Sustainable Built Environment National Research Centre

The Role of Big Data and Technology

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"Railways as the Low-Carbon and Sustainable Transport Development Solutions in Achieving Safe, Inclusive, Efficient and Resilient Communities under the2030 Agenda for Sustainable Development"

Venue: United Nations University, Tokyo, Japan

26 February-2March 2018

Big Data, Technologies, and Transportation: Relieving peak congestion and improving emergency responses across the transport network

Project Steering Group Chairperson:
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30th Governor of Western Australia (2006-11)
Western Australian Commissioner of Main Roads (1991-96)

Sustainable Built Environment National Research Centre

Our Partners

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BGC

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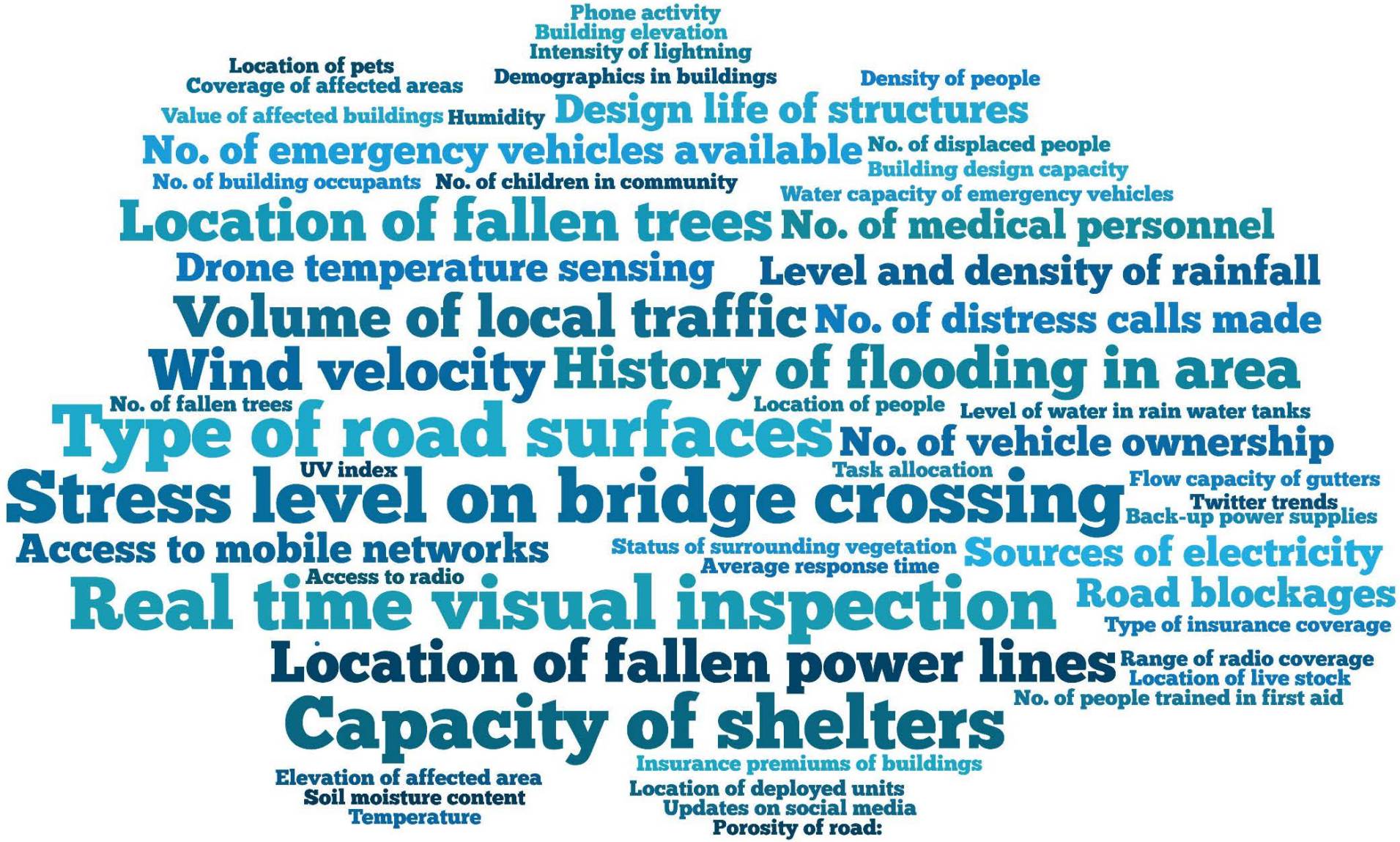
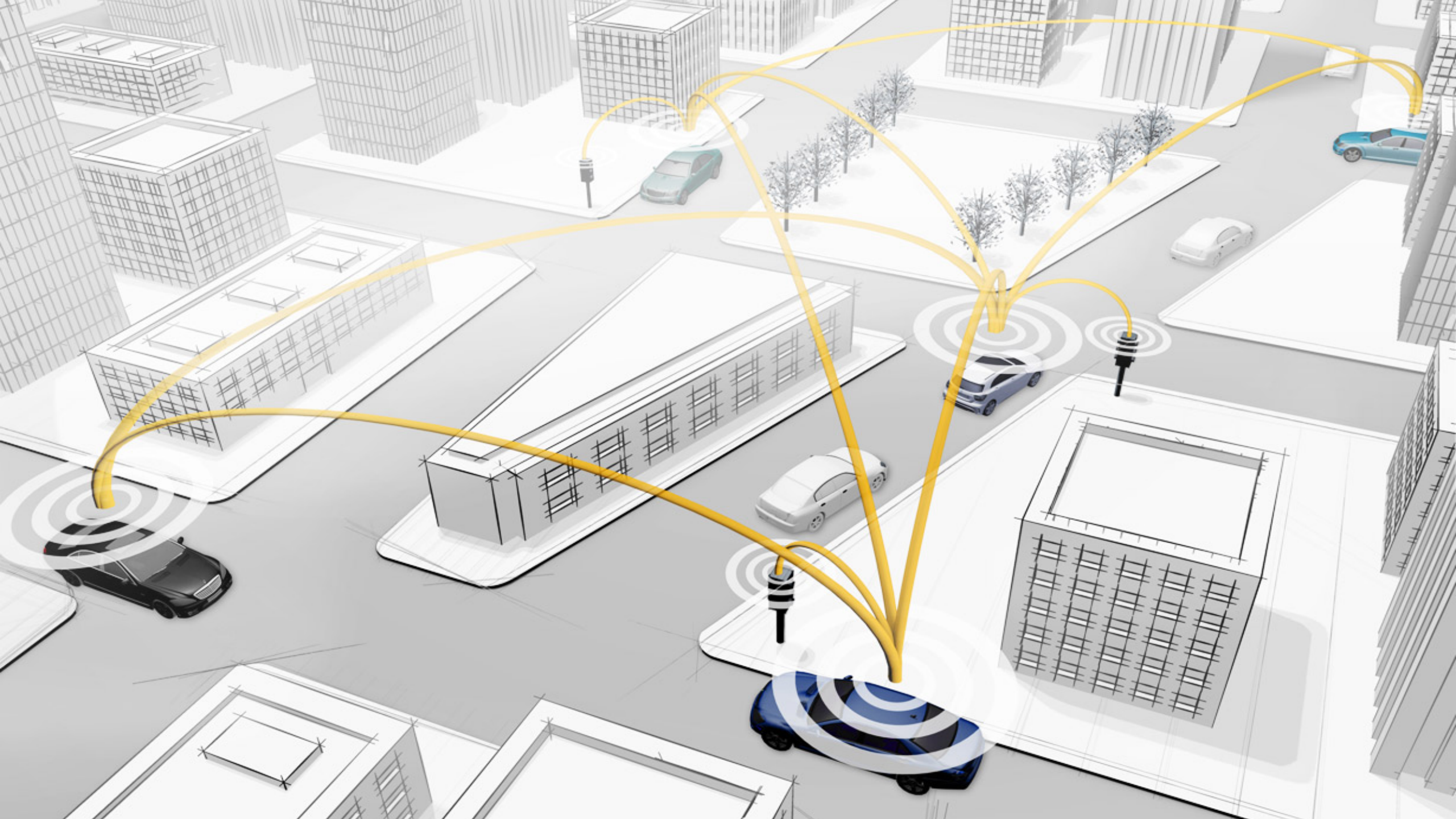
SWINBURNE UNIVERSITY OF TECHNOLOGY

