Formulation of RAMS Phase III

Workshop on RAMS, data collection technologies and scope for RAMS III

Bishkek, Kyrgyzstan – May 23, 2023

Formulation of RAMS III

Background

- The Asian Development Bank is providing technical assistance to Kyrgyz Republic for the Issyk-Kul Ring Road Improvement Project.
- Project will reconstruct 75km road between Barksoon - Karakol on the south ring road.
- As part of project preparation, we are conducting detail design review, road safety audit, preparation of bidding documents, etc.
- New project consider additional support to RAMS efforts that will be a logical continuation of RAMS II
- Objective of this brief presentation is to describe process of formulating RAMS III scope and highlight potential activities

Content

1. Formulation of RAMS III

Overview of RAMS III formulation process and key considerations

2. Possible components of RAMS III

Initial list of possible activities that could be considered under RAMS III scope

3. Examples of data collection technologies

Technologies for traffic and condition data collection

Formulation of RAMS III

RAMS III formulation process

- RAMS III should be a continuation of efforts, therefore
- Good understanding of expected outcomes of RAMS II is critical
- Feedback from this workshop and results of RAMS maturity assessment will guide definition of RAMS III scope

Scope must be formulated together based on your needs and should cover number of areas:

- Institutional level
- Capacity development
- Equipment to support data collection
- Software and system functionality improvement
- Data collection/update

Formulation of RAMS III

Key Considerations for successful RAMS project – PPT Framework

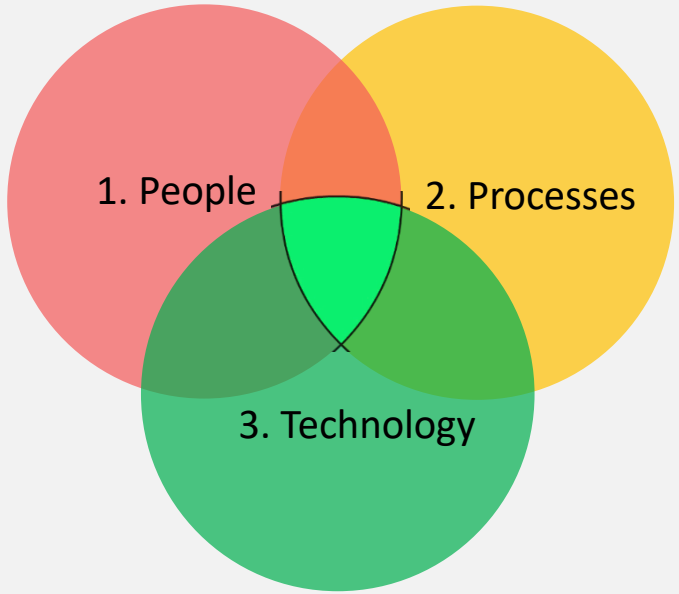
To help with scope definition, standard PPT framework approach can be used.

1. **People** are most important part of the framework. Understanding actual preconditions and baseline human resource capacity is vital before initiating RAMS development process. *Example of good precondition would be the existence of RAMS unit and employs technical capacity for knowledge transfer.*

2. A **Process** is a series of actions or steps that need to happen in order to achieve a particular goal. People are ineffective without processes in place to support their decisions. *Example of good precondition would be the existence of chain of processes for preparation of multi-year planning, including its high level review and formal approval.*

3. Despite its abilities, **Technology** (software/equipment) alone can not solve problems without the people and processes around to support it.

- Too often, agencies make an investment in technology without consideration of preconditions.
- Technology should not be overcomplicated as it can overwhelm people and compromise the utility of the technology.



Formulation of RAMS III

People

To achieve RAMS institutionalization:

- There must be an **leading unit** to manage, monitor and continually improve the RAMS
- Unit must have appropriate staff, clear job responsibilities, defined **reporting lines to upper management**
- Written guidelines and technical manuals in combination with video recordings of all capacity building and training activities – classroom videos + computer screen recordings.
- Continuous training, development and commitment to improvement
- Support from upper management

Processes

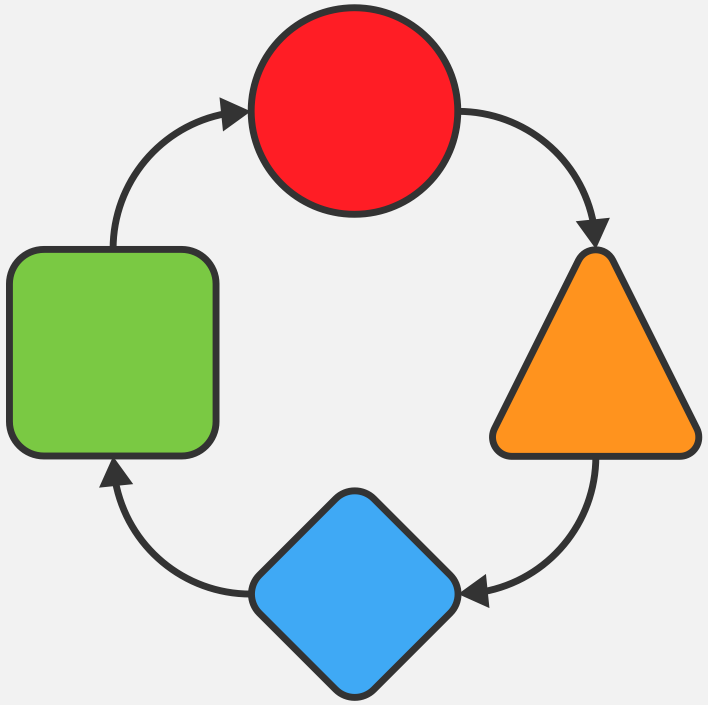
RAMS must have an active role in the agency

To Achieve This:

- The RAMS must be an integral part of the agency's monitoring and planning process and be part of overall **asset management strategy**
- Have written guidelines for annual cycle of activities
- Outputs should be used to prepare annual reports to ensure that data is **regularly collected** and systems are being used

Outputs can include:

- Reporting on Key performance indicators
- Multi-year plans/goals
- Annual asset management plan



Technology

Data collection must be appropriate and sustainable

- Basic data
- At the adequate level of detail based on capacity and needs
- With technology based on agency's constraints and capabilities
- Focusing on automated data collection and processing methodologies – such as high speed IRI measurements, spatial analysis tools (GIS) for automated data processing, etc.
- Has to be systematic. Outdated data is no much better than no data

Formulation of RAMS III

Technology

RAMS can be a combination of commercial off-the-shelf (COTS) software instead of all in one custom solution.

- Lower cost
- Avoid dependence on individual developers
- Timeframe – implemented much faster
- Experience – reflects inputs and testing from a larger number of users
- Ongoing development – continual upgrades and improvements
- Exchange of ideas – conferences and other users

Examples of RAMS III potential components

1. Preparation of RAM Strategy document

Document should outline strategic goals, objectives, and priorities for managing a road network's assets over a defined period. Document will include guidelines for asset inventory, condition assessment, service levels, funding and resource allocation, etc. and guide decision-making for efficient and effective road network management.

