



**POLITÉCNICA**

"Ingeniamos el futuro"



GRUPO DE INVESTIGACIÓN EN  
**INSTRUMENTACIÓN Y  
ACÚSTICA APLICADA**

# Disgregación del RUIDo Ambiental producido por vehículos individuales

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ST-27 "Ruido urbano,  
Big Data y Smart City"



# Antecedentes



## ENVIRONMENT

### LIFE Programme

European Commission > Environment > LIFE Programme

HOME | ABOUT LIFE | NEWS | FUNDING | PUBLICATIONS | TOOLKIT | CONTACT | SITE MAP



#### LIFE by theme

→ Nature, Biodiversity

→ Environment

LIFE search



Home | LIFE by Theme: Air and Noise

## Air and Noise

LIFE co-finances innovative projects located across the European Union that explore ways to facilitate the implementation and enforcement of EU policy and legislation on air quality management and the prevention and reduction of air and noise pollution. This thematic section provides a selection of these projects and their results.

# LOW (NOISE) EMISSIONS ZONES



THE NETWORK  
OF MAJOR  
EUROPEAN  
CITIES





# Antecedentes

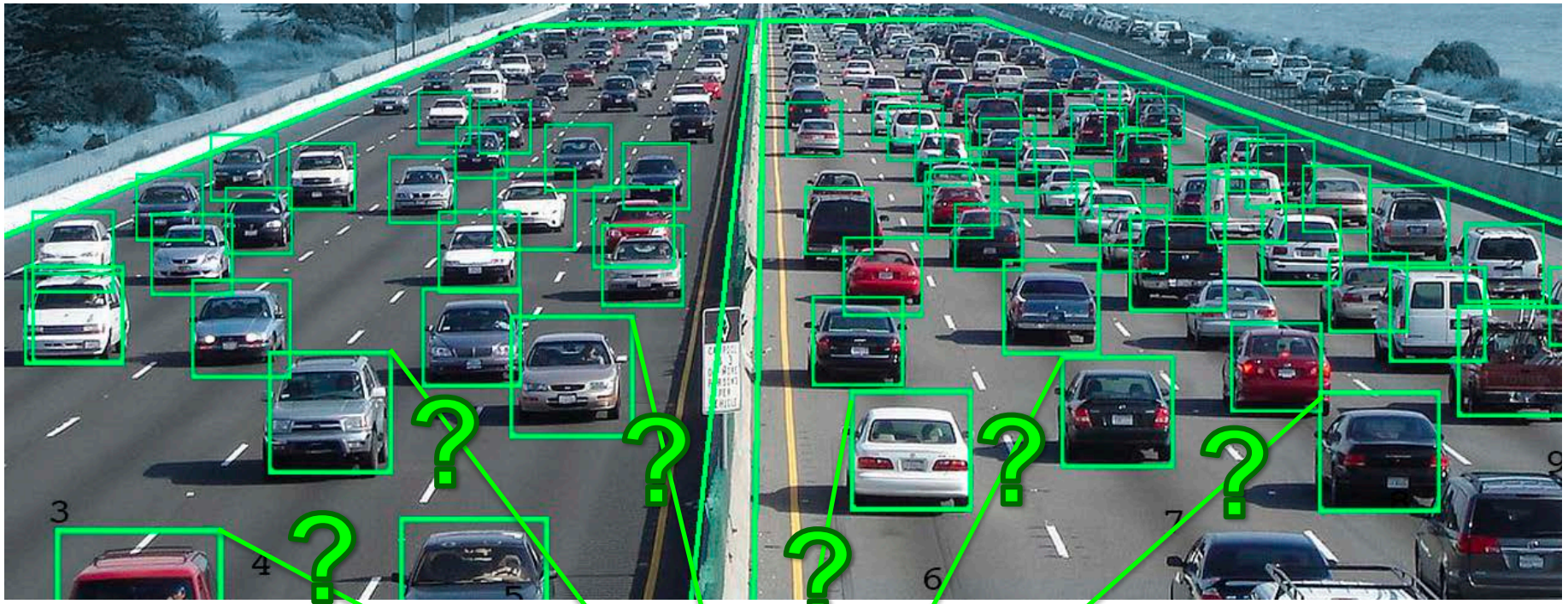


$$\Sigma \text{ kWh} = \text{ kWh}$$

$$\Sigma \text{ kWh} = \text{ kWh}$$



# Antecedentes



$\Sigma$

