City of Hagen

Germany / North Rhine-Westphalia

195.000 inhabitants

29.000 buildings

105.000 homes

160 km² area

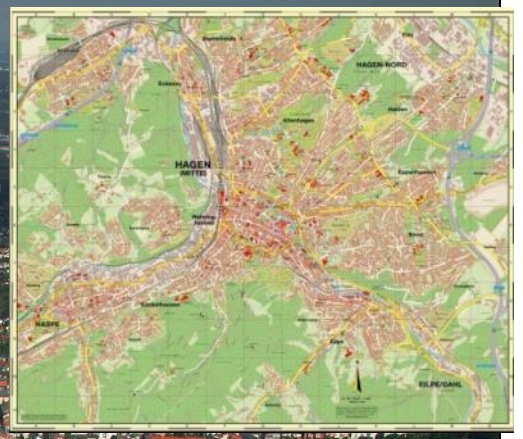
22 % building area

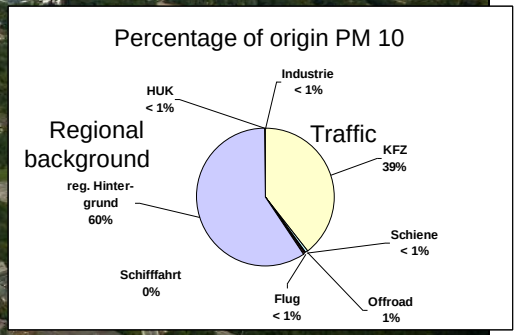
21 % agricultural area

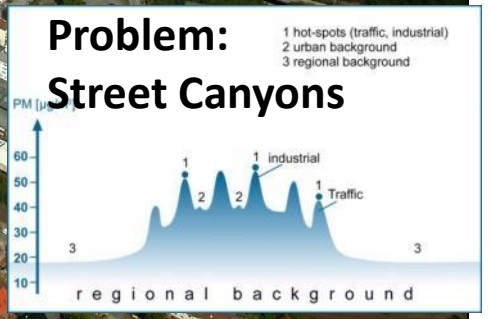
42 % wood land

84 bis 438 m altitude a.s.l.

situated in basin and valleys







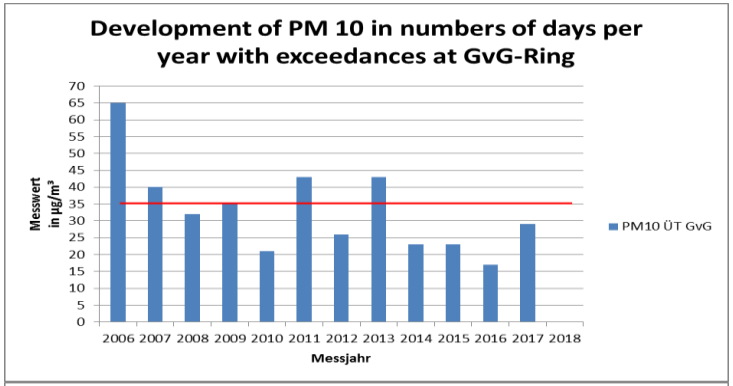
City of Hagen

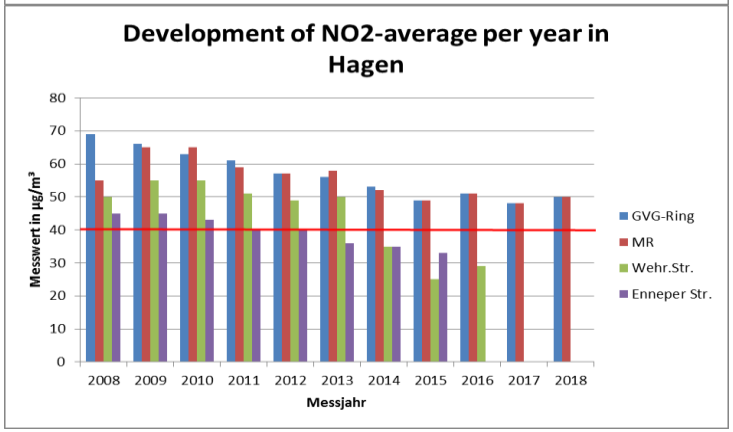
Clean Air Management as an important part of an integrated and sustainable Traffic and Urban Developement Plan