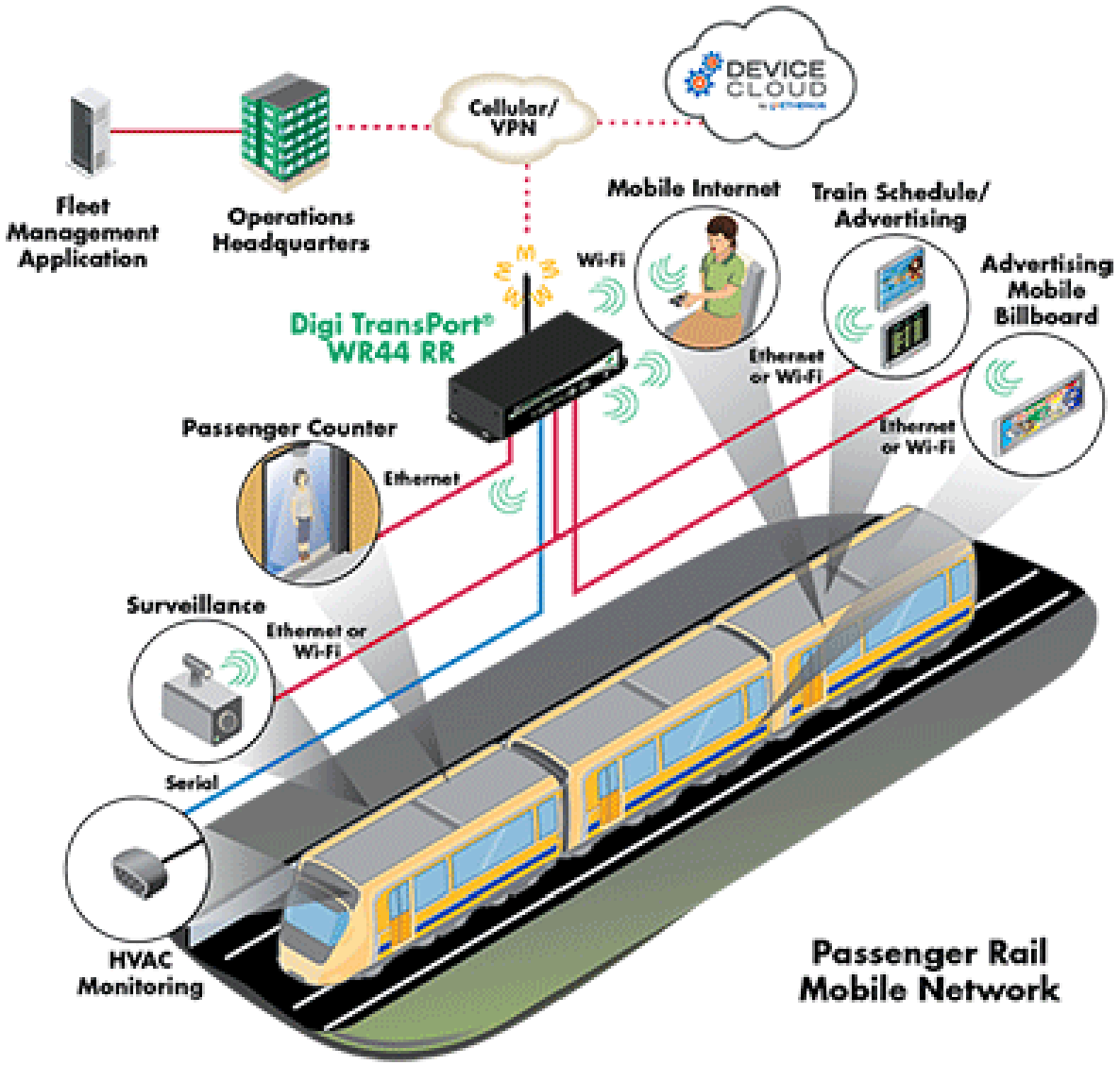
What is Big Data?