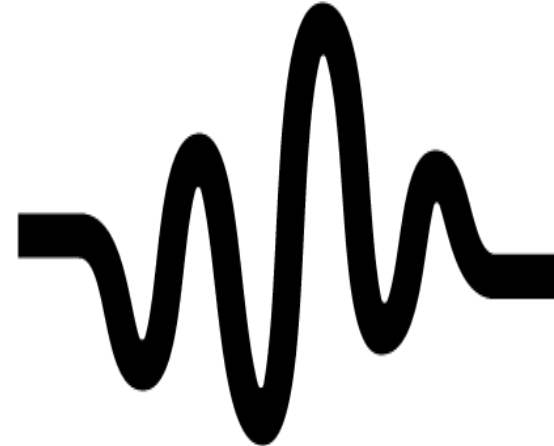




# Antecedentes



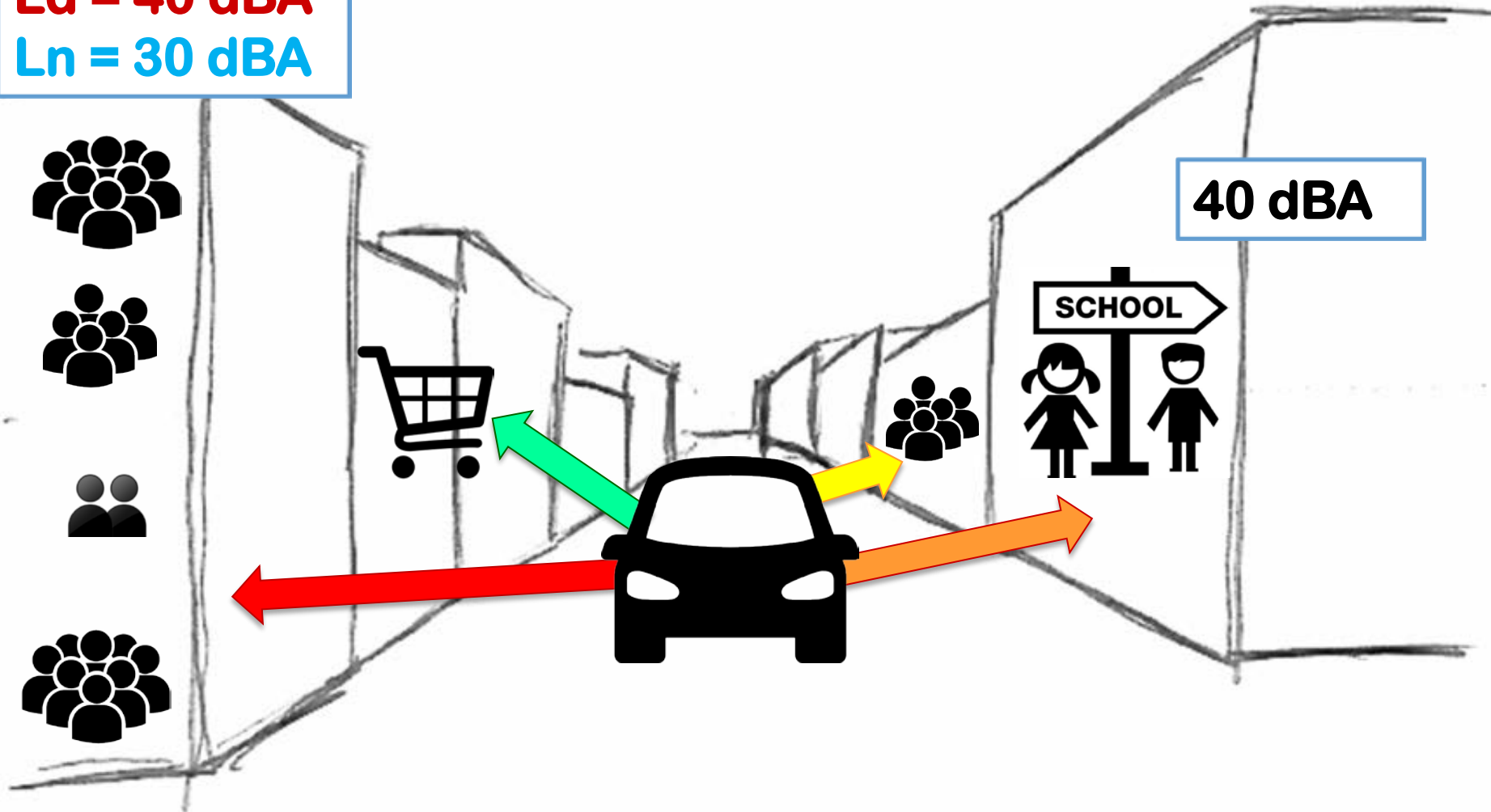
CERTIFIED  
GUARANTEE





# Antecedentes

**Ld = 40 dBA**  
**Ln = 30 dBA**



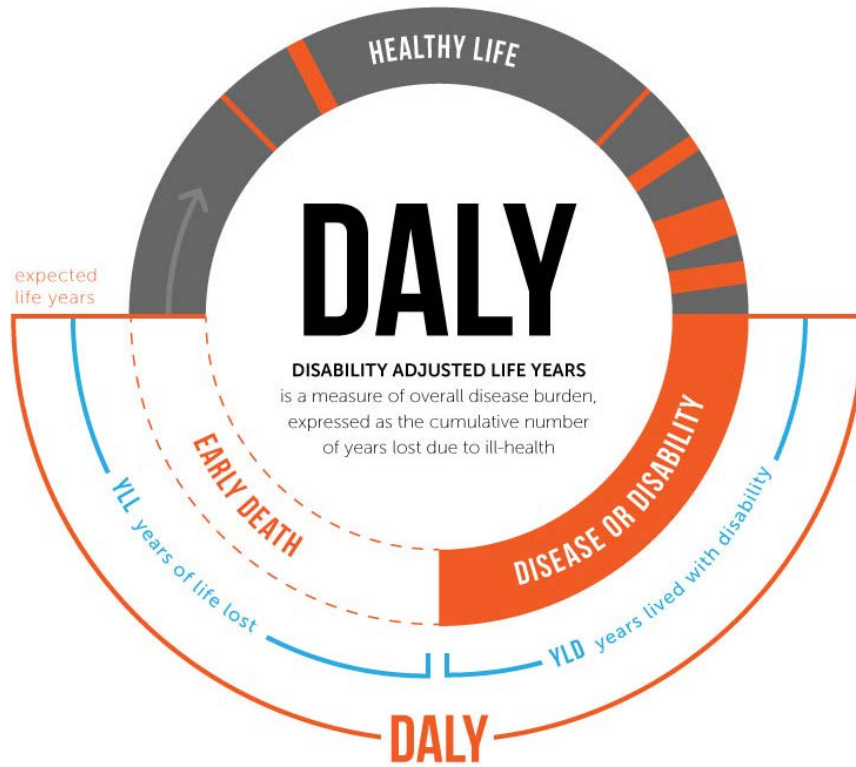


## Burden of disease in Europe

Effect	DALY
Cardiovascular Disease	61 000
Sleep Disturbance	903 000
Annoyance	654 000
Tinnitus	22 000
Children's Cognitive Impairment	45 000



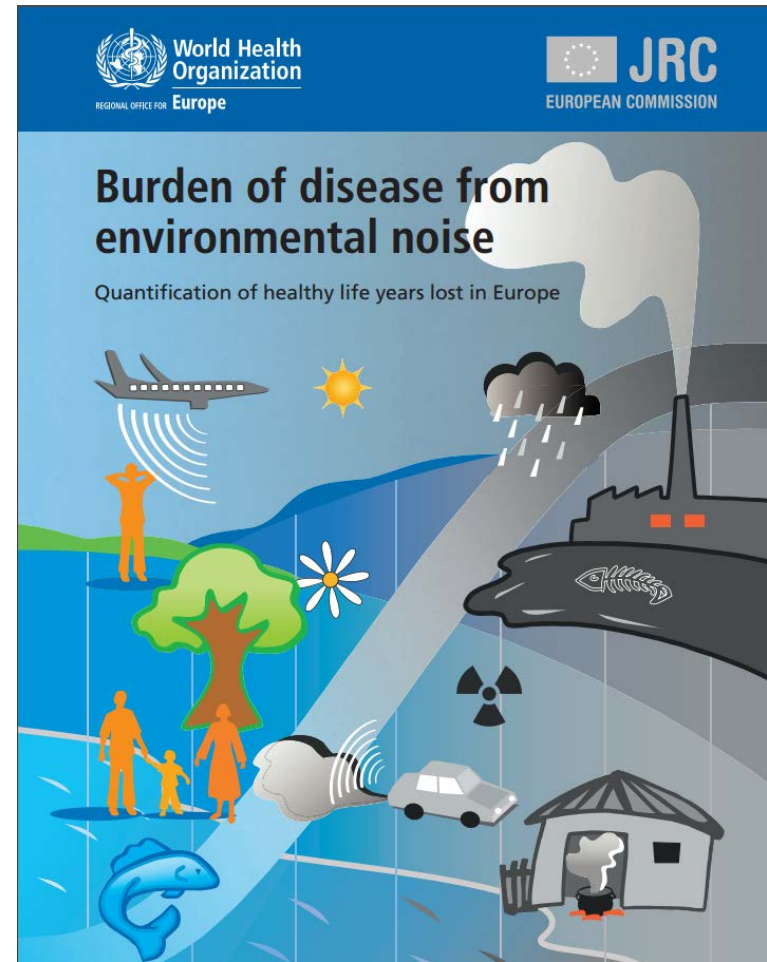
# Antecedentes



## DALY

Disability Adjusted Life Years measure the overall burden of disease, expressed as the cumulative number of years lost due to ill-health, disability or early death.

$$\text{DALY} = \text{YLD (Years Lived with Disability)} + \text{YLL (Years Life Lost)}$$



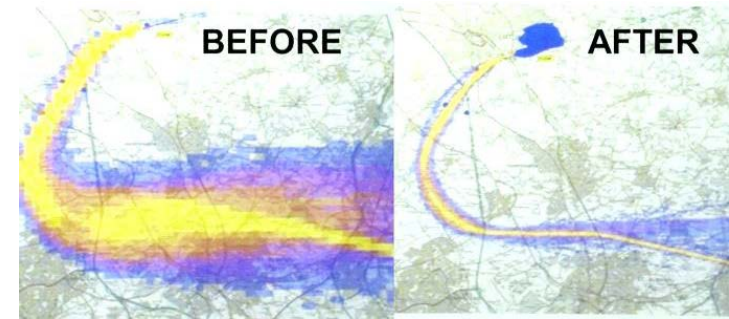
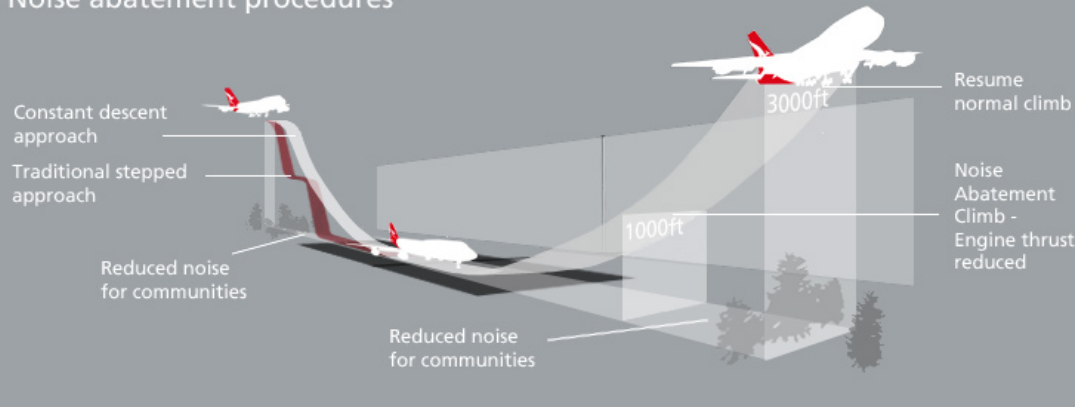
$$\text{DALYs} = \text{Years of life lost due to premature mortality (YLL)} + \text{Years lived with disability (YLD)}$$





# ANTECEDENTES. Cuota Ruido Aeronaves

## Noise abatement procedures



## Clasificación de aeronaves por cuota de ruido

EPNdB	Cuota de ruido (CR)
Más de 101,9	CR - 16
99 – 101,9	CR - 8
96 – 98,9	CR - 4
93 – 95,9	CR - 2
90 – 92,9	CR - 1
Menos de 90	CR - 0,5