Legal basis: EU-directive 2008/50/EG of European Parliament and Council dated May 21, 2008 about air quality and clean air in Europe

EU legal limits and deadlines for particles PM2,5 / PM10 and NO2

Stoff	Mittel über	Grenzwerte	Einhaltungsfrist
Partikel-PM2,5	Zielwert, 1 Jahr	25 µg/m³	seit 01.01.2010
	Grenzwert Stufe 1, 1 Jahr	25 µg/m³	ab 01.01.2015
	Grenzwert Stufe 2, 1 Jahr	20 µg/m³	ab 01.01.2020
Partikel-PM10	24h	50 µg/m³ 35 Überschreitungen/Jahr	seit 01.01.2005
	1 Jahr	40 µg/m³	seit 01.01.2005
NO2	1h	200 µg/m³ 18 Überschreitungen/Jahr	seit 01.01.2010
	1 Jahr	40 µg/m³	seit 01.01.2010





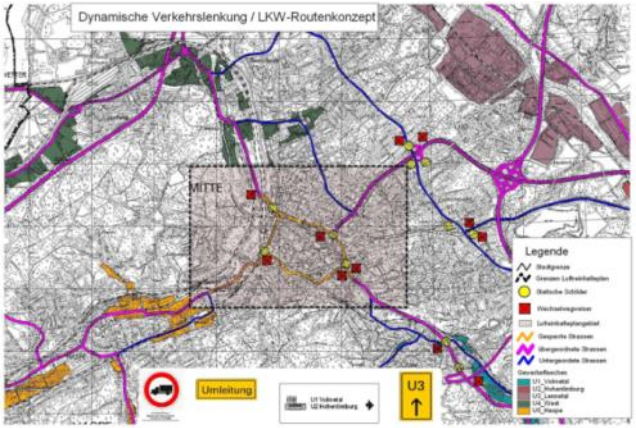
Transformation into a national law and by directive about air quality standards and maximum limits of emissions (39. BImSchV, akt. 2015)

§ 3 Legal limits for nitrogen dioxide (NO2)
§ 4 Legal limits for particulate pollution (PM10)

City of Hagen

Integrated Clean Air Management Plan: Measures and its importance + /++/+++

- Lorry-routing concept / dynamic immission-controlled traffic routing +++
- Tempory driving bans for lorries +++
- Retrofitting public busses (particle filters-/motor optimisation) ++
- Hybridbusses & smart GPS function +
- City-logistic: pooling of urban commercial transport +
- Use of (electric) fright bikes +
- Bypass road at train station +/+++
- Relocation of potencial deviation for lorry traffic from highways +
- Signs on exits of highways +
- Implementation in GPS systems +
- Relocation & ban of overland busses with regard to street canyons +
- Information & strict controlling of regulations by city authorities and police ++



City of Hagen

Integr. Clean Air Management Plan: Measures

- Optimisation of traffic flow by traffic light pre-emption +
- Speed limit of 30 km/h in neuralgic street sections ++
- Mobility concepts for public and private enterprises +
- Low emission street cleaning and garbage trucks +
- Implementation of **Low Emission Zone** , ++/+++ next: Blue emission sticker?