WIDTH OF BIKE LANE
No. of passengers sitting
ROAD INCLINATION
Size of footpath
Vehicle acceleration rate
GPS IDLE TIME
TEMPERATURE
Vehicle break usage
TRAFFIC FLOW
GPS location
TIME TO FIND CARPARK
No. of bike accidents
No. of buses
STANDARD HEAVY VEHICLE ROUTES
Average vehicle velocity
FREQUENCY OF RAIN
VEHICLE OIL TEMPERATURE
SIZE OF TRAM/TRAIN CARRIAGES (PASSENGER CAPACITY)
VEHICLE IDLE TIME
No. of passengers getting on/off each stop
% OF CARS TRAVELLING AT SPEED LIMIT
Road wetness
DRIVER AGE
NO. OF CARS THROUGH SCHOOL ZONE
FREQUENCY OF ACCIDENTS ON ROAD/INTERSECTION
Average overtaking distance between vehicle and bike
Average vehicle wait time at an intersection
HEAVY VEHICLE LENGTH
Vehicle size
NO. OF AVAILABLE CARPARK SPACES
Distance to carpark
VEHICLE WEIGHT
No. of road potholes per unit distance
NO. OF BREAKDOWNS PER YEAR PER VEHICLE
CARPARK EARLY BIRD USAGE
WIFI availability and usage on public transport
NO. OF PHONE CALLS
Average vehicle waiting time at pedestrian crossing
Social media event location/size/attendance/time
NO. OF LANE CHANGES PER VEHICLE
Average vehicle acceleration time to reach speed limit
No. of passengers standing
Vehicle age
Frequency of roadworks on road/intersection
Phone location
No. of passengers getting on/off at bus stop
Average heavy vehicle speed
Average distance before intersection vehicle breaks
AVERAGE VEHICLE MERGE TIME
Traffic volume
DIRECTION OF TRAFFIC
AVERAGE BIKE SPEED
Average time bus is stationary at bus stop
Nature of heavy vehicle goods
HEAVY VEHICLES AS % OF ALL TRAFFIC USAGE ON ROAD
AVERAGE VEHICLE SPEED THROUGH AN INTERSECTION
CARPARK EARLY BIRD COST
No. of stops on train/tram route
FREQUENCY OF EMERGENCY PHONE USE
No. of lanes
FREQUENCY OF HEAVY VEHICLES ON ROAD
No. of tram/train carriages per train/tram
AVERAGE TIME VEHICLE STOPPED BEHIND STATIONARY BUS
Average bus size
Road evenness
No. of bikes
Vehicle value
% OF TIME HAND BREAK IS ON
Average heavy vehicle acceleration
Average wait time to overtake car
No. of toll roads
% OF CARS TRAVELLING OVER SPEED LIMIT
NO. OF HEAVY VEHICLES ON ROAD
NO. OF CHILDREN BEING PICKED UP/DROPPED OFF
Carpark cost
Carpark size
NO. OF PASSENGERS IN VEHICLE
TOLL ROAD COST
% of cars travelling under speed limit
Average wait time to overtake heavy vehicle
Road size
AVERAGE VALUE OF VEHICLE INSURANCE
Frequency of motorbike lane filtering
Fuel mileage
SOCIAL MEDIA KEY WORDS: ACCIDENT/CONGESTION ETC.
Rain intensity
AVERAGE VEHICLE WAIT TIME TO OVERTAKE BIKES
Cloud coverage
No. of seats available on train/tram
FREQUENCY OF BIKE ACCIDENTS
NO. OF CARS STOPPING AT SCHOOL ZONE
GPS speed
Heavy vehicle lane usage on multilane roads
Instantaneous vehicle velocity
No. of stopped delivery vehicles
Intersection size
AVERAGE TIME OF PASSENGER PICK-UP/DROP-OFF
NO. OF PEDESTRIANS USING CROSSING
No. of passengers getting on/off at train/tram stop
No. of past tyre changes per road
% tread wear of vehicle tyres
ROAD SURFACE TYPE
No. of road cracks per unit distance
STREETLIGHT COVERAGE
SPEED OF CARS THROUGH SCHOOL ZONE
No. of parked car break-ins
Sun strength
Vehicle type
VEHICLE USAGE (% TIME)
Instantaneous vehicle emissions
No. of accidents on road/intersection
% of oxygen in vehicle emissions
No. of double parked cars
AVERAGE DISTANCE BETWEEN VEHICLES
STRENGTH OF SUNLIGHT ON CARPARK
Carpark height restrictions
Last service date of vehicle
NO. OF STOPS ON BUS ROUTES
FREQUENCY OF ROAD UPGRADES
Carpark usage
% USAGE OF INDICATORS
BUS WEIGHT