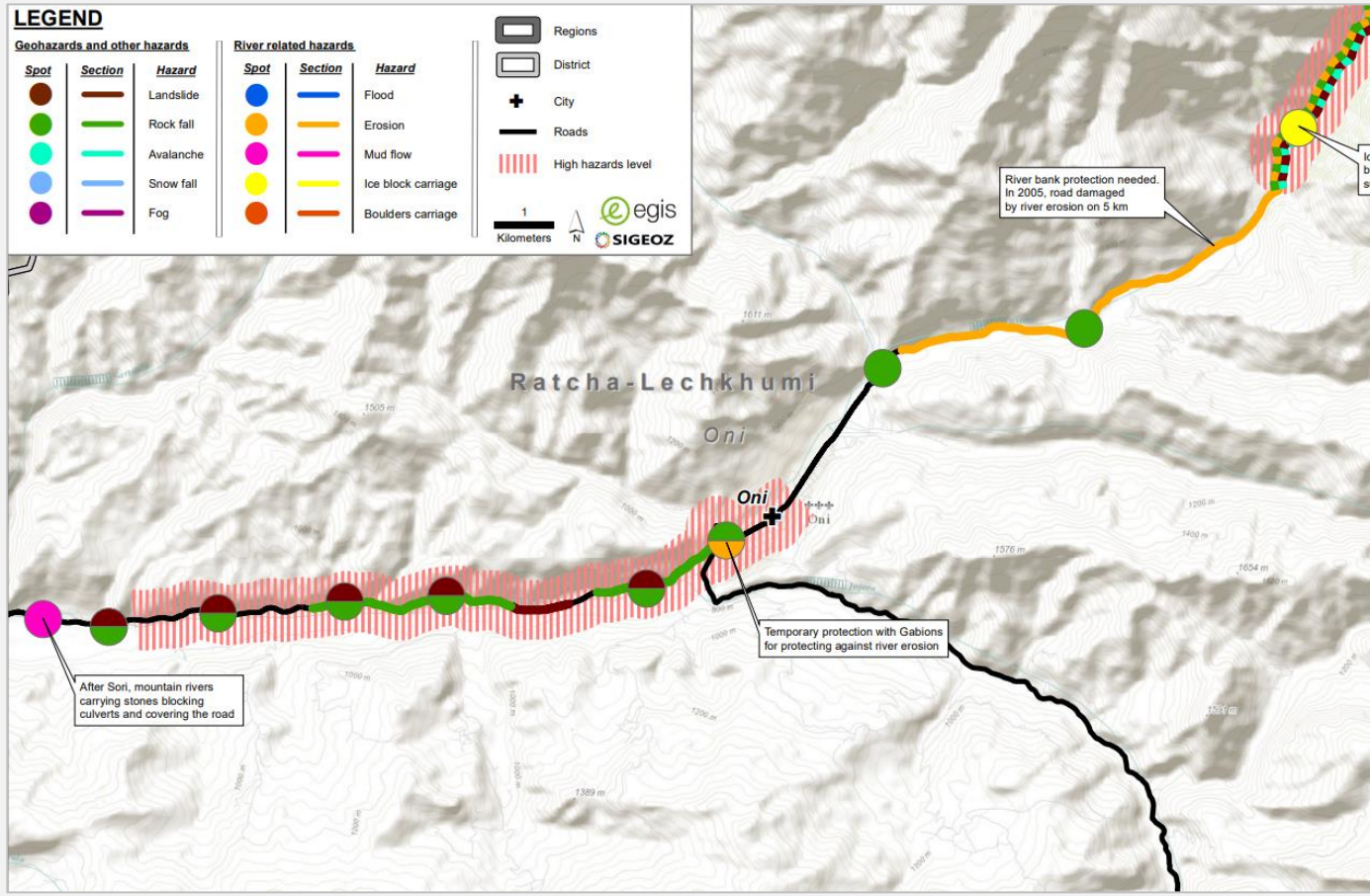
Such document will help to plan, approve and execute annual activities related to RAMS operation.

Examples of RAMS III potential components

2. Additional Data Collection/Update

- Continuation of data collection and update efforts.
- Road condition data update.
- Inventory of road assets, culverts, km posts etc.
- Increase the coverage of Traffic Data points.
- Bridge inventory and inspection. Assessment of bridge health index. Etc.
- Data related to climate resilience adaptation, such as risk/hazard maps and asset vulnerabilities.