Fuente: AIP Aeropuerto de Madrid-Barajas



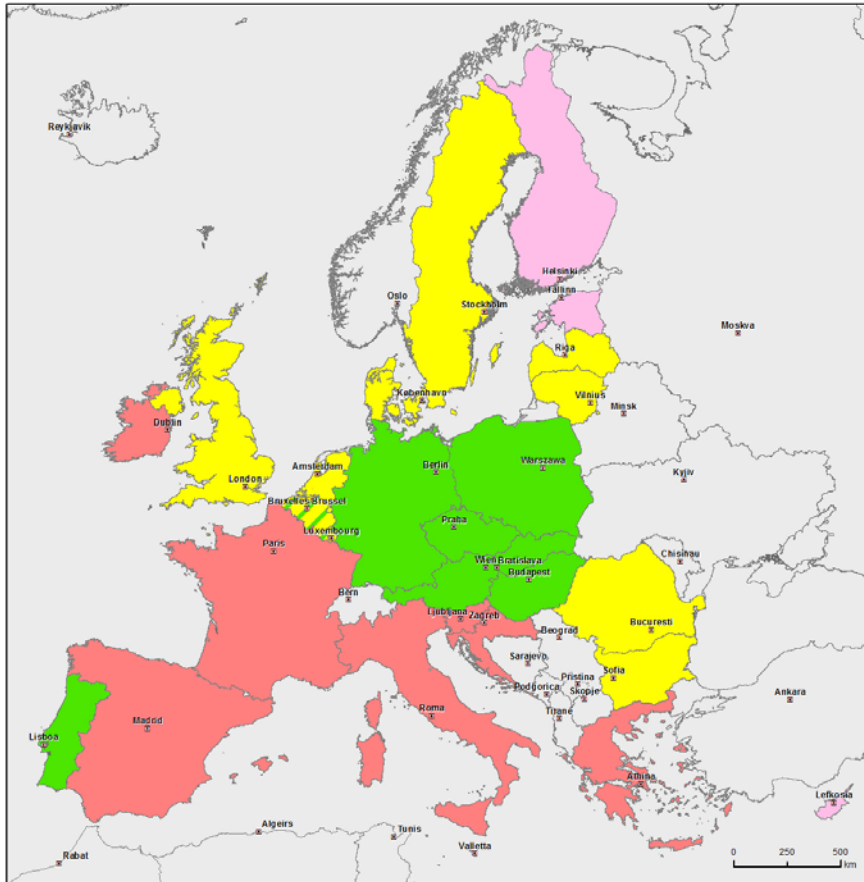


# ANTECEDENTES. Directiva Euroviñeta



## CHARGING OF HEAVY GOODS VEHICLES IN THE EU

Directive 1999/62/EC as amended by Directive 2006/38/EC and Directive 2011/76/EU



### Legend

- Vignette (time-based charge)
- Electronic network-wide toll (distance-based charge)
- Toll with physical barriers (distance-based charge)
- Neither vignettes nor tolls
- Electronic network-wide toll (distance-based charge) under preparation

© EuroGeographics 2007 for the administrative boundaries  
Geography: DG SD-IE ENL 4 Date: 21 April 2010  
http://ec.europa.eu/eurogeographics/index\_en.htm

## Evolution of the “Eurovignette” Directive

Infrastructure financing



Traffic management

### Current Directive:

- Tolls can recover infrastructure costs ('user pays principle') but not pollution costs

### Proposed New Directive:

- Implementation of the 'polluter pays principle' through additional air and noise pollution charges
- Reduce congestion through more differentiated tolls


### What is (and will remain) outside the scope?






- Passenger cars, urban areas (and still no mandatory tolling)





# ANTECEDENTES. Ferrocarriles

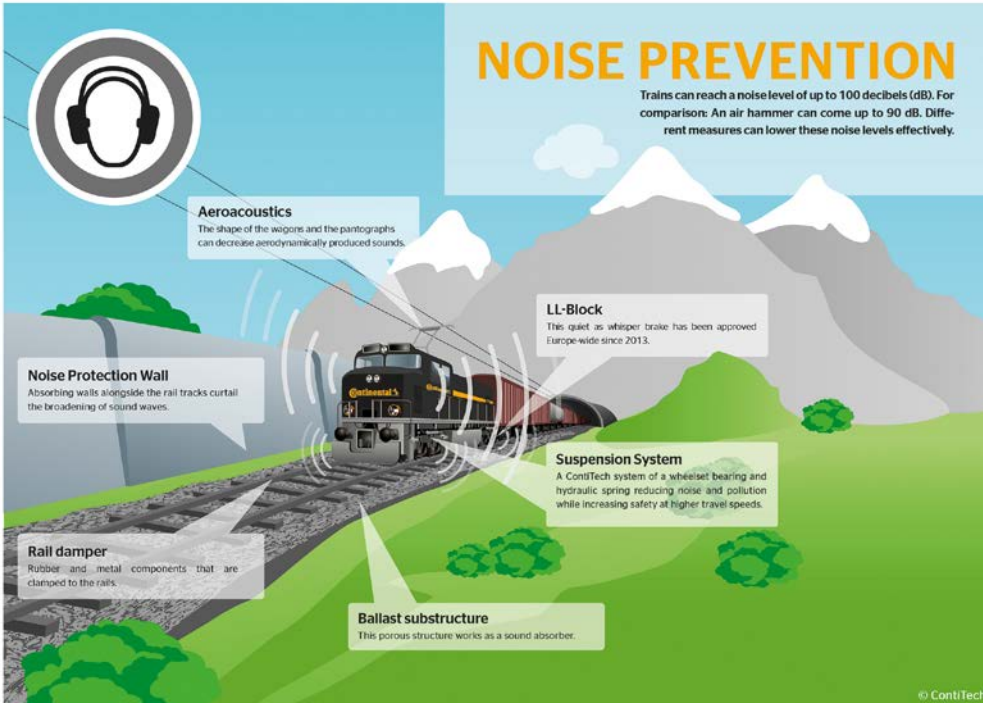
  
 EUROPEAN PARLIAMENT  
 DIRECTORATE-GENERAL FOR INTERNAL POLICIES  
 POLICY DEPARTMENT  
 STRUCTURAL AND COHESION POLICIES **B**

- Agriculture and Rural Development 
- Culture and Education 
- Fisheries 
- Regional Development 
- Transport and Tourism** 

**REDUCING  
RAILWAY NOISE  
POLLUTION**

**NOISE PREVENTION**

Trains can reach a noise level of up to 100 decibels (dB). For comparison: An air hammer can come up to 90 dB. Different measures can lower these noise levels effectively.



**Aeroacoustics**  
The shape of the wagons and the pantographs can decrease aerodynamically produced sounds.

**Noise Protection Wall**  
Absorbing walls alongside the rail tracks curtail the broadening of sound waves.

**Rail damper**  
Rubber and metal components that are clamped to the rails.

**Ballast substructure**  
This porous structure works as a sound absorber.

**LL-Block**  
This quiet as whisper train has been approved Europe-wide since 2013.

**Suspension System**  
A ContiTech system of a wheelset bearing and hydraulic spring reducing noise and pollution while increasing safety at higher travel speeds.

© ContiTech

L 70/36

EN

Official Journal of the European Union

14.3.2015

## COMMISSION IMPLEMENTING REGULATION (EU) 2015/429

of 13 March 2015

setting out the modalities to be followed for the application of the charging for the cost of noise effects

(Text with EEA relevance)



