Problems Caused by Congestion

Increased…

- Travel time
- Travel cost
- Air pollution
- Accident risk



How to Solve?/Options for congestion reduction

- **Construct new roads**
  - Covered in geometric design
  - Not likely to happen on a large scale
- **Reduce Traffic**
  - Travel demand management
  - Alternative transportation
- **Increase existing infrastructure capacity**
  - Uses intelligent transportation systems (ITS)

Linkage of vehicle and transportation infrastructure through ITS infrastructure

Alternative Transport

Increase Existing Infrastructure Capacity

- An alternative to expensive new highway construction is the implementation of strategies that promote more efficient utilization of transportation infrastructures.

- These strategies are known as the **Intelligent Transportation Systems (ITS), which aims to reduce travel time, ease delay and congestion, improve safety, and reduce pollutant emissions**

Intelligent Transport Systems (ITS)

ITS is an emerging transportation system which is comprised of an advanced information and telecommunications network for users, roads and vehicles.

ITS is the integrated application of advanced Technologies using electronics, computers, communications, and advanced sensors.

Intelligent Transport Systems (ITS) intend to add information and communications technology to transport infrastructure and vehicles in an effort to improve:

Safety, reliability, efficiency and quality of means of transport.

Intelligent Transportation Technologies/Infrastructures

- **Wireless communications**
- **Computational technologies**
- **Sensing technologies**
- **Video vehicle detection**
- **Probe & smart vehicles**
- **The incident detection centers**
- Floating car data/floating cellular data
- Inductive loop detection
- **In vehicle information & route guide**

Intelligent Transportation Applications

ITS has wide range of applications as,

1. **Electronic toll collection**
2. **Emergency vehicle notification systems**
3. **Cordon zones with congestion pricing**
4. **Automatic road enforcement**
5. **Collision avoidance systems**
6. **Dynamic Traffic Light Sequence**
7. **Intelligent Vehicle**

Manage and monitor the network traffic flows

Provide information on the state of the network

Fleet management (vehicle location)

- Trucks
- Buses

Monitoring vehicle condition and status

- Trucks
- Buses

Autonomous systems

- Vehicle status
- Intelligent cruise control
- Obstacle detection

Intelligent Transportation Applications

1. **Electronic toll collection (ETC)**

like E-ZPass, that detects and processes tolls electronically.

E-ZPass uses a **vehicle- mounted transponder (**where account information is stored) that is activated by **an antenna on a toll lane**.

The antenna identifies your transponder and reads your account information. The amount of the toll is deducted and you're allowed through.

ETC makes it possible for vehicles to **drive through toll gates at traffic speed, reducing congestion at toll plazas and automating toll collection**.

Intelligent Transportation Applications

2. Emergency vehicle notification systems

The **in-vehicle eCall is an emergency call generated either manually by the vehicle occupants or automatically via activation** of in-vehicle sensors after an accident.

ITS particularly the FCD (Floating Car Data) model can also be used to **provide advance warning to motorists of traffic jams, accidents and other emergency situations**.

This system can then provide **alternative routes or recommendations to motorists so as to avoid congestion and travel delays**.

Intelligent Transportation Applications

3. Cordon zones with congestion pricing:

With the intelligent transportation system, cordon zones can also be enforced where mass transportation systems are available and their use encouraged. Cordon systems make it possible to collect taxes from those entering city areas with high traffic while encouraging the use of Sign indicate the boundary of mass transit. the congestion charge area

Intelligent Transportation Applications

4. Automatic road enforcement

A traffic enforcement camera system, consisting of a **camera and a vehicle-monitoring device**, is used to detect and identify vehicles disobeying a speed limit or some other road legal requirement.

Hot lanes: These are the roads where the speed limit is more than 100 kms./hr. & goes in one track. There are radiators on the sides of the road where if the car goes out of lane, it produces shocks & hence keeps the car on the track.

A traffic enforcement camera system, **consisting of a camera and a vehicle- monitoring device**, is used to **detect and identify** vehicles disobeying a speed limit or some other road legal requirement and automatically **ticket offenders based on the license plate number**. Traffic tickets are sent by mail. For Exam :-

- **Speed cameras** identify speed limit.
- Red light cameras detect vehicles that cross a stop line.
- **Bus lane cameras** identify vehicles traveling in lanes reserved for buses.