Example of risk/hazard GIS dataset



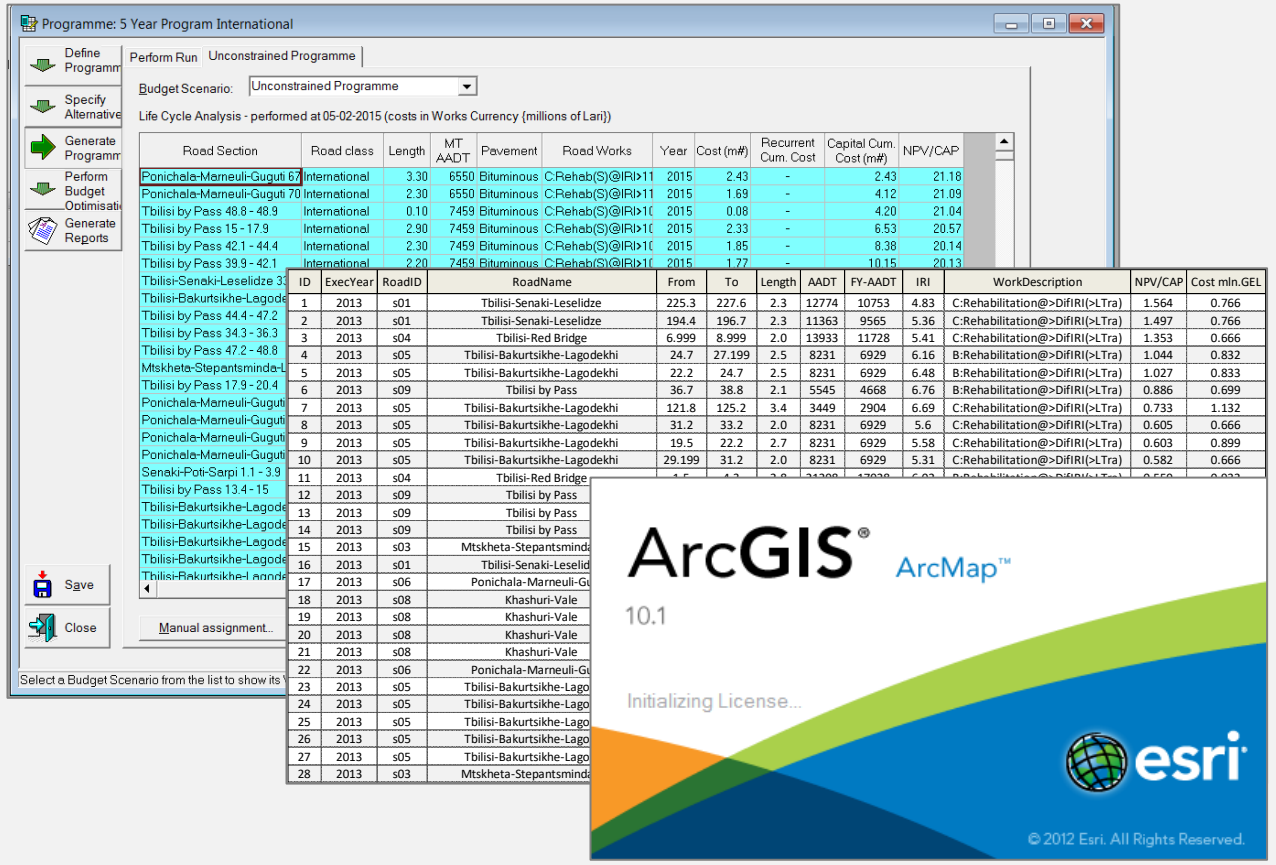
Formulation of RAMS III

Examples of RAMS III potential components

3. HDM-4 Integration and introduction of non-monetary prioritization indicators through GIS spatial analysis

- Continued integration of HDM-4 and RAMS at a program level analysis

- Introduction of non-monetary indicators, such as population density, number of schools, hospitals, touristic attractions etc.



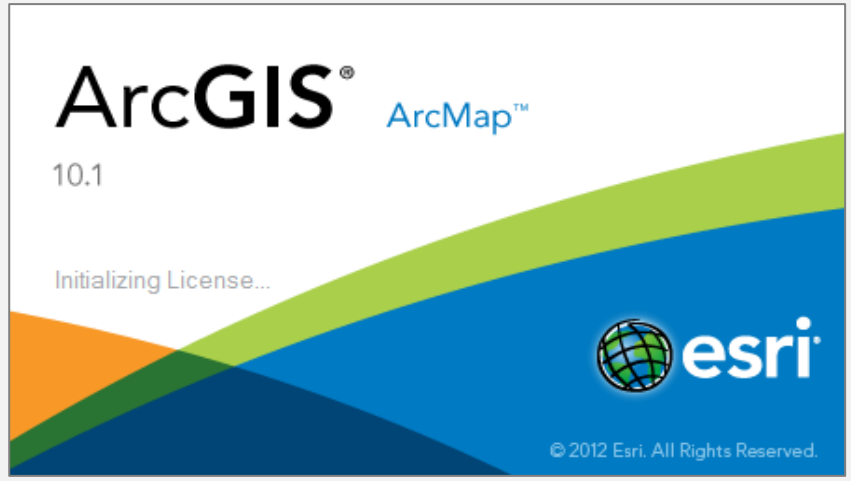
Formulation of RAMS III

Examples of RAMS III potential components

4. Bridge Inspection / BMS

- Development of Bridge Management System and relevant field inventory and inspection mobile app
- Guidelines for bridge inspection, detailed inventory of elements
- Bridge health index assessment and multi-year approach
- Climate resilience considerations for bridge assets.

Examples of RAMS III potential components



5. Trainings and Capacity enhancement for COTS software solutions

ArcGIS/QGIS trainings for MOTC, PIU, PIC

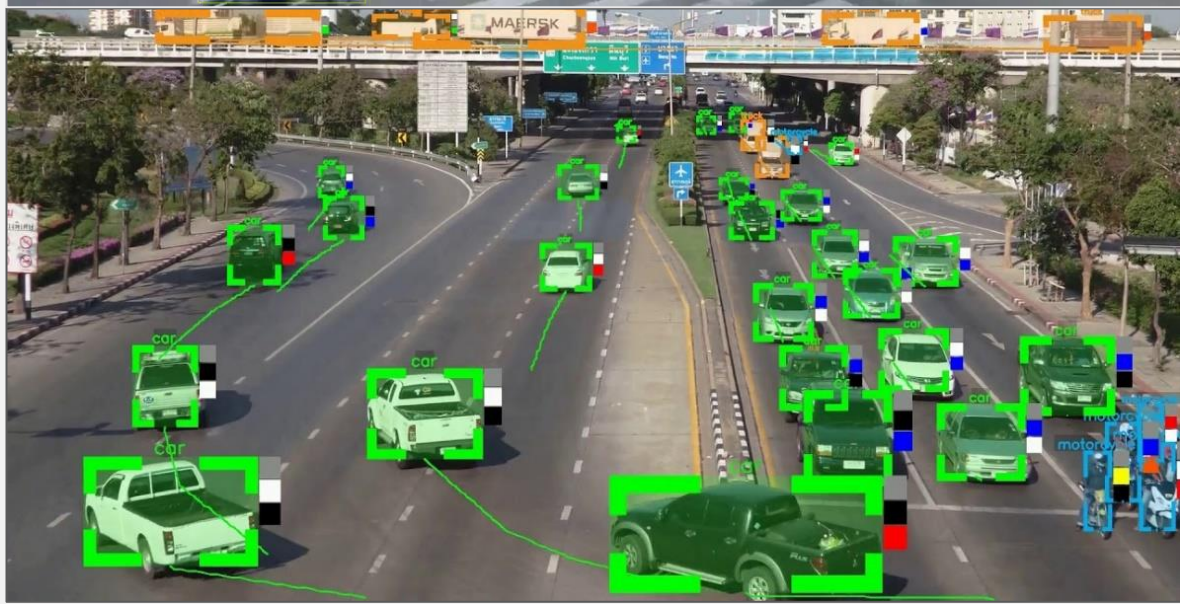
- Even with fully operation custom RAMS software, there is a need for GIS capacity as it plays major role in data processing and analysis.
- Basic and Advanced training can be considered under RAMS III that will include preparation of training materials including video/screen recordings for future reference

