GrowSmarter
Transforming cities for a smart, sustainable Europe

FACTSHEET

Smart traffic signals

PART OF SMART SOLUTION 10: SMART TRAFFIC MANAGEMENT

SUSTAINABLE URBAN MOBILITY

- Smart management of traffic signal lights can reduce congestion and make traffic flow more smoothly in cities
- Signal priority systems give certain vehicles a green light faster than others, reducing their travel time. This works as an incentive for cleaner vehicles
- Smoother traffic rhythm reduces stops and queuing, which in turn reduces energy consumption, emissions, noise and risk of accidents

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 646456. The sole responsibility for the content of this document lies with the author and in no way reflects the views of the European Union.

What is the solution?

In Barcelona and Stockholm different types of traffic signal light adaptations will be tested to improve traffic flow and decrease congestion.

In Barcelona an improved traffic signal management system will be used to avoid or alleviate congestion in dense urban areas.

In Stockholm a limited number of traffic lights will be equipped with specialised software so that cars with the right equipment can get information and adapt their speed to be able to reach the green lights.

Also in Stockholm, electric and renewable fuelled delivery trucks operating from a logistics centre will be given traffic signal priority at certain crossings. This is a pilot to see if such an initiative works as an incentive for better vehicles and smarter logistics.

How does it work?

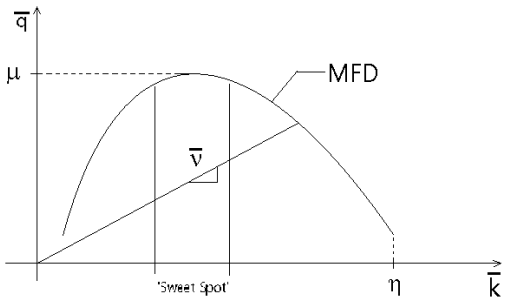
Barcelona

The aim of this measure is to provide the city council's traffic managers with an innovative tool to manage traffic in congested areas of the city.

Barcelona will use the information gathered by the tool to test the existence of the theory of the macro fundamental diagram (MFD) of traffic flow in the district of Sant Martí.

The macrofundamental diagram is a diagram which assesses the relationship between the space-mean flow, density and speed of an entire network, with many separate links. This means that all finished trips within the area of study are plotted and saved for analysis.

A macroscopic traffic model considers traffic, flux, traffic density and velocity in the different streets of the district. This forms the basis of the macrofundamental diagram. The MFD represents the capacity of the network in terms of vehicle density.



By providing the city traffic manager with this information, it will be possible to assess the performance of the traffic light network based on the density of vehicles in the streets. Managers will then be able to see how well each area is performing at different times, enabling them to take the best decisions in terms of traffic light timings.

The MFD model will be built using real data from existing traffic gauges installed in the city. Data from different days and time frames will be gathered and the O/D matrices will be calculated. Using the traffic modeling software Aimsun and traffic demand, it will be possible to estimate the macrofundamental diagram of the area of study.

Recommendations will then be given to the city council in order to help traffic managers improve the traffic light timing for smoother traffic flows.

Stockholm

In Stockholm, around ten traffic lights will be equipped with software which communicates the current status of the light and when it is about to switch to another colour.

This is achieved through a data connection between the traffic light, the car's on-board software and GPS, and a central computer handling the calculations. On the information system in the car, the driver will get information on what speed to adopt in order to reach a green light at the next junction.

This information tool will be tested in two cars over a period of a few months. Effects of travel time and the drivers' experiences will be evaluated. If the test meets expectations, the system could be rolled out to more traffic lights and introduced in additional cars. The demonstration will work with the current traffic signal system with little (if any) need for significant alterations.

Traffic lights at two junctions will also be equipped with signal priority systems to give environmentally sound trucks priority. The trucks, which will be operating for the construction consolidation centre that serves the renovation of refurbishments within the GrowSmarter Stockholm Site in Valla Torg and Slakthusområdet, will be equipped with a special sensor which can be recognised by the priority systems installed on the traffic lights.

Before the test can be implemented, a pre study needs to take place in order to make sure that giving priority to the trucks will not negatively affect the overall traffic flow in the area.

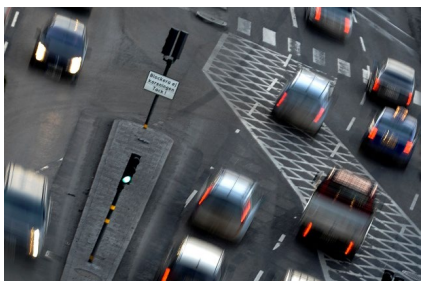
Business models to ensure future developments

In the case of Barcelona, the study of the applications of the MFD in real traffic conditions is a relatively novel solution, so business models will be investigated at a later stage if the pilot is considered to be successful.

The system and tool in Stockholm that gives the driver information about what speed to adopt in order to reach a green light at the next traffic light may be sold to the car industry and introduced in new cars. It could also be sold as a special device directly to car owners. The demonstration of this measure will represent a first step towards helping Stockholm prepare guidance for cars and autonomous cars.

If there were interest from more than one vehicle supplier, this could present an interesting opportunity to expand the demonstration to make Stockholm a test platform for intelligent traffic lights for the car industry.

Signal priority for trucks may be introduced and offered to electric and renewable fuelled trucks that operate in smart logistic solutions as an incentive to promote better vehicles and smarter operation. Benefits like this could make up for the extra cost of the vehicles and make companies more interested in these new drivelines and fuels.



Integration with other smart solutions

In Stockholm the signal priority for trucks is connected to the construction consolidation centre operated by Carrier. Environmentally sound trucks from Carrier will be given priority at traffic lights between the consolidation centre and the GrowSmarter building sites in Valla Torg and Slakthusområdet.

Expected impact

Barcelona

- Reduction in traffic density in the area of study (vehicles per kilometre)
- Reduction in emissions
- Average time saving for trucks and car journeys
- Increase of the average cruising speed for both inner and passing routes

Stockholm

- Improved traffic flows, reduced queuing and less stops.
- This is expected to lead to less energy consumption, less air pollution, and a reduction in noise and accidents