Traffic Congestion

Topic

Urban traffic flow

Introduction

As towns and cities have grown larger, so has the amount of traffic. People have to move around in order to get to and from work (often called "the rush hour"), to shop, and to take part in leisure and recreation activities. This increased mobility, and the volume of traffic that it creates, can cause serious problems in many urban areas. One problem is congestion, where there is too much traffic at given points or times so that movement of vehicles is slowed down or obstructed. You will be using a Traffic Intensity Index to measure the average waiting time in the flow of traffic. You will consider the questions: Is there a pattern of traffic congestion? If so, does it occur at certain times or places?

Time required

1 day for traffic survey
1–2 hours for analysis

Materials

stop watch or watch with sweeping second hand (one per group)
pencils
street map of town/city

Safety note

Work in a minimum of groups of three. Be aware of traffic and pedestrians.

Procedure

1. Using the street map, discuss the probable places and times for traffic congestion in your urban area. For example, it could take place in the town center or during the "rush hour."
2. Decide as a class what data are needed. For instance, you might need to go to different places where you think congestion occurs. Alternatively, the congestion might occur at different times – data can be collected at this location for different time periods. Divide into groups to share the data collection, whether for different locations or different time periods at the same location. Give each group a copy of the data table overleaf.
3. Within each group, record the flow of traffic for a 15-minute period by completing the data table. The arrival rate of the vehicles is measured by timing how long it is between each vehicle arriving at the site. Record this in the first column. Record in the second column the waiting time of each of these vehicles, from their arrival at the site before moving on again.

DATA TABLE	
Site (e.g., street name):	
Time:	Date:
Time between each vehicle (minutes)	Time waiting before moving on (minutes)
Average	Average

Analysis

1. Calculate the average times for both columns in the data table. Now calculate the Traffic Intensity Index at that site/time. This is a measure of the average waiting time in a flow of traffic:

$$\text{average waiting time } (e) = \frac{\text{average time waiting (2nd column)}}{\text{average time between vehicles (1st column)}}$$

   If *e* is greater than 1.0, then the average waiting time increases and the length of the line of traffic will also increase. Gather the *e* index from each group
2. For each site, draw a line graph to show *e* over time. Have "time" on the x-axis and "average waiting time (*e*)" on the y-axis. Does traffic congestion occur? When does it happen? For how long does it last?
3. Discuss in your groups whether you need any more data to produce a complete pattern of traffic flow and congestion in your urban area. Would you need to collect data at other times or places? Were there any inaccuracies or problems in your data collection?
4. Are there any ways that the traffic is managed at the sites to make it flow more efficiently – for instance, traffic controls at the road intersections? What other methods are there to reduce traffic congestion? What problems does traffic congestion cause?

Want to know more?