Processing Data**
   Base station, trajectory, georeferecing data, multipass adjustment, checking accuracy
3. **Extracting Data**
   Point Clouds in Sodong Bridge
4. **Create Surface**
   Surface or DTM 1cm GSD, from two periods
5. **Substract and Gridding**
   Visualization and sampling point elevation settlement of road surface

Result and Analysis



Resampled Data
1 m resolution

Range (m)	Colour
>0.1	
0.051 to 0.1	
0.021 to 0.05	
0 to 0.02	
-0.02 to 0	
-0.02 to -0.05	
-0.05 to -0.1	
<-0.1	

Elevation Range

Track A Percentage	Range (m)	Track B Percentage
0,00 %	>0.1	0,00 %
0,14 %	0.051 to 0.1	0,02 %
25,28 %	0.021 to 0.05	0,02 %
52,51 %	0 to 0.02	1,12 %
0,30 %	-0.02 to 0	**78,31 %**
19,10 %	-0.02 to -0.05	2,19 %
2,67 %	-0.05 to -0.1	**18,33 %**
0,00 %	<-0.1	0,00 %

Overlaid Asphalt

Subsidence Road Surface

Conclusion

1. The settlement result completely varies based on the subtraction analysis from two different periods

2. Visualization and statistical method where the deviation has a range from -0.1 to 0.058 meters. From that analysis, it can be compelling information for toll road engineers to maintain quality of toll road Minimum Service Standards

3. Point cloud features have a significant impact on the quality of analysis and very accurate to represent the actual condition, it should be considered that advanced data processing is needed

Reconstuction Sodong Bridge, Sept 2022

Terima Kasih – Thank You