# Aportación INDIVIDUAL de cada vehículo

## Enfoque agregado



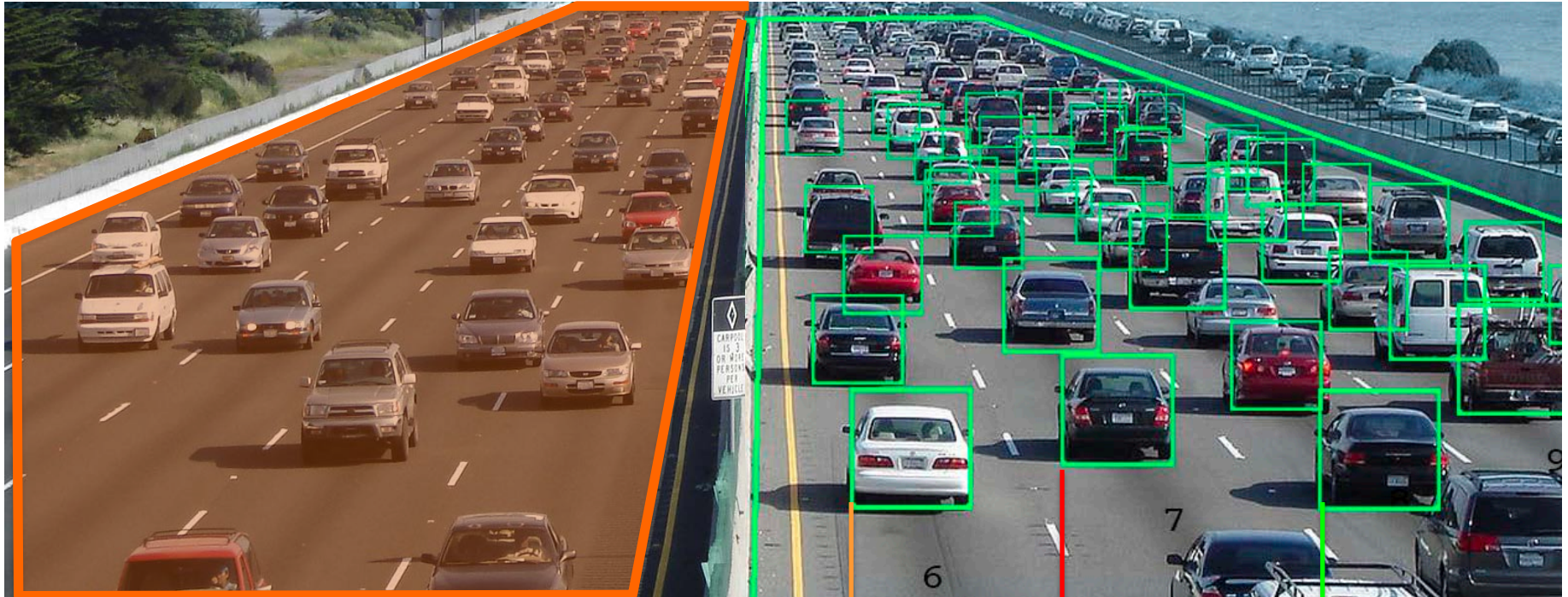
$\Sigma$  DALY



# Aportación INDIVIDUAL de cada vehículo

Enfoque agregado

Enfoque **des**agregado



$\Sigma$  DALY

$n_2$  DALY

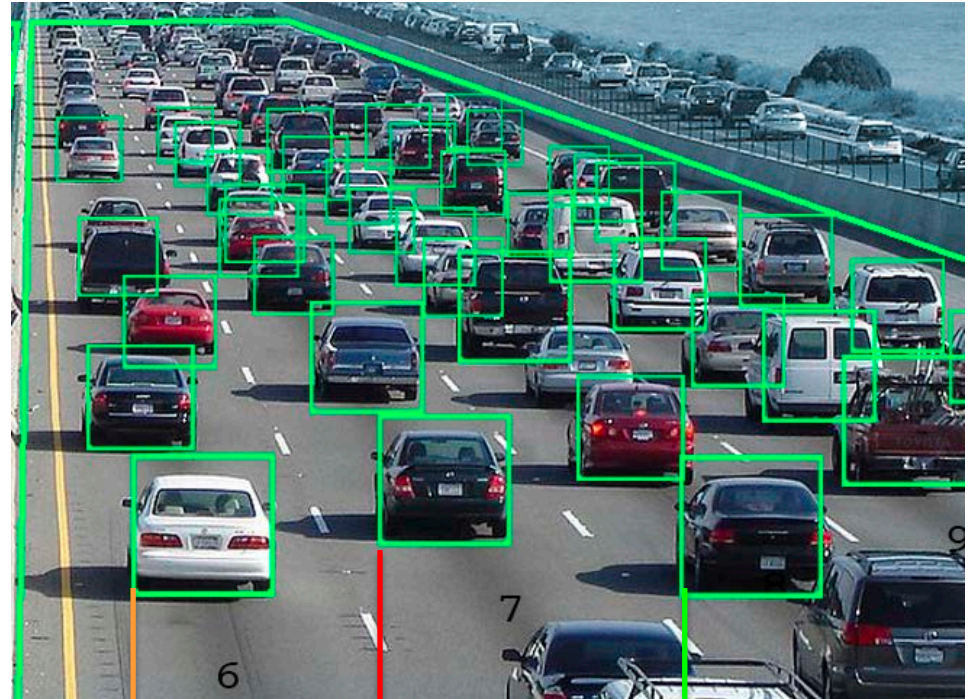
$n_n$  DALY