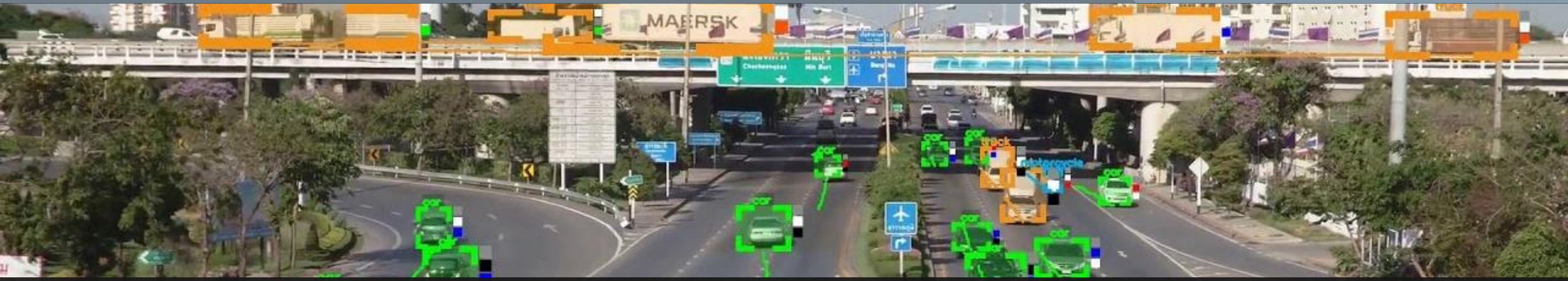
Formulation of RAMS III

Examples of RAMS III potential components

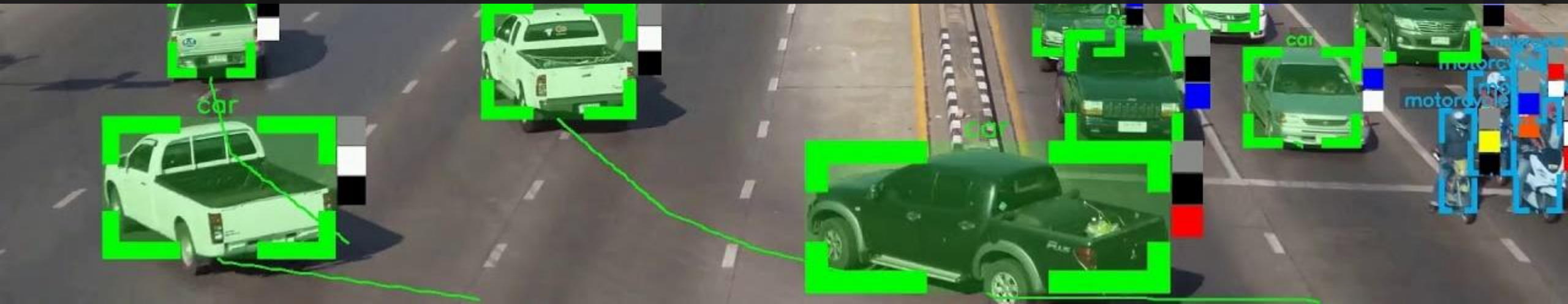
6. Enhanced traffic data collection with video analytics

- Increase number of automated traffic counters and network coverage
- Introduction of more advanced and accurate counters





Mobile Traffic Counts



Data Collection Technologies

Manual Traffic Counts (While Driving)

One of the additional manual count methods is a mechanical Tally or Tally App for mobile. This method is practical only if done in parallel with other road surveys, such as centerline data collection, or during inspections by maintenance contractors.

Operator needs to count vehicles on opposite lane and in addition to final count number must record the duration of the trip, this can be later used to determine approximate daily traffic levels. If used in parallel for example by maintenance units or anyone who has to drive the road anyway, it can provide planning level data with negligible cost.

Data Collection Technologies

Automated Counts (Radars, Infrared, etc.)

PIC already operates few radar counters:

Advantages:

- Mobility, can provide reliable data on traffic volume, speed, and other relevant metrics.
- Time-efficient as Automatic traffic recorders can operate continuously, 24/7 and if equipped with solar batteries can operate continuously.
- Most automatic traffic recorders (apart from acoustic) can capture additional data, such as vehicle classification, speed, and direction.

Disadvantages:

- Requires installation and site configuration.
- May not be suitable for all locations or situations.
- Accuracy can be affected by adverse weather conditions such as rain, snow, or fog as well as high traffic levels.
- Requires supervision if there is a risk of theft or vandalism

Data Collection Technologies

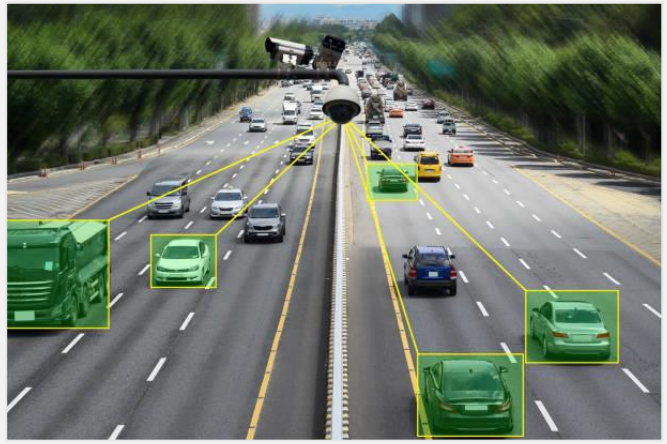
Video Analytics

Advantages:

- Video analytics system can provide highly accurate and detailed data on traffic volume, classification, speed, and other relevant metrics.
- Automation enables its use for large-scale studies or projects, and can cover wider areas than manual counting methods.
- Video analytics solutions come as Equipment and Software sets but standalone software is also available that can process existing footages.

Disadvantages:

- Analytic software dependent on lighting and visibility conditions, and may not function effectively in adverse weather or lighting conditions.
- Video analytics software may raise privacy concerns, as it captures and stores images of vehicles and drivers.
- Payment mechanism based on length of video processed / number of vehicles processed



Data Collection Technologies

Mobile Adaptive Recognition

Pricing Information

Below are the total costs for these different subscription durations.
Additional taxes or fees may apply.

ANPR Cloud powered by Carmen® | Vehicle identification software

Units	Description	1 MONTH
Basic_10k	10.000 requests / month	$12.5
Basic_20k	20.000 requests / month	$24
Basic_40k	40.000 requests / month	$46.5
Basic_80k	80.000 requests / month	$86
Standard_160k	160.000 requests / month	$164
Standard_320k	320.000 requests / month	$310
Pro_640k	640.000 requests / month	$589
Pro_1280k	1.280.000 requests / month	$1,117
---DO-NOT-USE-1---	This dimension doesn't include any requests, do not select it!	$0
---DO-NOT-USE-2---	This dimension doesn't include any requests, do not select it!	$0
VIP_5m	5.000.000 requests / month	$4,034
VIP_10m	10.000.000 requests / month	$7,484
VIP_20m	20.000.000 requests / month	$14,220