Intelligent Transportation Applications

5. Collision Avoidance Systems:

Obstacle Detection Intersection Collision Warning Lane Change assistance Lane Departure Warning

Collision Avoidance Systems …… Road Departure Warning, Rollover Warning, Forward collision Warning, Rear Impact Warning,

6. Traveler Information Service:

Information is Sent to Travelers Generated … Travelers .. Respond

- Delay Traffic Sensor
- Incident Change Route
- Road Aerial Weather surveillance Change
- Next Bus Departure
- Traveler Weather Time Monitoring Times
- Emergency Change Mode Incident Alerts Detection
- Alternate Change Routes Destination Transit Location

Intelligent Transportation Applications

7. Emergency Management Services:

Emergency Management Services are greatly enhanced by traffic control centers that continually monitor roadway conditions. When an incident occurs, the nearest emergency service vehicle is located electronically and dispatched to the scene. Highway managers then alert other drivers of the incident through dynamic message signs. These services reduce response times, help save lives, and reduce the occurrence of secondary incidents.

Benefits of ITS

Time Savings

Better emergency response times and services

Reduced Crashes and Fatalities

Cost Avoidance

Increased Customer Satisfaction

Energy and Environmental Benefits

Decreasing of probability of congestion occurrence

Projected ITS Infrastructure Benefits (1996-2015)

Accident Cost Savings (44%)

Time Savings (41%)

Emissions/Fuel (6%)

Operating Cost Savings (5%)

Agency Cost Savings (4%) Other (< 1%)

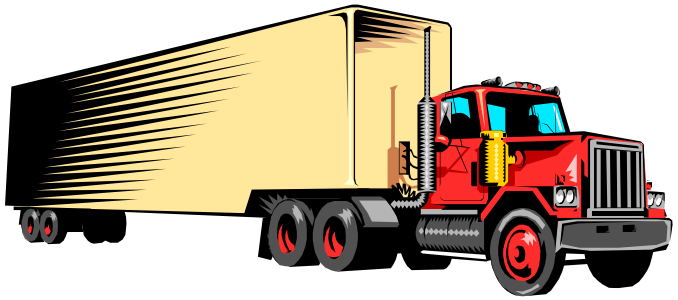
Source : Apogee Report on Global ITS Benefits

Five Primary Functional Areas of ITS

- **Advanced Traffic Management Systems (ATMS)**
- **Advanced Traveler Information Systems (ATIS)**
- **Commercial Vehicle Operations (CVO)**
- **Advanced Public Transportation Systems (APTS)**
- **Advanced Vehicle Control Systems (AVCS)**

Commercial Vehicle Operations

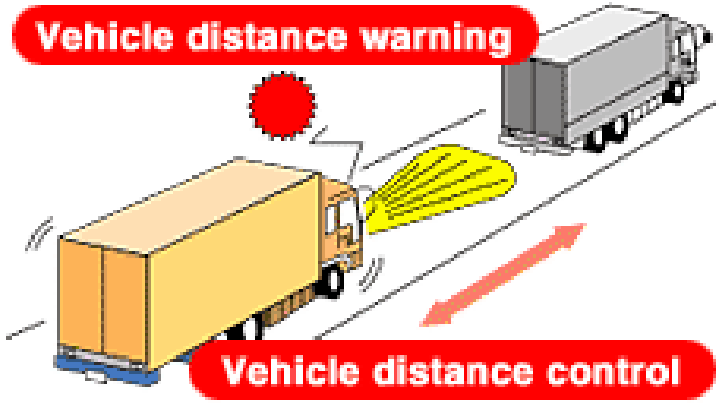
- Apply, pay for and receive permits, registrations, and licenses electronically
- Share of common trucking data across agencies
- Exchange information electronically with roadside enforcement personnel
- Electronic “screening” of trucks for safety or other regulatory violations
- Share information across state lines and with Federal information systems



Advanced Public Transportation Systems



Advanced Vehicle Control Systems



Intelligent Cruise Control (ICC) System