Emision Stickers by National Order

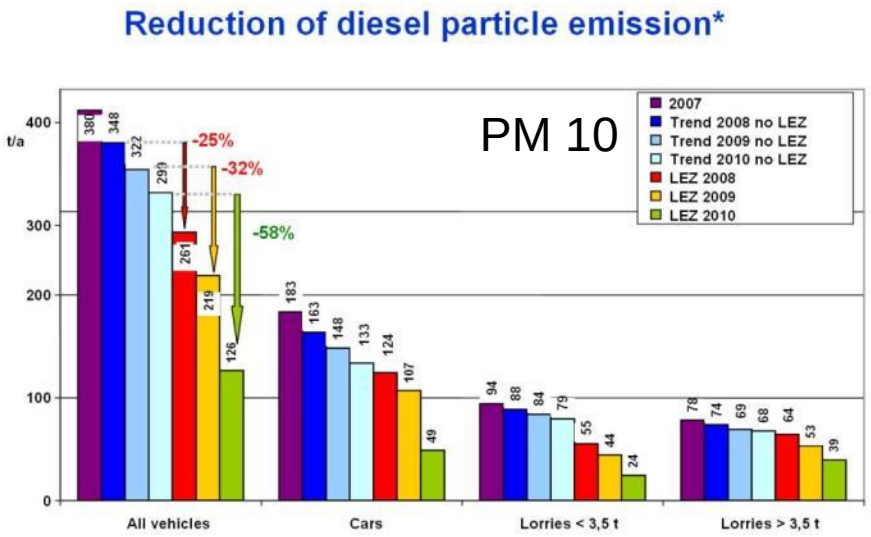
Schadstoff-gruppe	1	2	3	4
Plakette:	keine Plakette	2 S-UM43	3 S-UM43	4 S-UM43
Anforderung für Diesel	Euro 1 oder schlechter	Euro 2 od. Euro 1+ Partikelfilter	Euro 3 od. Euro 2+ Partikelfilter	Euro 4 od. Euro 3+ Partikelfilter
Anforderung für Benziner	ohne geregeltem Kat			Euro 1 mit geregeltem Kat oder besser

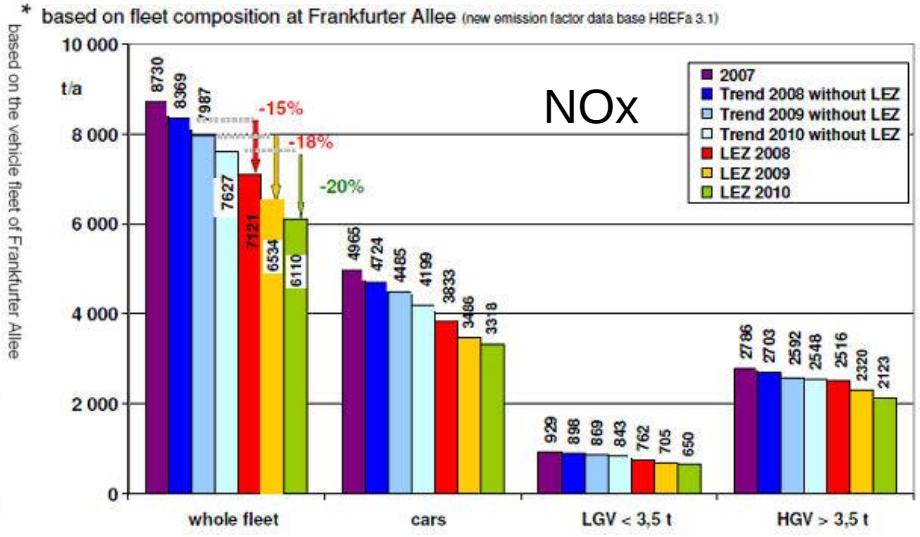
City of Hagen

Integrated Clean Air Management Plan: Low Emission Zone as Core Element

Quelle: Berlin Senatsverwaltung für Gesundheit, Umwelt und Verbraucherschutz Umwelt

Berlin: a scientifically proven example of the outcome / eco value of a **Low Emission Zone**





- Low emission zone has reduced PM10
- Decrease of critical exceedances from 28 to 22 days /year (minus 24-14%)
- Diesel-oil-particle- & PM_{10}- concentrationen minus 3% on main roads
- Emissions of NOx were leading to NO_2–pollutions in the air
- Low emission zone has reduced NO_2 up to 20% !