Data Collection Technologies

Datafromsky

Intermediate Package

1000 Credits

1000 hours

of video

only 3.32 €/h

Precise raw trajectory data

No video length limitation

Easy file management

Better Value for money

Medium Processing priority

Order

https://datafromsky.com/

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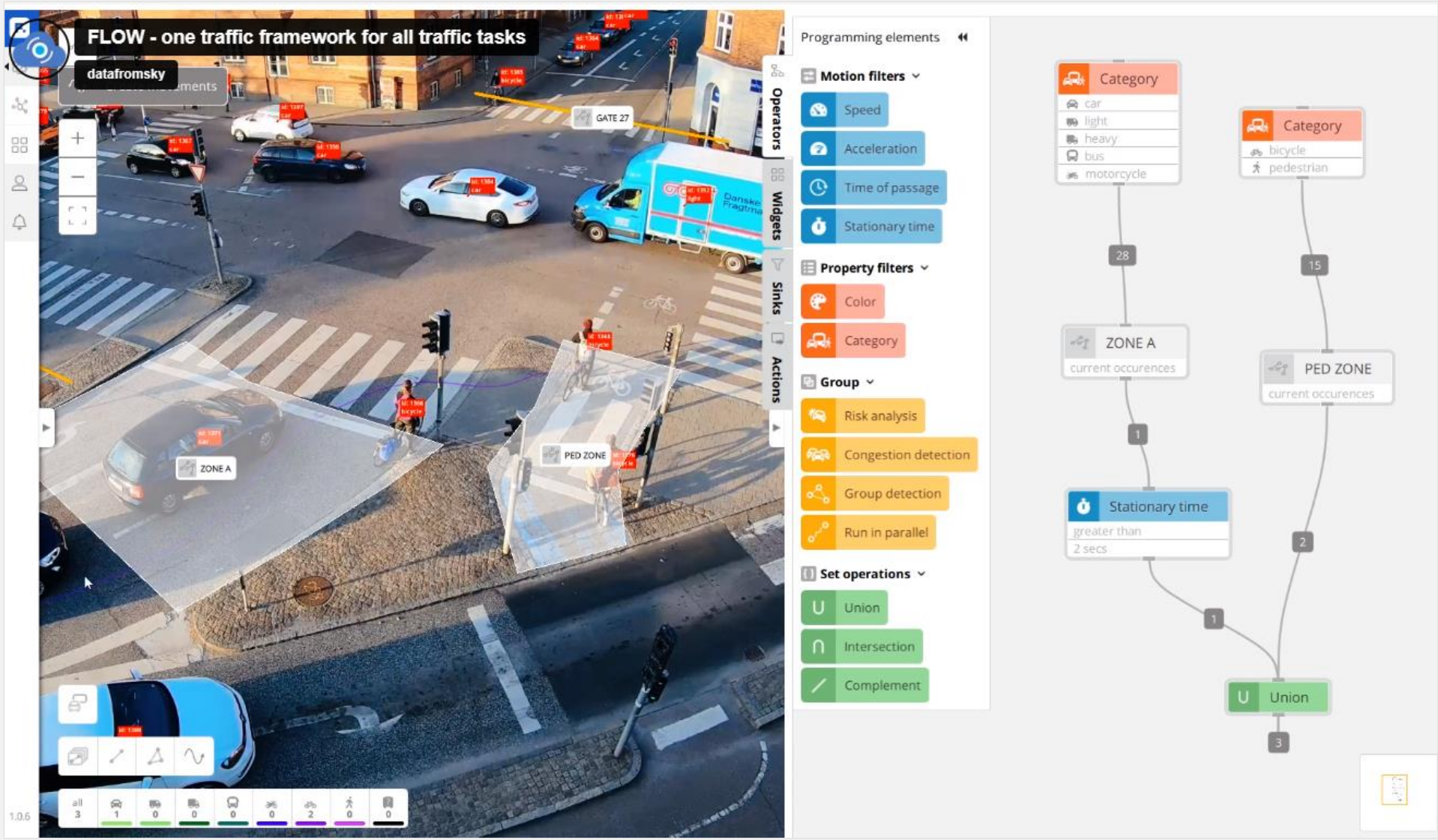
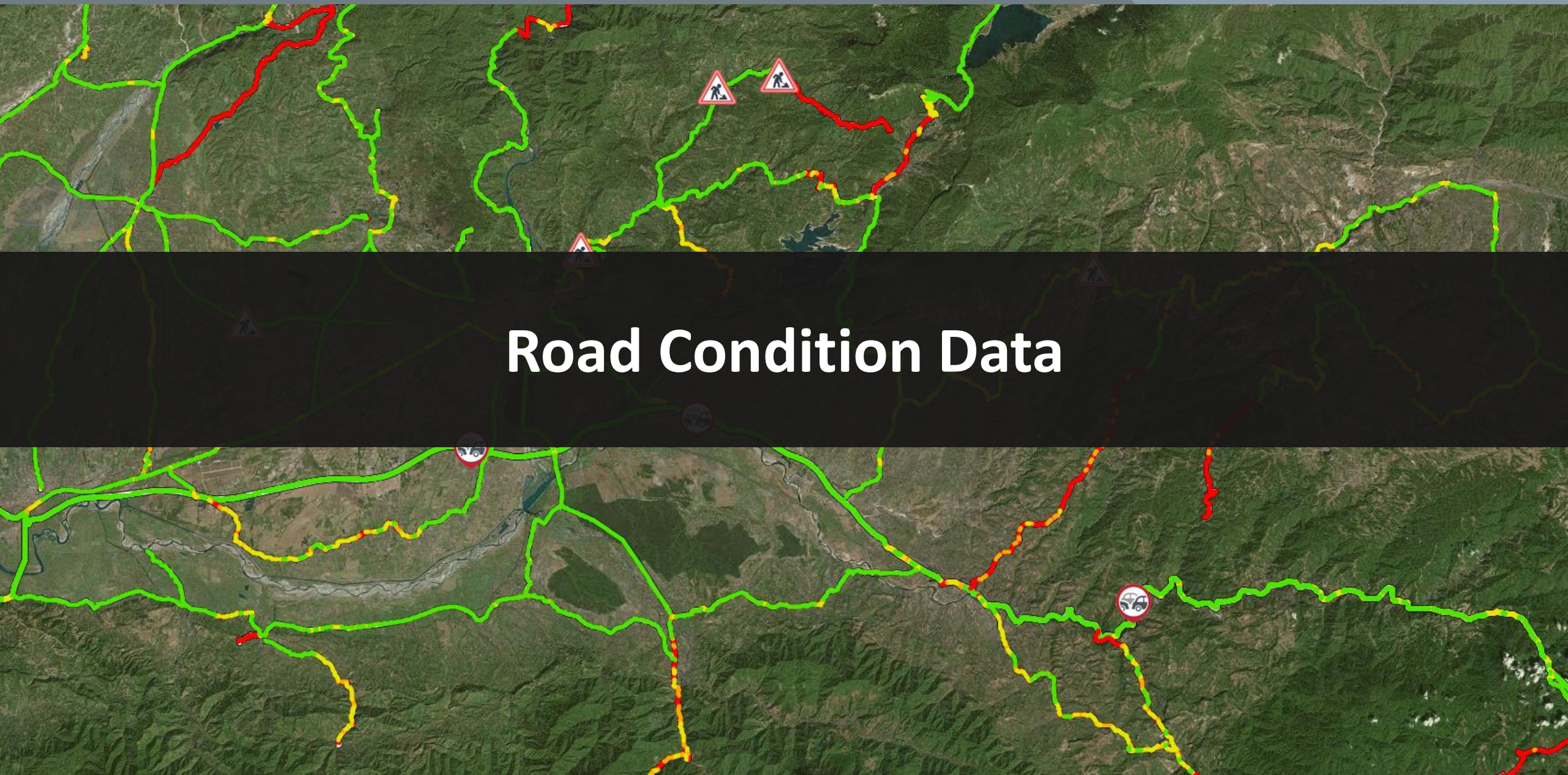




