

# **Vision of Climate-Friendly and Unpolluted Cities Until 2050 and Roadmap for Realising the Vision**

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## **The vision for 2050:**

**A climate neutral and unpolluted city, where these aims are achieved with minimum costs and disadvantages and thus welfare is maximised.**

**➡ climate neutral: reduction of 95-100% of 1990 greenhouse gas emissions, no carbon leakage**

**➡ Unpolluted: fulfilment of WHO air quality guideline values, e.g. PM<sub>2.5</sub>: 10 µg/m<sup>3</sup> annual mean; PM<sub>10</sub>: 20 µg/m<sup>3</sup> annual mean; NO<sub>2</sub>: 40 µg/m<sup>3</sup> annual mean.**

Ensures, that the course of decisions and activities from now to 2050 leads to the fulfilment of the environmental and climate protection aims.

Thus all environmental policies should act as building blocks of a roadmap to fulfilling the vision.

**However: characteristics of techniques, trends, preference in 2050 are uncertain**

Thus: description of alternatives/options in different scenarios;  
periodical review of the vision

Modes: pedestrians, bicycles, motor vehicles (cars, minibuses, vans and trucks) , rail bound public transport.

Motor vehicles and trains are **autonomously driving (level 5)** and **interconnected**, cars and minibuses are used in **car sharing or ride sharing** mode.

**Autonomously driving:** less accidents, for everybody (no driving licence), parking at central places/charging station, no street parking

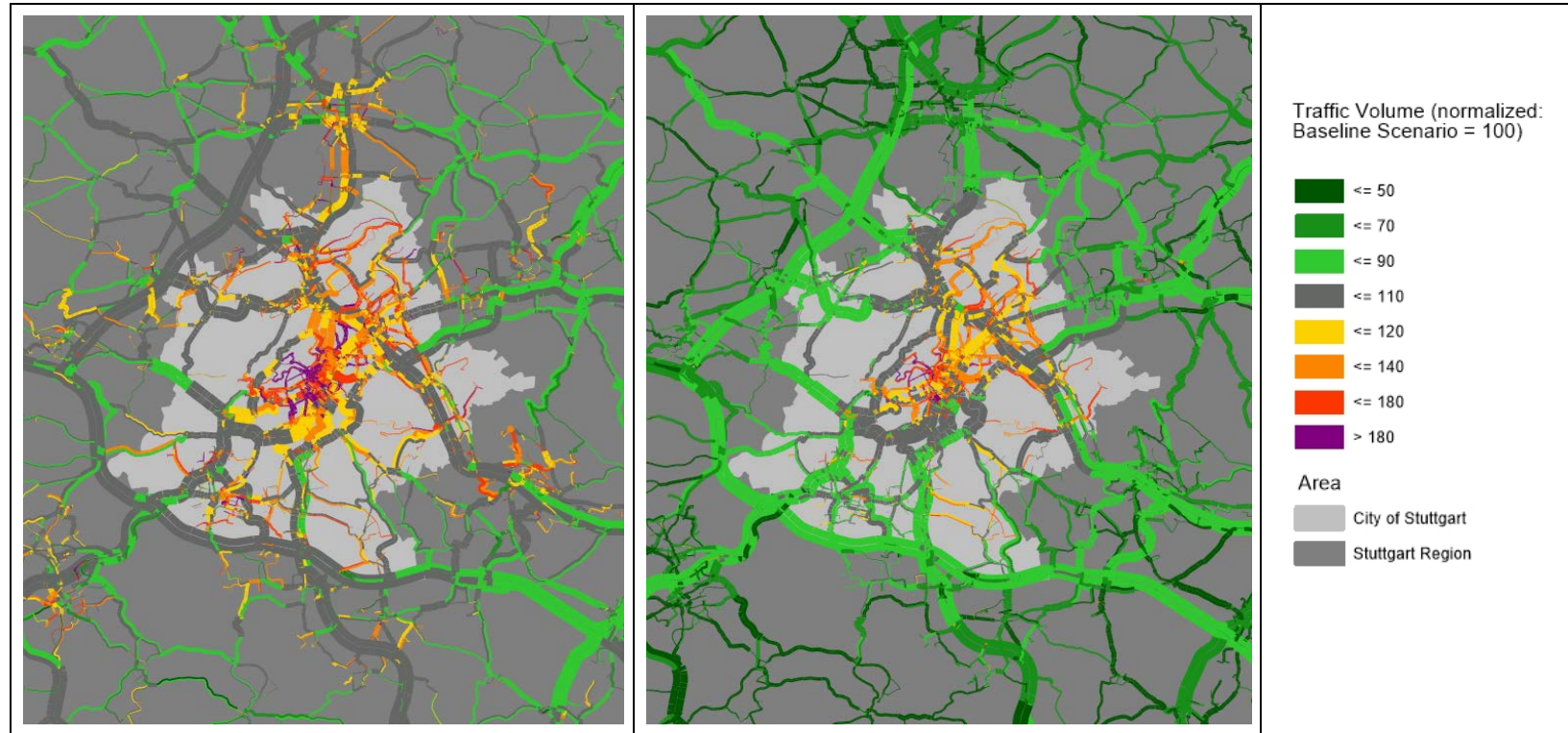
**Interconnected:** optimisation of traffic flow,

**Car and ride sharing:** less vehicles, price steers traffic demand



Foto: Bosch

**Result: Car-sharing reduces number of vehicles by 50%, ride sharing by 80%. However: during rush hours car-sharing leads to traffic jams -> ride sharing with mini-buses plus use of rail bound transport (S-Bahn, Tram) necessary to minimize travel time.**



**Solution: mix of public (ride sharing and rail bound) and individual transport (car sharing) with maximization of travel time and comfort, managed by adjusting prices.**

**Process: enter desired trip into smartphone (spontaneous or in advance) -> choose among options -> get into car or minibus arriving in front of the door.**

**Mix of several techniques:**

**Electric heatpumps with photovoltaic system and insulation;**

**Fuel cell or condensing boiler operated with methane, later with green hydrogen;**

**District and local heating with biomass, biogas, waste, green hydrogen;**



Diffuse PM<sub>2.5</sub> emissions: abrasion processes, e.g. tyre and break wear

Particulate filter in small wood firings, ban of open chimneys

Reduction of indoor pollution (less passive smoking, use of efficient kitchen hoods, ban of incentive sticks, use of improved HEPA filters, use of mechanical ventilation with heat recovery)

## **Priority research and market launch of improved techniques:**

Accelerate development of autonomously driving cars;

Decrease costs and weight and increase energy density of batteries

Efficient long term electricity storage;

efficient electrolysis;

transformation of gas network into hydrogen network;

long distance hydrogen transport;

Improve efficiency of thermal insulation;

prolongation of lifetime of tyres and brakes;

Improve particulate filters for wood stoves