$n_1$  DALY



# Aportación INDIVIDUAL de cada vehículo

## Enfoque **des**agregado



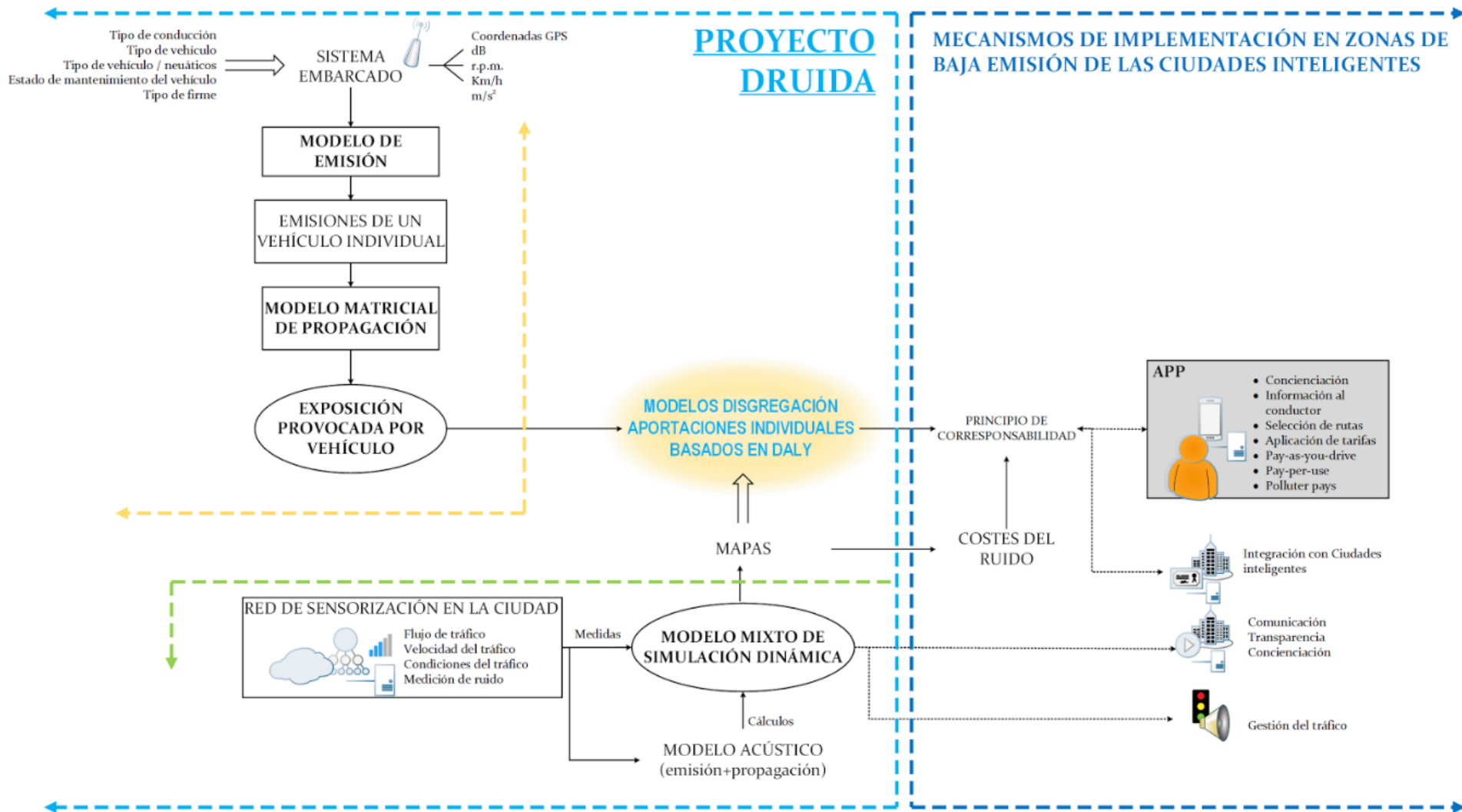
$n_1$  DALY

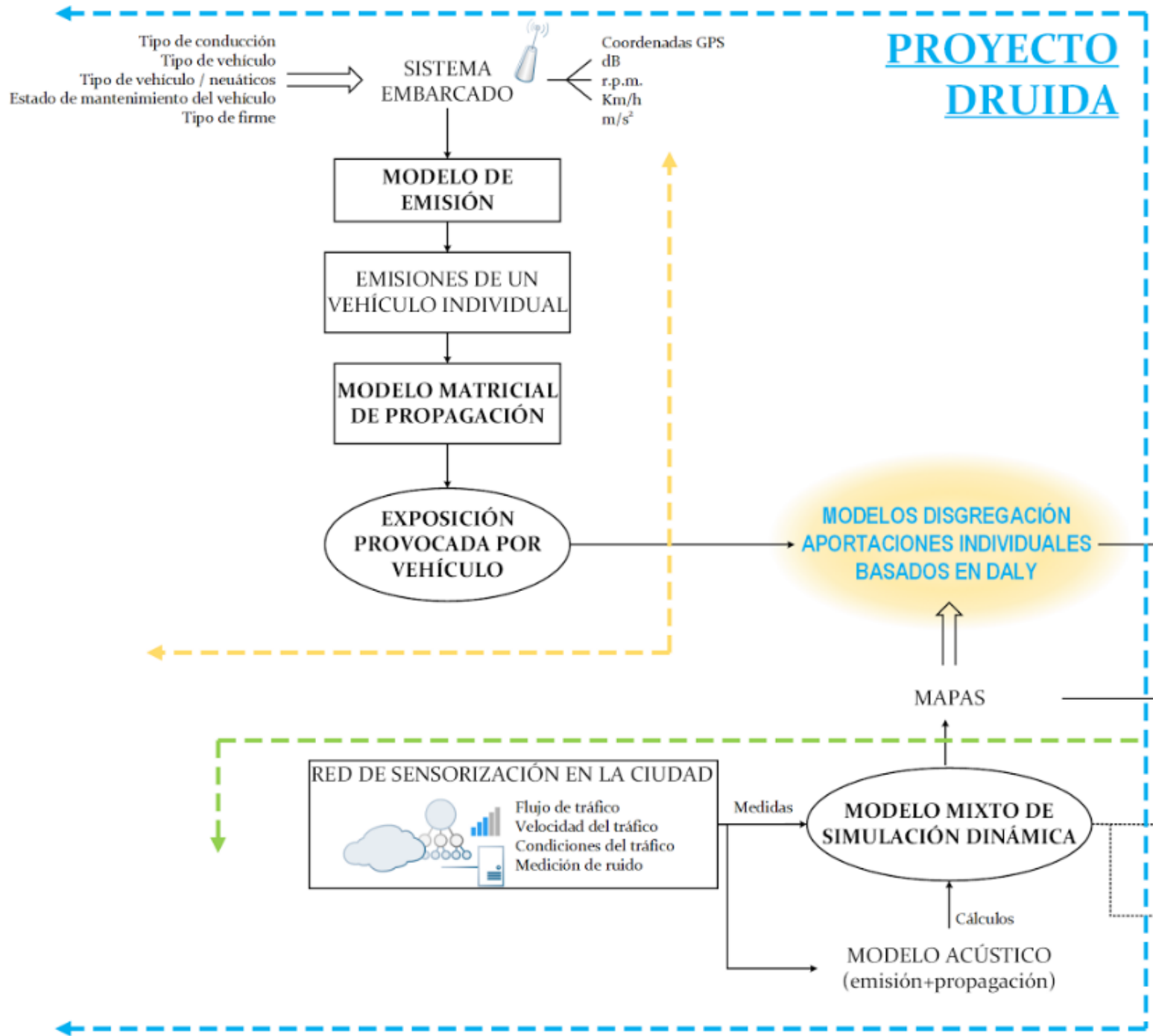
$n_2$  DALY

$n_n$  DALY



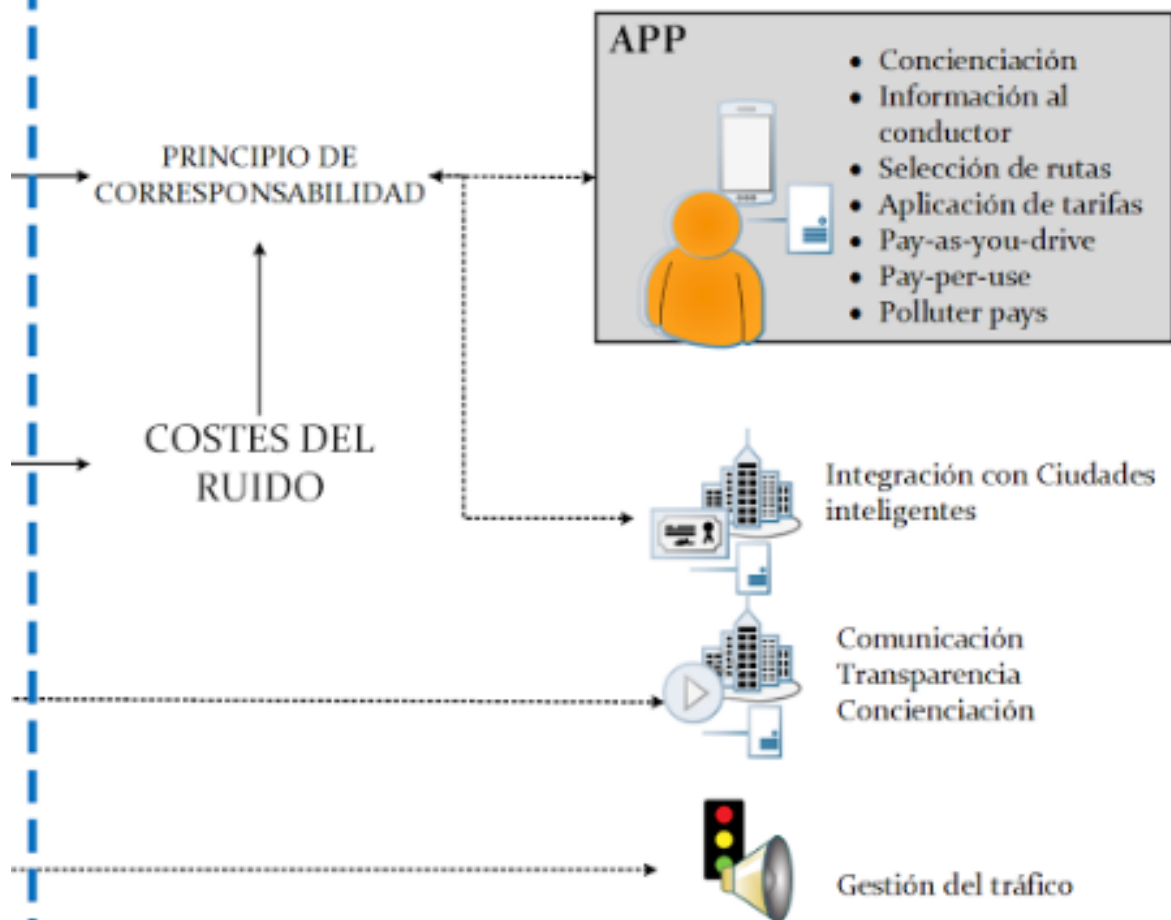
# Aportación INDIVIDUAL de cada vehículo