Road Condition Data

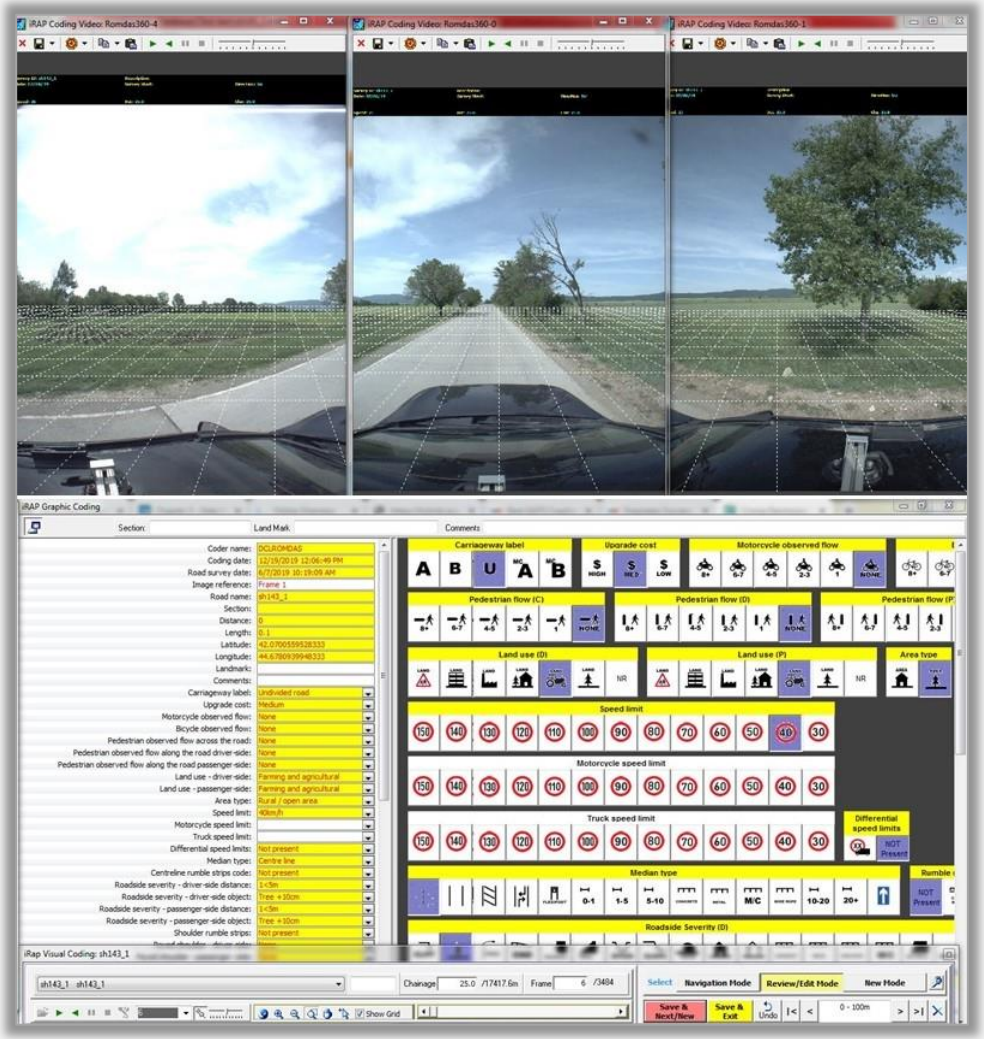
Road Condition Data by Manual Coding

Advantages:

- Coding enables wide variety of data classification related to road condition as well as safety such as traffic signs, markings, etc.
- Low cost for the equipment

Disadvantages:

- Slow process, not applicable for medium or large scale network
- High cost for coding, labor intensive



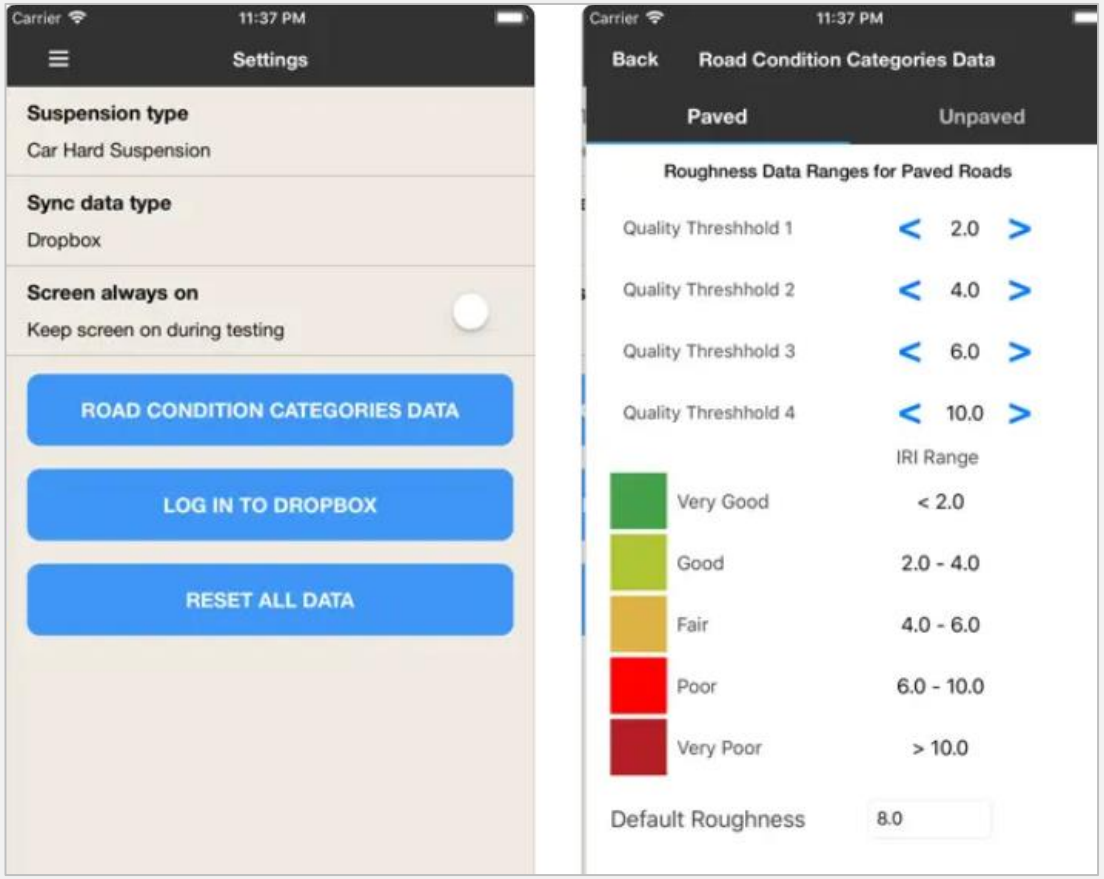
Road Condition Data collection with RoadLAB

Advantages:

- RoadLab mobile app is free

Disadvantages:

- Low Accuracy
- Optimal only if done in parallel with other surveys, otherwise not worth the effort
- Data quality not suitable for prioritization and multi-year planning



Data Collection Technologies

Road Condition Data collection with bump-integrator

Is part of RAMS II – equipment for unpaved roads.