City of Hagen

Integrated Clean Air Management Plan: Low Emission Zone as Core Element

Outcome / Eco value is in general dependent from:

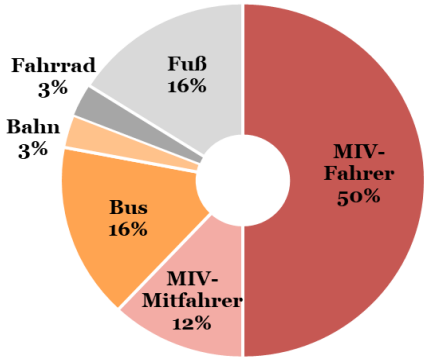
- Basic level of emissions (regional & urban background)
- Extent of green zone
- Rigorousness of restrictions (color of emission stickers)
- Consistant regulations (exceptions, controlling etc.)
- Number of involved cars & their kilometric performance
- Composition of fleat before installing low emission zone (age, kind of vehicle, %-of diesel /-of gasoline engines)
- Options of car holders to react (high force for new or second hand buys, retrofitting & particle filters)
- Impact of different sources of pollution (Does traffic have a high proportion of immissions?)
- Appearance of extreme inversions per year

In Hagen: about 200 inversions / a, mostly in winter

Masterplan „Sustainable Mobility“ needed

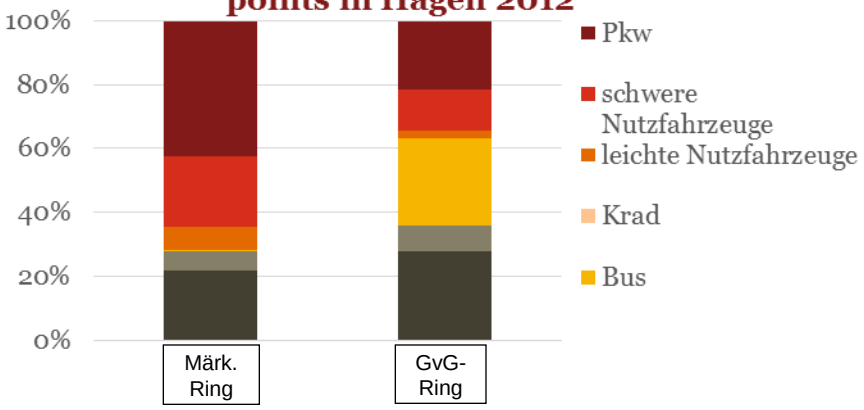
Despite several actions and newly integrated concepts, the NO_2 limit is constantly exceeded in Hagen - new forms of mobility help to change the general pattern of mobility

Modal Split in Hagen 2015



- With 62%, the MIV has the largest share of
- The bicycle traffic has a very low value with 3%

NO_x-polluter analysis for measuring points in Hagen 2012



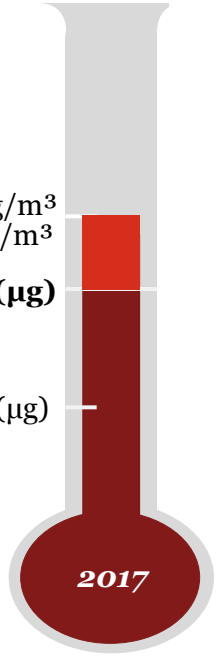
NO_2- Pollution in Hagen

The annual average for nitrogen dioxide (NO2) was 2017 at the two critical measuring points by approx. 20% above the permissible limit.

Graf-von-Galen-Ring 48 µg/m³
Märkischer Ring 48 µg/m³

limit 40 (µg)

20 (µg)



Content and Objectives of Masterplan

The masterplan aims to introduce a change of mobility in Hagen, showing potential action for sustainable mobility and creating a basis for funding applications

Objectives of the Masterplan

- Identify opportunities **for sustainable mobility** (☐ the Transitional Mobility Process)
- Prerequisite for applying for funding from the **"digitisation of municipal transport systems"** directive
- basis for applying for further funding to **implement emission abatement measures**
- Note: Individual funding applications are required

01 / 02
Project Management / Networking and Participation

03 Analysis	04 Actions	05 Traffic Strategy	06 Master-plan	07 Controlling
Pre-selection of possible actions	*List of priorities of measures and actions*	*Strategies for implementation of masterplan into urban development*	*Action catalogue*	*Concept for impact control of actions*

parallel: actualization of the assessment of actions included in the Clean Air Plan (HBEFA 3.3)