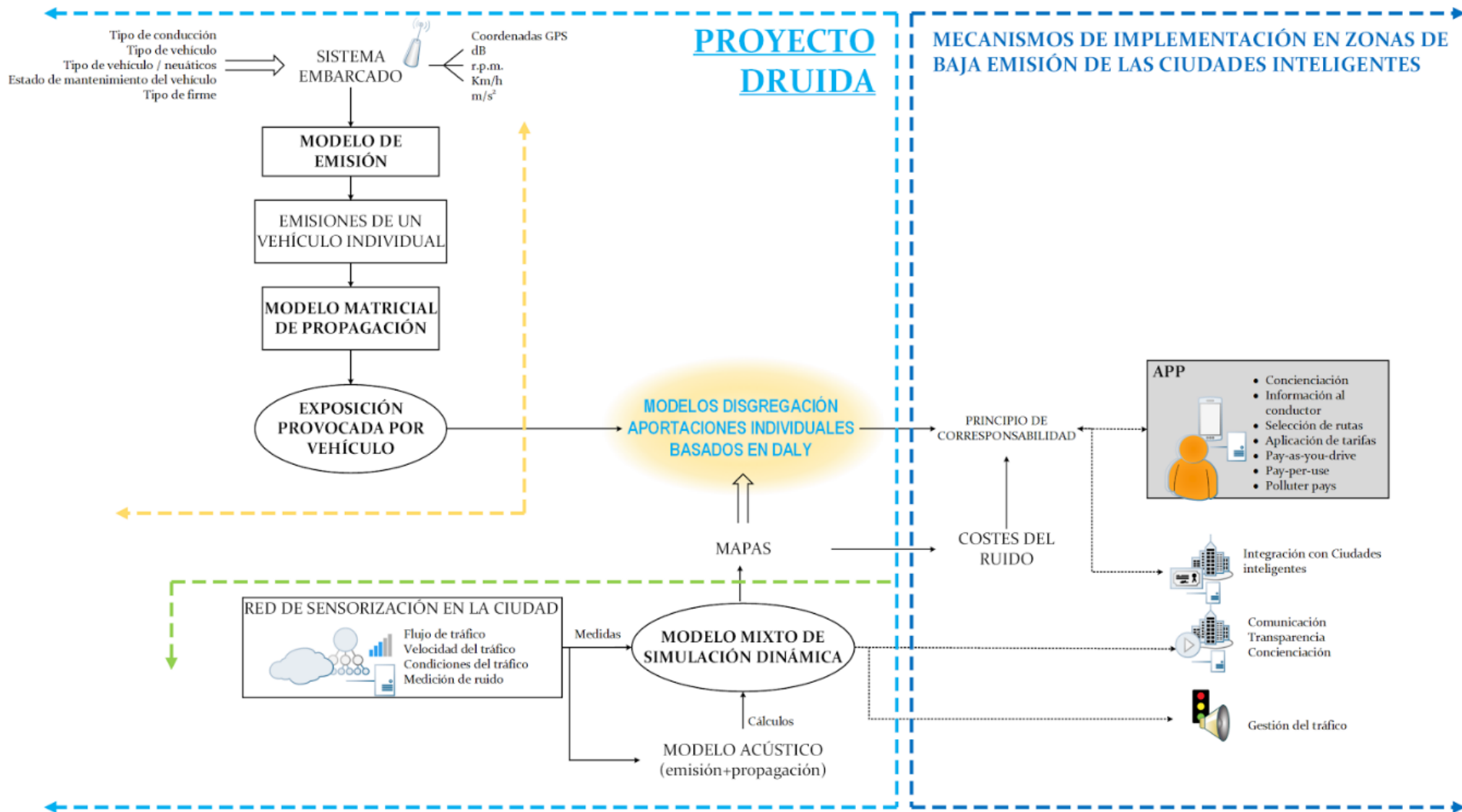


## MECANISMOS DE IMPLEMENTACIÓN EN ZONAS DE BAJA EMISIÓN DE LAS CIUDADES INTELIGENTES





# Aportación INDIVIDUAL de cada vehículo

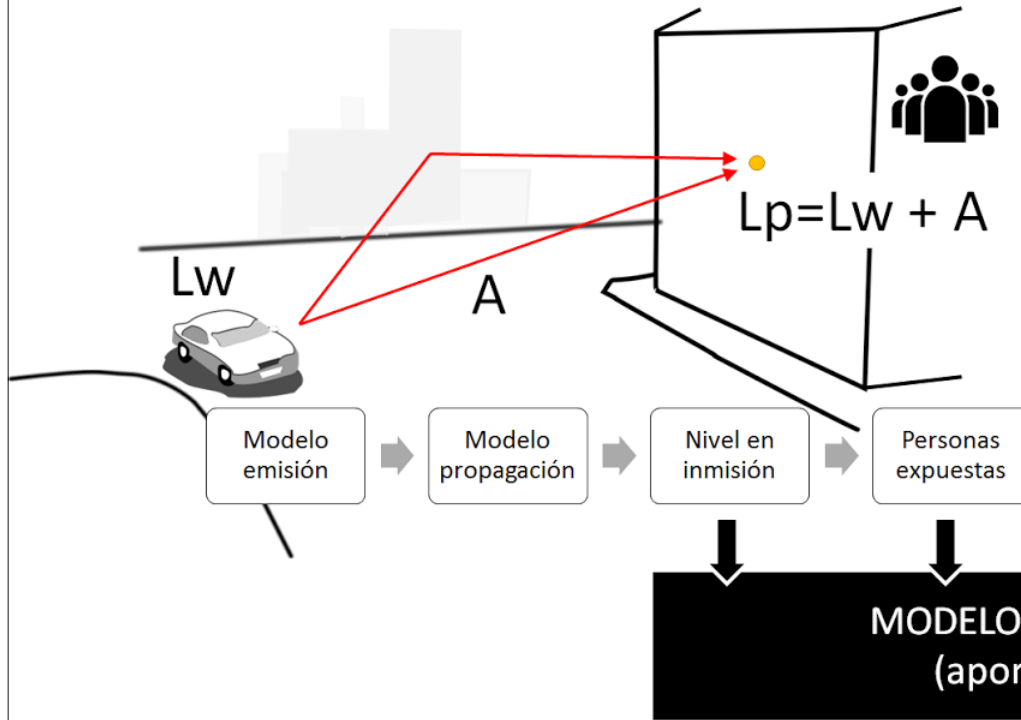




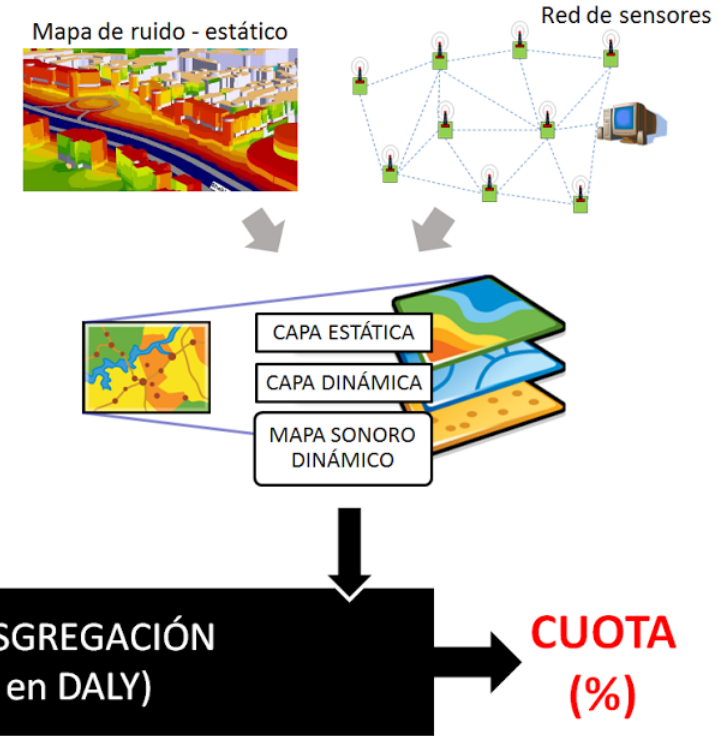
# Aportación INDIVIDUAL de cada vehículo