Phone activity
Building elevation
Intensity of lightning
Location of pets
Coverage of affected areas
Demographics in buildings
Density of people
Value of affected buildings
Humidity
Design life of structures
No. of emergency vehicles available
No. of displaced people
Building design capacity
No. of building occupants
No. of children in community
Water capacity of emergency vehicles
Location of fallen trees
No. of medical personnel
Drone temperature sensing
Level and density of rainfall
Volume of local traffic
No. of distress calls made
Wind velocity
History of flooding in area
No. of fallen trees
Location of people
Level of water in rain water tanks
Type of road surfaces
No. of vehicle ownership
UV index
Task allocation
Stress level on bridge crossing
Flow capacity of gutters
Twitter trends
Back-up power supplies
Access to mobile networks
Status of surrounding vegetation
Sources of electricity
Average response time
Access to radio
Real time visual inspection
Road blockages
Type of insurance coverage
Location of fallen power lines
Range of radio coverage
Location of live stock
No. of people trained in first aid
Capacity of shelters
Insurance premiums of buildings
Elevation of affected area
Soil moisture content
Temperature
Location of deployed units
Updates on social media
Porosity of road:



What are the implications for Rail Transport?


DEVICE CLOUD
Cellular/ VPN
Fleet Management Application
Operations Headquarters
Mobile Internet
Train Schedule/ Advertising
Advertising Mobile Billboard
Wi-Fi
Digi TransPort® WR44 RR
Ethernet or Wi-Fi
Ethernet or Wi-Fi
Passenger Counter
Ethernet
Surveillance
Ethernet or Wi-Fi
Serial
HVAC Monitoring
Passenger Rail Mobile Network


78%
78%

Big Data benefits for Rail Operation

Predictive Maintenance: Using sensors to avoid breakdowns by monitoring of the condition of components and triggering maintenance actions (can access as much as 6000 parameters per second including engine current, overhead voltage, engine speed, breaking force, traction force, and energy consumption).

Status Forecasting: Using sensors to improve estimates of remaining lifespan of carriages and rail infrastructure.

Cost Forecasting: using data to inform estimations of costs forecasts for maintenance or carriages and infrastructure.

What types of data could inform the feasibility of transit activation in a corridor?


PRAKASH
DEPARTMENTAL STORES


22


SUBWAY
Tryst Place

How to best prepare to capture value associated with Big Data

Big Data, Technology and Transport: The State of Play

A Sustainable Built Environment National Research Centre (SBEnrc)

Final Industry Report

Project 1.45 - April 2017

Sustainable Built Environment National Research Centre

Strategy related recommendations

- Be clear on what is to be achieved and store only what is needed.
- Ensure existing data is harnessed and review new data options to ensure strong utility.
- Consider the development of multi-jurisdictional legislation or standards around data to ensure compatibility.
- Consider the development of specific policies to ensure privacy concerns are appropriately handled.

Data related recommendations

- Decide on the format, language and syntax of data and ensure historic datasets are formatted accordingly.
- If sensors are added to the network ensure they are located at high priority locations and are able to communicate with data platforms.
- Create protocols for the verification of data from secure third party providers or unsecured public sources.
- Decide between cloud-based (cheaper/insecure) or local storage and analytics (more expensive/secure/faster).