Gefördert durch das **BMVI – Förderrichtlinie Digitalisierung kommunaler Verkehrssysteme**

Bundesministerium für Verkehr und digitale Infrastruktur

Project partner:

HAGEN Stadt der FernUniversität

pwc

DTV Daten Technik Verkehr Verkehrsconsult GmbH

MÜLLER-BBM

Methodological approach for the creation of the masterplan

An analysis for prioritisation of several actions has been undertaken

1 Survey of measures

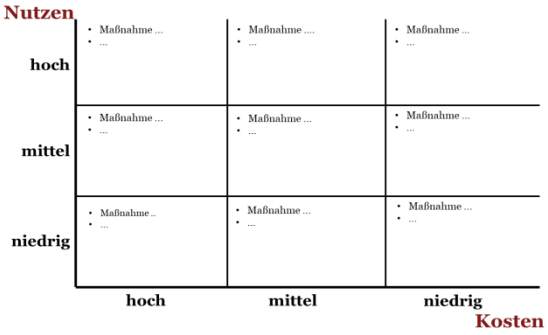
Maßnahmen-Steckbrief für den Masterplan „Nachhaltige und emissionsfreie Mobilität“ in Hagen	
Allgemeine Daten	
Maßnahmen-Nr.	
Maßnahmentitel	
Themenfeld	
Institution/Träger der Maßnahme	
Federführender Ansprechpartner (inkl. Kontaktdaten)	Name: Institution: Position: E-Mail: Telefon:
Weitere Projektbeteiligte (Institution und Ansprechpartner)	
Maßnahmenbeschreibung	
Beschreibung der Maßnahme (Inhalte)	
Umsetzungsschritte	
Bewertung/Auswirkungen	
Zeithorizont der Umsetzung und Wirkung (kurz-/mittel-/langfristig)	( ) Kurzfristig (< 1 Jahr) ( ) Mittelfristig (1-5 Jahre) ( ) Langfristig (> 5 Jahre)
Benötigte personelle und technische Ressourcen	
Umsetzbarkeit bzw. zu behebende Hemmnisse	
Synergien & Zielkonflikte mit anderen Maßnahmen	
Umsetzungs- und Folgekostenschätzung	
Erwartete NO_2-Minderung	
Erwartete PM10-Minderung	
Erwartete Veränderung der CO_2-Emissionen	
Erwartete verkehrliche Auswirkungen (Verkehrsvermeidung/-verlagerung)	
Weitere Auswirkungen (z. B. soziale Nachhaltigkeitsaspekte)	

2 Criteria for the evaluation of measures

	Nutzen				Kosten		
Bewertungskriterien/ Maßnahmen	erwartete NO_2-Minderung	erwartete CO_2-Minderung	verkehrliche Auswirkung (Verkehrs-vermeidung,-verlagerung)	Realisierungs- und Wirkungs-zeitraum	Umsetzungs- und Folgekosten	Umsetzbarkeit bzw. zu behebende Hemmnisse	Gesamt-bewertung
Maßnahme 1	◑	◑	○	●	●	◑	1,25
Maßnahme 2	◑	◑	○	●	○	◑	0,75
Maßnahme 3	○	○	○	●	◑	●	1
…							

○ (0 Punkte)	keine nennenswerten oder negative Auswirkungen	langfristig (> 5 Jahre)	Kosten > 1.000 T€	wesentliche Hemmnisse	aggregierter Wert
◑ (1 Punkt)	geringe Auswirkungen (keine ablesbaren Effekte)	mittelfristig (1-5 Jahre)	Kosten ≤ 1.000 T€	geringere Hemmnisse	
● (2 Punkte)	größere Auswirkungen (mit ablesbaren Effekten)	kurzfristig (< 1 Jahr)	Kosten ≤ 100 T€	keine Hemmnisse	

3 Prioritisation of actions



Participation of Hagen's citizens and other actors

During the creation of the masterplan, local actors have been integrated into the process through a successful stakeholder workshop on May 24, 2018