## PROYECTO DRUIDA

### RUIDO VEHÍCULO INDIVIDUALMENTE

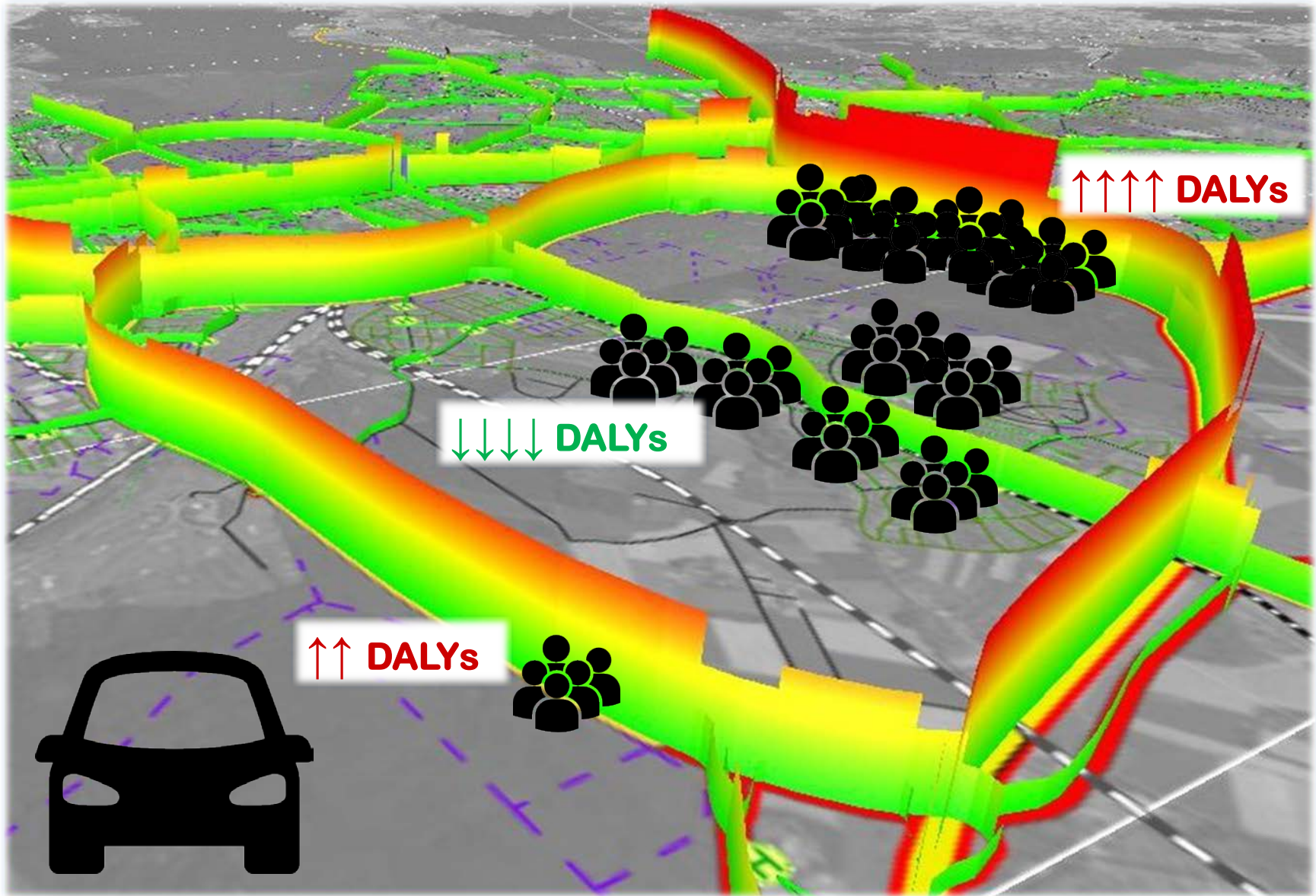


### RUIDO DE TRÁFICO



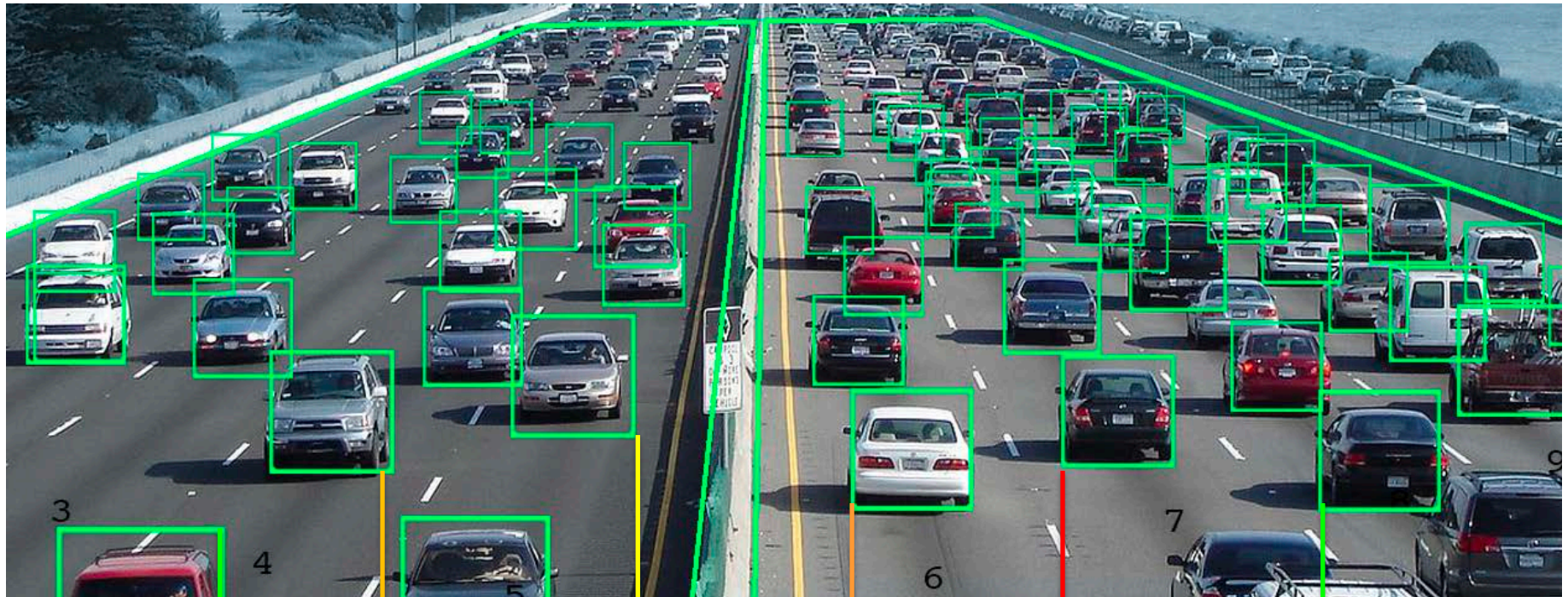


# Aportación INDIVIDUAL de cada vehículo





# Aportación INDIVIDUAL de cada vehículo



$n_1$  DALY

$n_3$  DALY

$n_5$  DALY...

