

To effectively **study traffic congestion at Mwenge Junction** and collect **speed and stop-time data**, you need a **structured data collection and analysis approach**. Here's a step-by-step guide tailored for your goals:

✓ 1. Define Your Study Objectives Clearly

Before collecting data, be clear about:

- What specific type of congestion are you studying? (e.g., peak hour congestion, specific movements like right-turn congestion)
- What variables are most important? (speed, delay, stop duration, queue length, etc.)
- Which directions/approaches of Mwenge Junction are of interest?

✓ 2. Choose Data Collection Methods

To capture **speed and stop-time**, here are your best options:

☐ A. Video Recording (Recommended)

- Set up cameras at key points (overhead or roadside, safely).
- Cover all approach lanes and turning movements.
- Use timestamped video to later extract speed and stop duration.
- You can manually or automatically process video using:
 - **Computer vision software** (e.g., CVAT, OpenCV)
 - **Traffic analysis tools** (e.g., PTV Vissim, Aimsun, or Tracker software)

☐ B. Manual Observation (if resources are limited)

- Use stopwatches and notepads or tablets to:
 - Record the time vehicles enter and leave the intersection.
 - Log vehicle stops, durations, and queues.
 - Record speeds via reference distance and stopwatch.

☐ C. Radar Guns / Speed Sensors

- Use radar/lidar devices to record real-time speeds of vehicles.
- These can be temporarily mounted or handheld by observers.

□ **D. GPS Tracking (optional, for sample vehicles)**

- Use mobile apps or GPS trackers in a few vehicles to log:
 - Speed variations.
 - Stop/start events with timestamp and location.

✓ **3. Data to Collect**

Here's a suggested format:

Time	Vehicle ID	Direction	Entry Time	Exit Time	Speed (km/h)	Stop Duration (s)	Queue Length
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✔ 4. Use Mapping and Tools

You'll need:

- **Google Earth or GIS tool** to map out your study area.
- **Distance markers** (e.g., 50–100m before the junction) for calculating speed.
- A clock or synchronized device for consistent timing.

✔ 5. Modeling and Simulation

Once data is collected:

- Use simulation tools like **PTV Vissim, Aimsun, SUMO (open-source)** to simulate congestion.
- Input:
 - Vehicle arrival patterns
 - Signal timings
 - Road geometry
- Output:
 - Congestion levels
 - Delays
 - Potential improvements (e.g., signal timing optimization)

✔ 6. Timing for Data Collection

Make sure to capture:

- **Peak hours** (e.g., 7–9 AM, 4–7 PM)
- **Off-peak** for comparison
- **Weekday vs. weekend** patterns

✔ 7. Safety and Permissions

- Obtain **permission** from local traffic authorities for data collection.

- Ensure the safety of your data collection team.
- Avoid obstructing traffic or violating privacy laws when using video.

✔ 8. Analyze and Interpret

After collecting data:

- Use **Excel**, **Python**, or **R** for data cleaning and analysis.
- Visualize trends using charts (speed vs time, stop durations, heatmaps of congestion).

If you're interested, I can help you:

- Design a **data collection sheet or mobile form**
- Set up a **basic Python script** for analyzing video or GPS data
- Simulate the junction using free tools like **SUMO**