Conclusions of the Stakeholder-Workshop

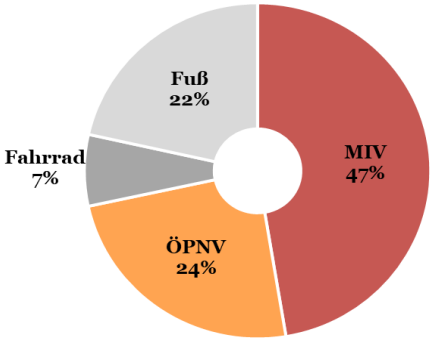
- Intensive discussion and concretisation of the different measures
- Development of new measures-ideas by actors evaluation of measures and ideas
- Networking between the actors (!)
- Great willingness to help shape the change of mobility (!)
- desire to continue the dialogue and participation process (!)
- High identification with the city of Hagen and the topic of Mobility change (!)

Objective for a change of mobility in the City of Hagen

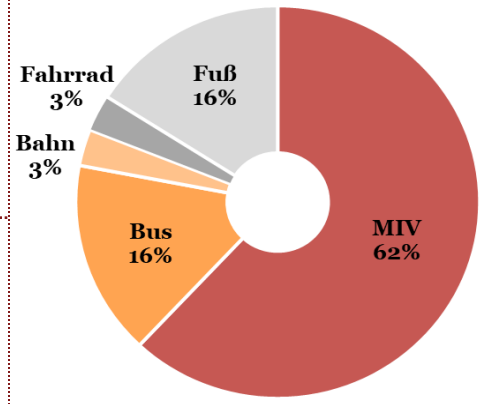
The comparison of the modal split with other cities shows that there is great potential for a change of mobility in Hagen