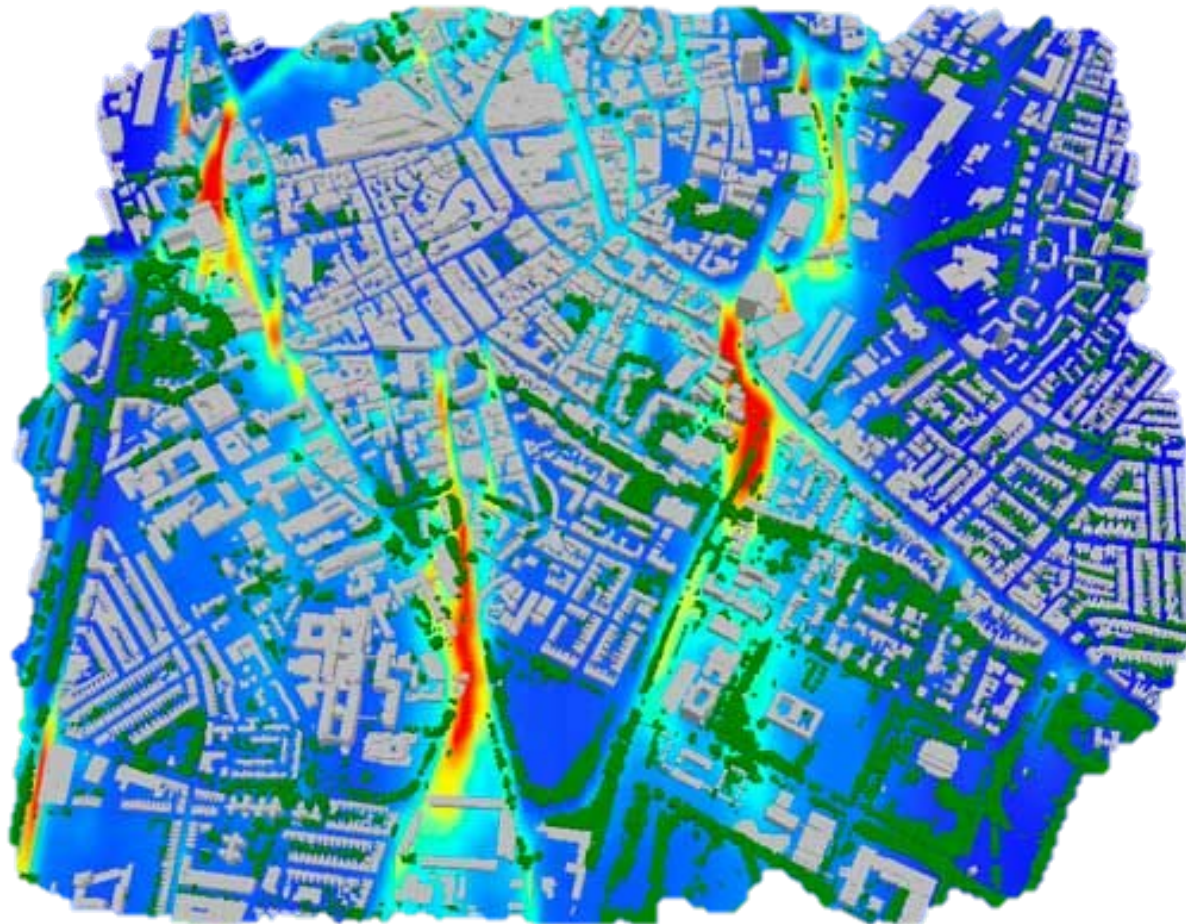
$n_n$  DALY

$n_2$  DALY

$n_4$  DALY

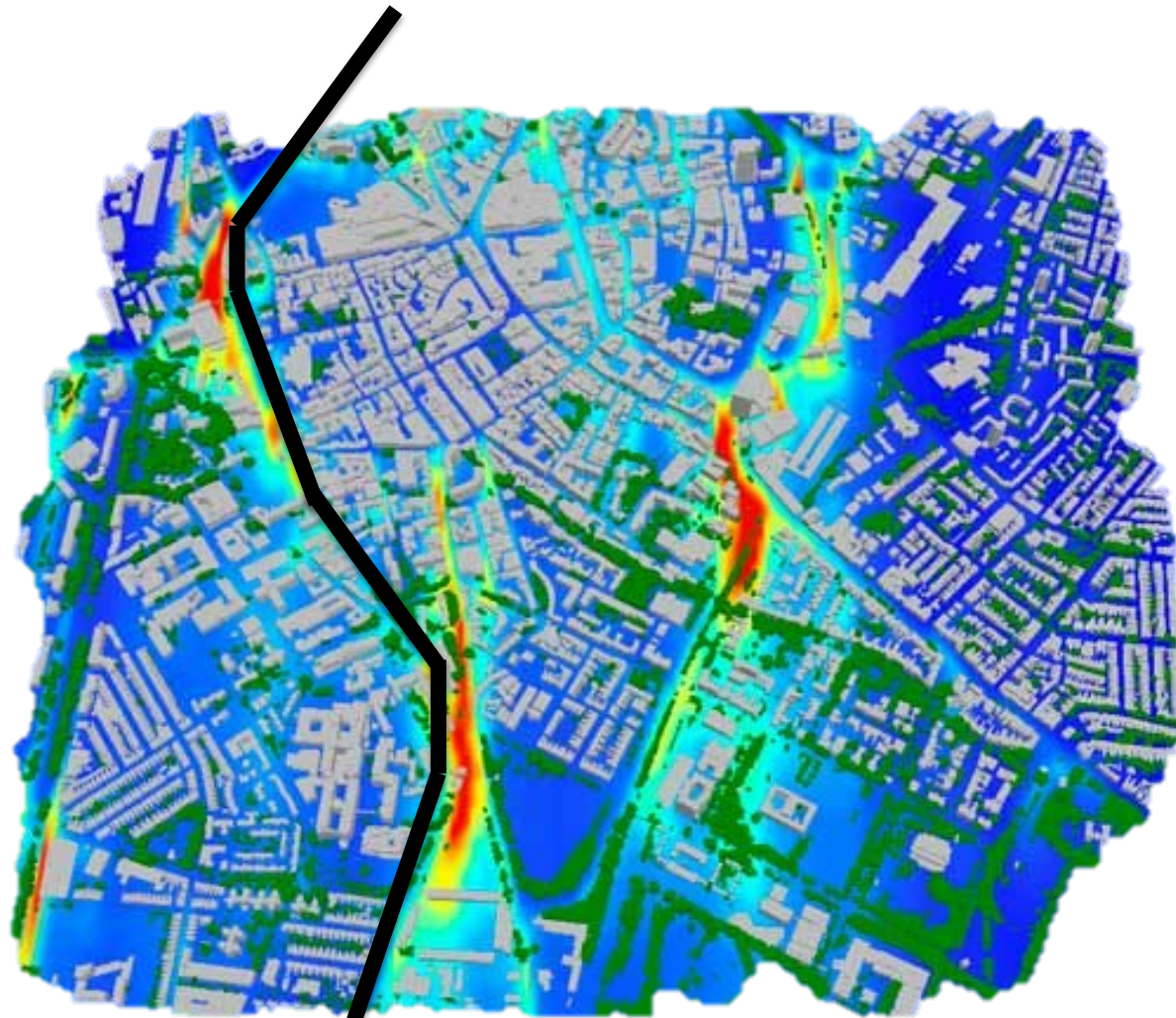


# Ejemplo de utilidad futura





# Ejemplo de utilidad futura



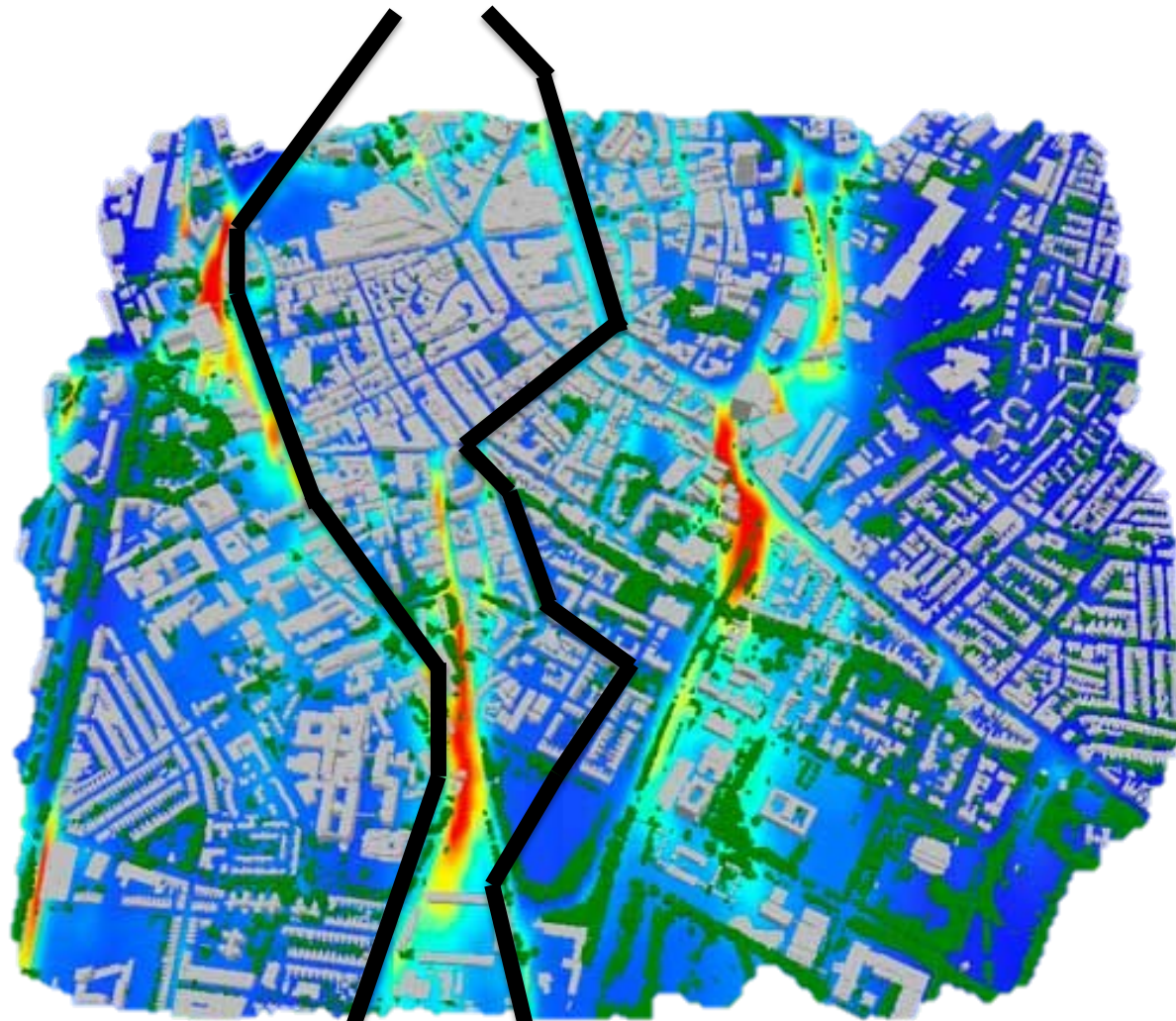
**Ruta A**

↑↑↑↑ **DALYs**

↑↑↑↑ **€**



# Ejemplo de utilidad futura



**Ruta A**

↑↑↑↑ **DALYs**  
↑↑↑↑ **€**

**Ruta B**

↓↓ **DALYs**  
↓↓ **€**





# Ejemplo de utilidad futura

09:50 pm



FM1  
91.9

**AUTO**

23° 28°

Icons: Fan, Heater, AC, Recirculation, Driver seat, Passenger seat

Icon: AUTO mode with fan and bar graph

Icon: Driver seat with up/down arrows

**AIR QUALITY**

250 kms  
+ 30 kms

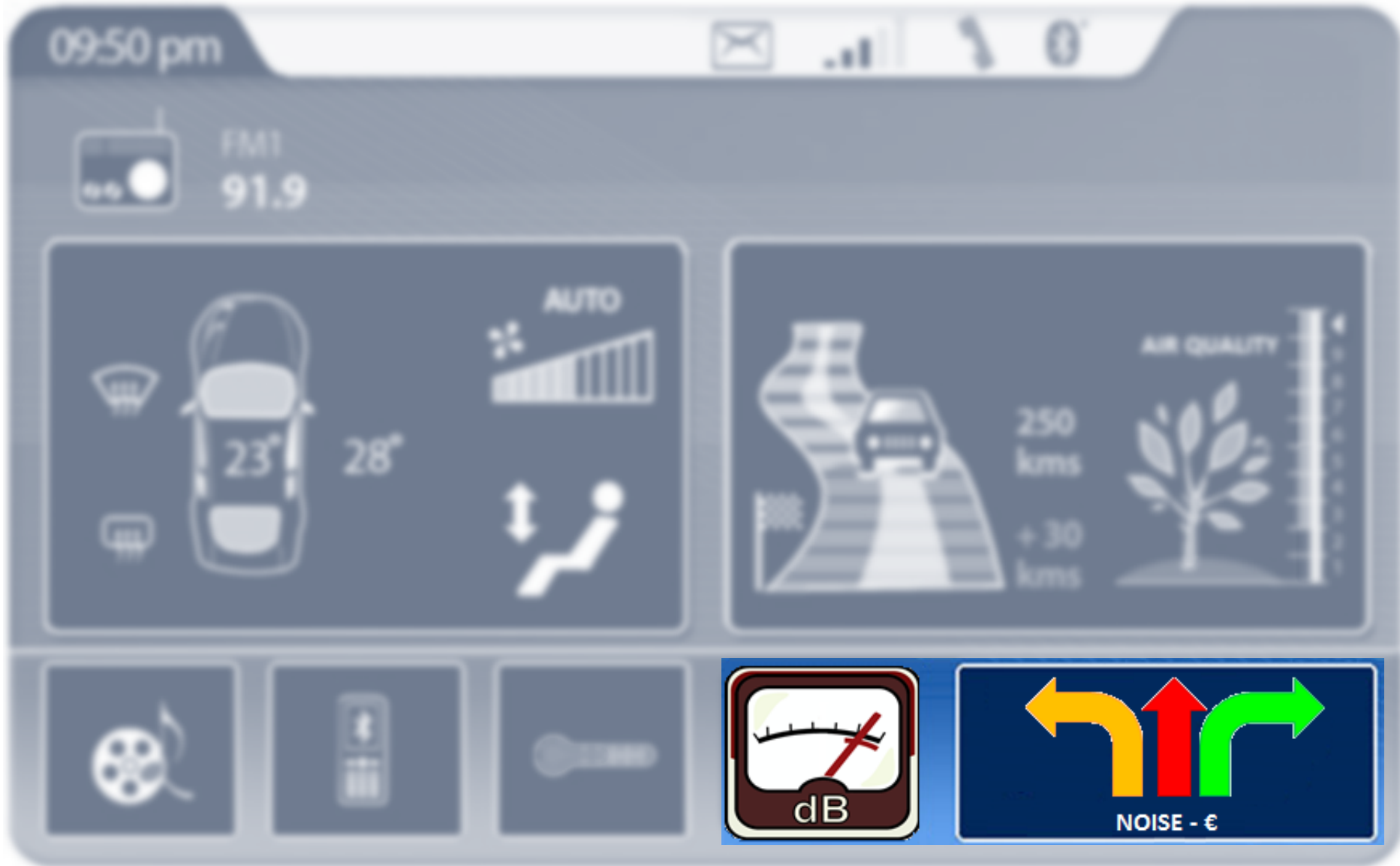
Icon: Car on a road with a checkered flag

Icon: Green plant





# Ejemplo de utilidad futura





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