Advantages:

- Low Cost
- Can be used on unpaved as well as paved roads
- If calibrated can provide sufficient accuracy for planning

Disadvantages:

- Low Accuracy
- Requires frequent calibration
- Individual calibration takes few days to one week

Data Collection Technologies

Road Condition Data collection with IRI Laser profilometers

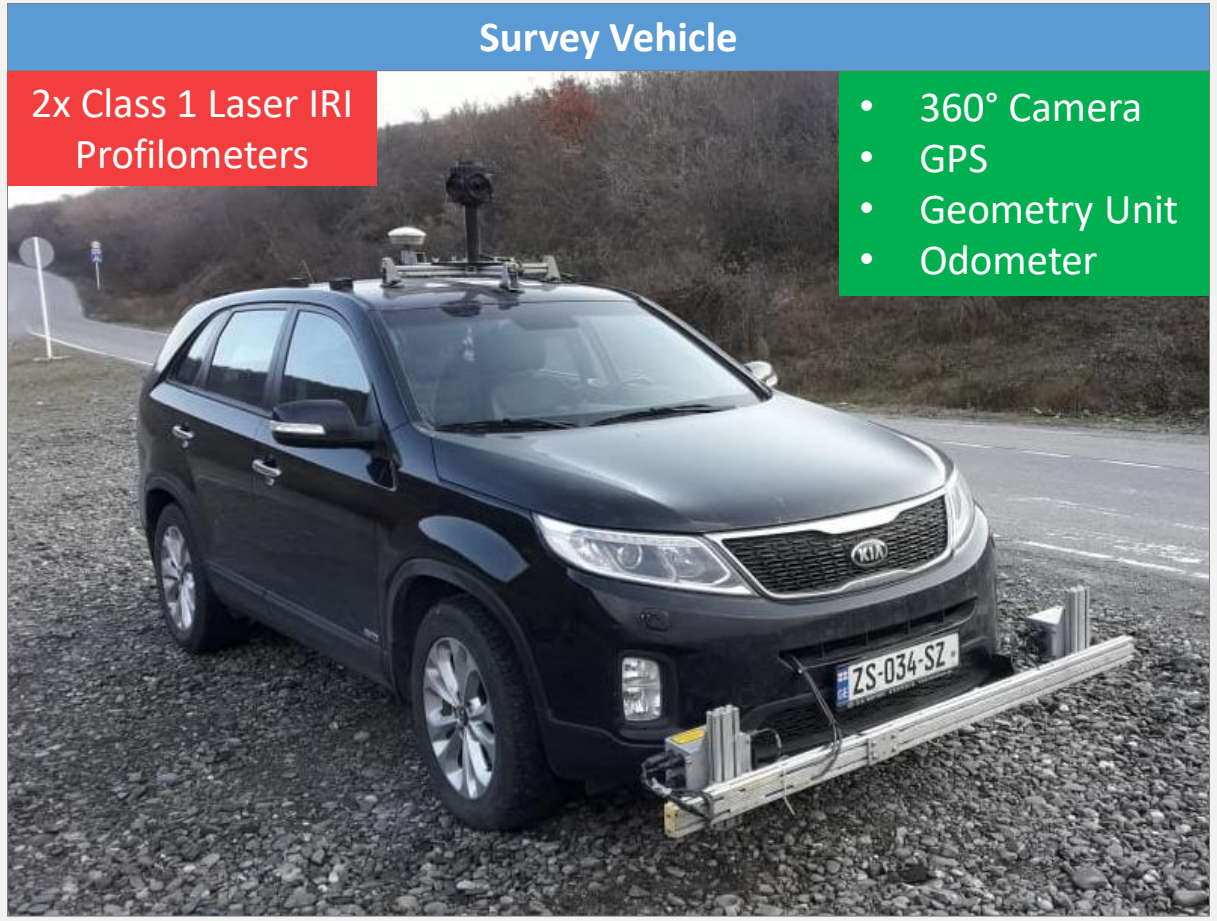
Similar to TRASSA vehicle used by PIC

Advantages:

- One of the most common methods, fast and cost efficient.
- Can collect additional data with Extra modules
- Accurate up to +-0.1 IRI sufficient for PBC contract monitoring

Disadvantages:

- Relatively expensive (100K-200K USD depending on modules), only IRI is not sufficient to assess pavement condition



Data Collection Technologies

Road Condition Data collection by Laser Crack Measurement System

Advantages:

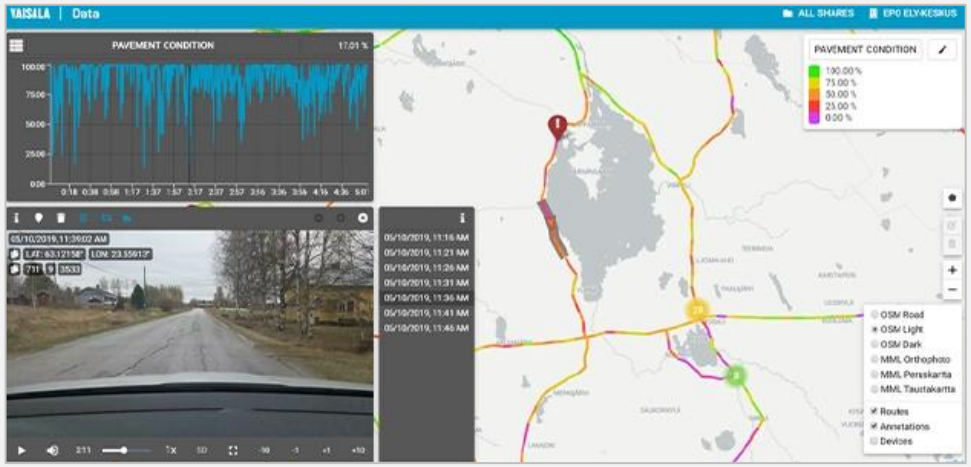
- Accurate and fast data collection method for surface distresses, texture, cracks, potholes, including rutting.
- Automated data processing of distress quantities and severity
- Data can be used for preventive maintenance planning

Disadvantages:

- Expensive system (500K-800K USD depending on modules)
- Potentially high support/maintenance costs

Data Collection Technologies

Road Condition Data with computer vision and machine learning techniques



Advantages:

- Automated data processing of surface distresses
- Low system and setup cost
- Scalable for large networks
- Some solutions can also process road signage and marking

Disadvantages:

- Limited accuracy, no distress quantities
- Video quality dependent (weather, lighting, etc)
- Per KM cost too high for large scale networks (~50USD per km)

examples:
https://www.roadbotics.com/
https://www.vaisala.com/en

Data Collection Technologies

Road Condition Data with LiDAR integration

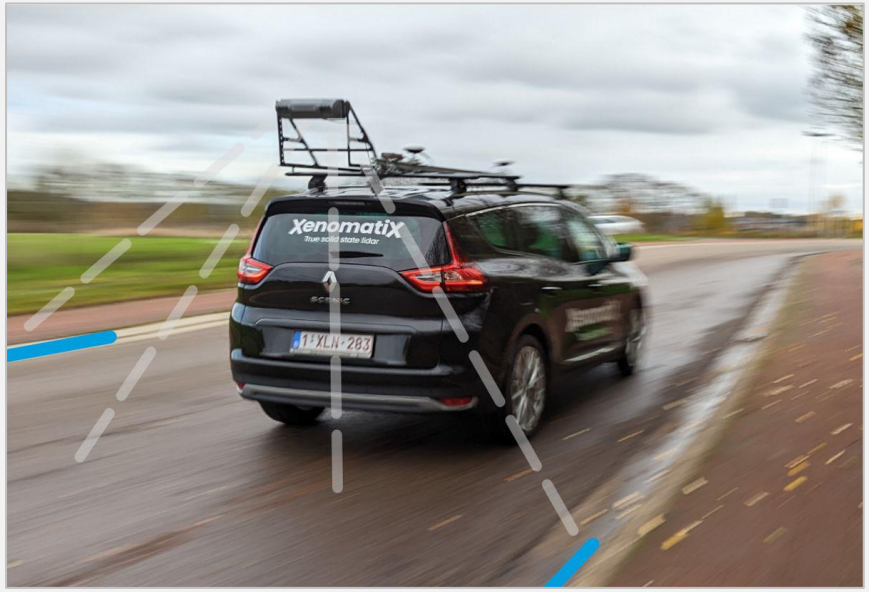
Advantages:

- Automated data processing
- High accuracy
- LiDAR datasets can be used for various other uses, including utilities

Disadvantages:

- High Cost
- LiDAR generates very large volumes of data
- Processing is time consuming and storage may become an issue
- High expertise requirement

[Example: Road Scanning Services | XenomatiX]



Data Collection Technologies

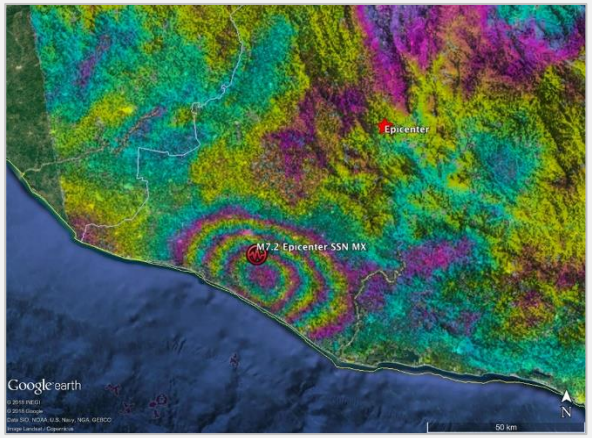
Road Condition Data with Remote Sensing, Synthetic Aperture Radar (SAR)

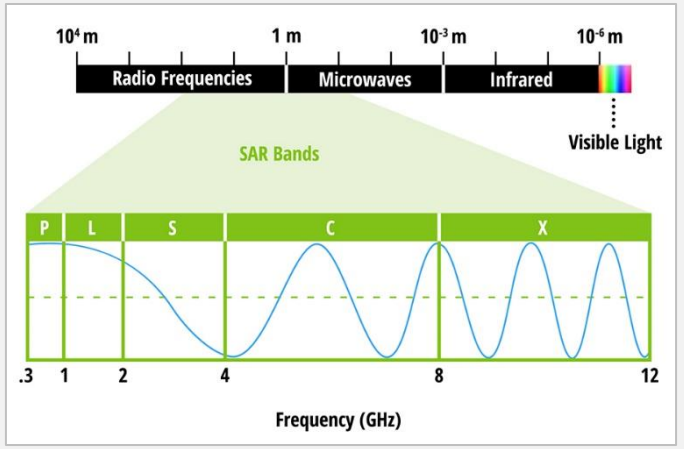
Advantages:

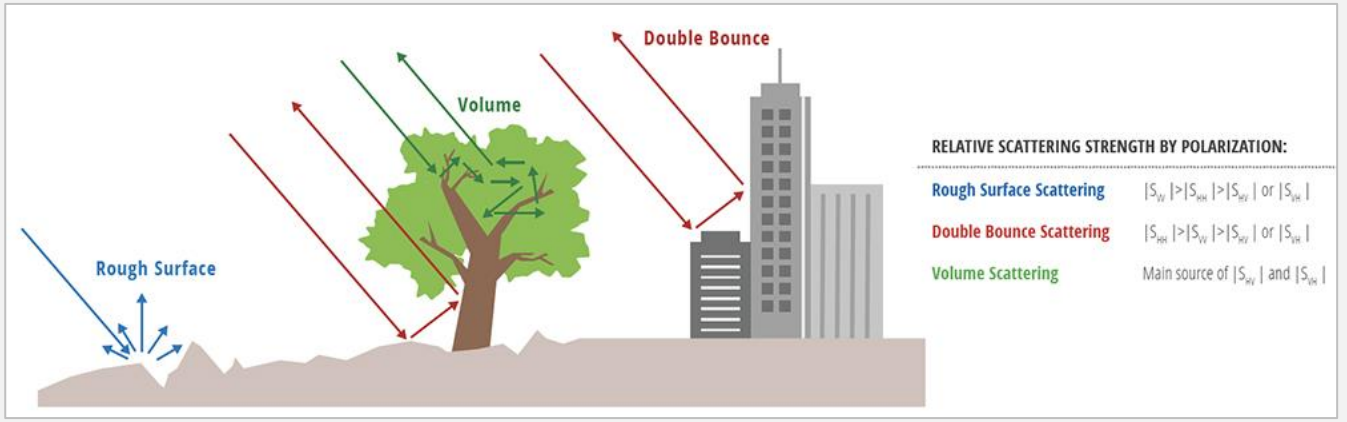
- No field survey required
- Data available for free use and coverage and quality is expected to be improved
- Automation and scalability to any network size
- Cost almost independent on network size
- WB pilot is ongoing

Disadvantages:

- Limited accuracy, only condition classification (good, fair, poor, bad)
- New approach, limited expertise







[What is Synthetic Aperture Radar? | Earthdata (nasa.gov)]

Summary and Q&A