Cities in North-Rhine Westfalia

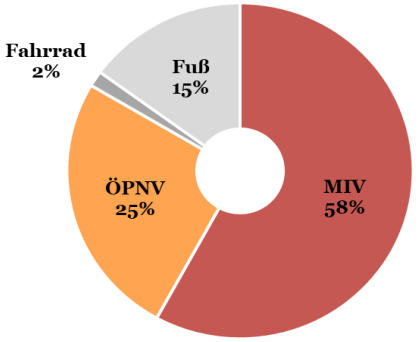
Modal Split: Dortmund 2013



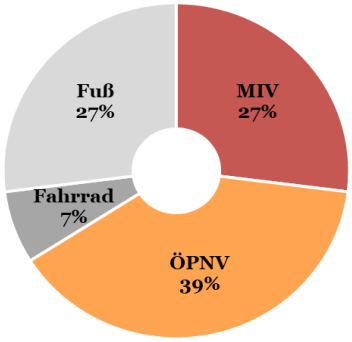
Modal Split: Hagen 2017



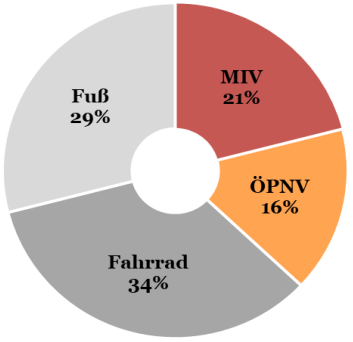
Modal Split: Wuppertal 2011



Modal Split: Wien 2015



Modal Split: Freiburg 2016



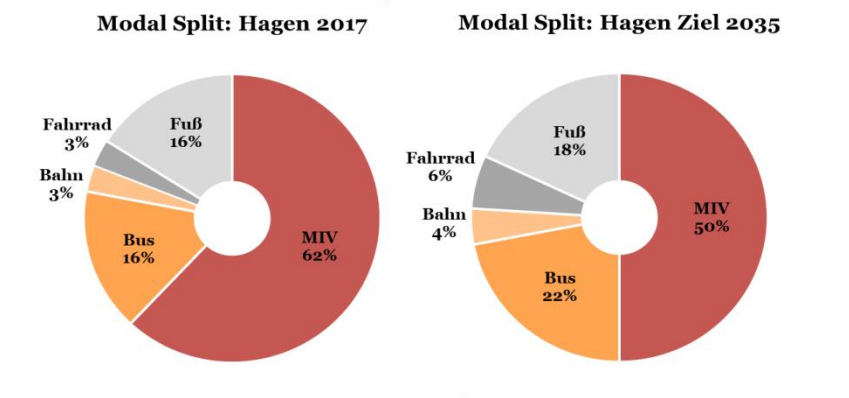
Best practices

City of Hagen

Goals for a change of mobility in the city of Hagen

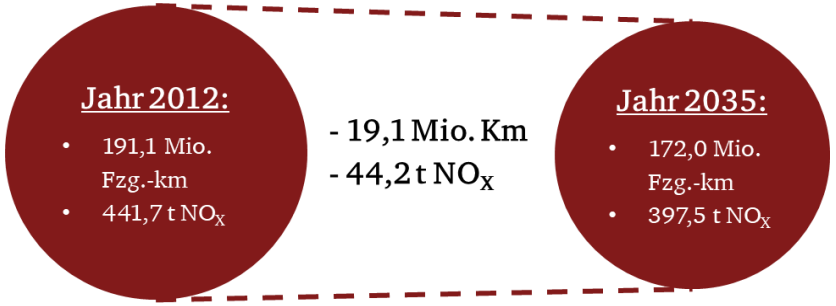
Based on the current situation in Hagen, mobility targets were developed for both passenger and freight traffic

50/50-target concept for passenger transport in Hagen until the year 2035



- **Extension of the environmental network to 50%** (public transport and cycling and foot traffic) in the course of the Hagen citizens '
- Decline of around 50 million passenger car kilometres per year **(approx. 16 tonnes of NOx emissions per year)**
- Shifts within the environmental network possible, depending on the concrete implementation of the measures

10%-target concept for freight transport in Hagen until the year 2035



- **Reduction of driving power by 10%** in freight transport by trucks and light commercial vehicles (**approx. 44 tonnes of NOx emissions per year**)
- To expect even greater reduction in emissions in the achievement of the driving performance-related objective by the continuous **modernisation of the fleets**
- Implementation in particular through intelligent logistics concepts and steering measures

City of Hagen

Presentation of new mobility strategy for the City of Hagen

Changing the mind for an emission-free, well-connected and sustainable mobility which leads to a new quality of life in urban areas of Hagen

„Hagen electrifies“

„Hagen coordinates“

„Hagen cycles“

„Hagen digitizes“

„Hagen experiments“

„Hagen informs“

„Hagen moves“

„Hagen transports differently“

„Hagen ccoperates“

„Hagen redirects“

Legende:

- core elements
- cross-section elements

Measures to implement a change of mobility at a glance

A large number of measures have been developed in the core elements, which generally have their optimal effect only to unfold together *(2/2)*

Hagen electrifies, e.g.

E-buses used by Hagener Straßanbahn AG

E-Emergency vehicles for public authorities

26 public electric vehicle charging stations

Electrification KEP services

E-Scooter rental system

(((eTicket Deutschland

Hagener Straßenbahn AG

Hagen transports differently

Micro Depots KEP Services

Use of low-pollutant cleaning and disposal vehicles

Rental (e-) freight bicycle

Digitalisation of Depot containers

Quelle: Deutsche Post DHL Group

Quelle: mark e

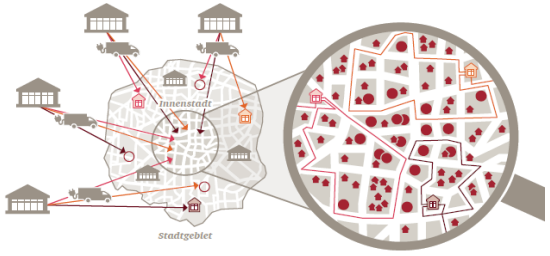
Hagen is moving, e.g.

Expansion of public transport services: offer + attractiveness increase

Creating an attractive access to public transport

(Small) Busses on Demand

Promotion of public transport services by companies/authorities/public service



Measures to implement a change of mobility at a glance

Further cross-sectional elements are important in order to implement the measures in a targeted manner, to coordinate them and to involve the actors and citizens.

Hagen coordinates

- Master plan encompasses many **interrelated building blocks and measures**
- Involvement of **many different actors**
- Control of **the master plan** process required by a central coordination Unit ("care")
- **Personnel resources**, **budgets** and independent **decision-making skills** necessary

Hagen informs

- Information for the actors and citizens in Hagen is crucial to create **acceptance** for the change of mobility
- Generate **identification** with a change of mobility
- Identify opportunities and successes to achieve positive **momentum**
- Image of Hagen can be further improved as **a city with sustainable means of transport and new patterns of mobility**

Hagen cooperates

- For the success of the mobility turnaround, a **cooperative, goal-oriented cooperation** of all actors at eye level is required
- Hagen should become an attractive partner for **innovative start-up companies** in the mobility sector
- This requires **structures** that are attractive to cooperation partners:
  - Flat hierarchies
  - Quick decisions

Hagen experiments

- Mobility sector is very **complex** and not all consequences of measures are precisely predictable
- To achieve mobility goals, **risks** must be addressed
- It is necessary to tread new paths and try out **innovative concepts**

Evaluation and prioritisation of measures

The measures differ both in terms of their usefulness and in terms of their feasibility and costs

Measures with the highest overall rating/prioritisation
VRR Radboxen Project – Collective storage systems
Marketing/Consulting E-mobility citizens and companies/action day mobility change
Priority of public transport via signals (acceleration)
Alliance for environmentally friendly mobility at eye level/round table actors
Rental (e-) freight bike & rental system for (e-)scooter
Avoidance of truck-abbreviation traffic (truck routing + signposting)
Environmentally-oriented parking space management
Promotion of public transport services by companies/authorities/public service
Municipal bicycle sharing system
Building a comprehensive data model on urban mobility

Measures with the greatest traffic and/or emission effect
Expansion of public transport services: increase in offer and attractiveness
Change of the HST vehicle fleet to electric buses
(Small) buses on demand
Creating an attractive access to public transport
Multi-modal network – „Hagen-mobile-App“
Establishment of mobility stations in urban areas
Well-connected urban quarters
Reduction of car lanes, more cycle paths
Building a comprehensive model for urban mobility
Loop tapping inner city ring – one-way street solution

Concept for analysis of actions

By examining traffic key figures, the success of the actions can be measured continuously

Traffic key figures for the controlling of meas… and actions, e.g.

- **Modal Split**
  (MIV, Umweltverbund, to be differentiated by reasons for travel)
- **Admission figures for cars and trucks**
  (According to Euro standard, hybrid and electric drives)
- **Share of electric vehicles** by city and urban enterprises, fleet composition in public transport
- **User numbers** and periods of charging stations
- **User Numbers** Car-/Bike-/freight bicycle-/Scooter sharing,
- **Bicycle rides** per citizen and on the main axes
- **Number of truck journeys** and operating performance
- **Proportion of passenger car journeys** at hot spots differentiated by type of vehicle
- **Travel times** in private and public transport

- ***Summary in an indicator system***
- ***Continuous recording of data***
- ***Assignment to singular components/measures***
- ***If necessary, readjusting actions***

Conclusion & Outlook

- The development of the Master Plan „Sustainable Mobility" will show a path towards **future-oriented, environmentally friendly mobility**
- By implementing the measures of the master plan a **change of mobility in Hagen** is achievable and the limit values for air pollution can be met
- Such a change requires all actors and citizens to **"pull together"**, through which workshops have been laid the basis for this
- ***Next steps:***
  - ***Decision*** *of the master plan by the Council of the City of Hagen*
  - *Short-term start of* ***implementation of measures*** *(in particular Mobility data Model for optimal alignment of the master plan)*
  - ***Financing****: Procurement of funds and provision of own resources by the city of Hagen (e.g. municipal financing pot or "mobility change fund")*
  - *Continuation of the* ***participation process*** *and communication*
  - ***Support and coordination*** *of the Master plan implementation by the city of Hagen (creating organizational requirements)*