Brian Vad Mathiesen

Kurt Prehn

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smar+
en.
ci+y

SmartEnCity Network Webinar
June 2, 2017

Low Carbon Mobility

Brian Vad Mathiesen
Aalborg University

Kurt Prehn & Peter Rathje
Sonderborg Municipality & ProjectZero

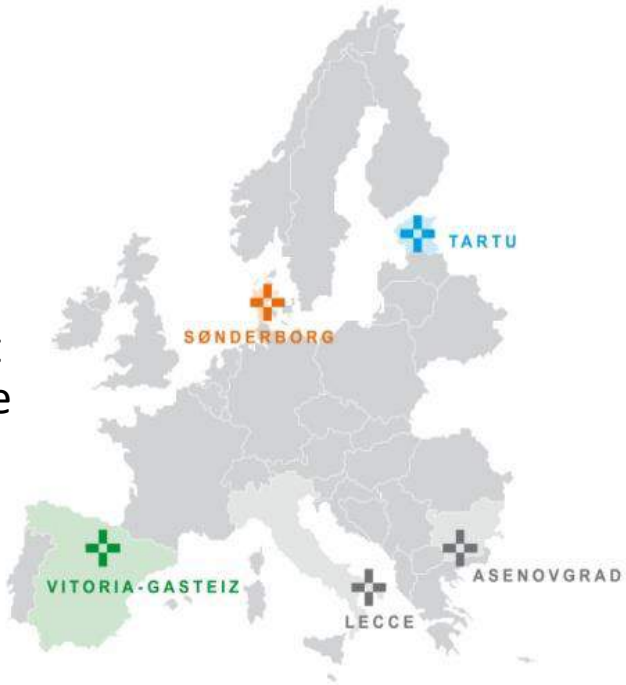
Aitor Albaina
Vitoria-Gasteiz Municipality

TOWARDS SMART ZERO CO_2 CITIES ACROSS EUROPE
VITORIA-GASTEIZ + TARTU + SONDERBORG

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691883

SmartEnCity project

- Project funded under the **European Union's Horizon 2020** research and innovation programme
- Under the coordination of Fundación TECNALIA Research & Innovation, **35 partners from 6 countries**
- To develop **strategies that can be replicated** throughout Europe in order to reduce energy demand and maximise renewable energy supply
- To develop a **systemic approach for transforming European cities** into sustainable, smart and resource-efficient urban environments in Europe
- **SmartEnCity Network** is being developed for European cities



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SmartEnCity Network webinar series

- These webinars are for city planners, policy-makers, private companies, government, researchers etc.

- They are being carried out to share the knowledge of the SmartEnCity partners and attract members to the network

- All webinars available online at www.smartencity.eu

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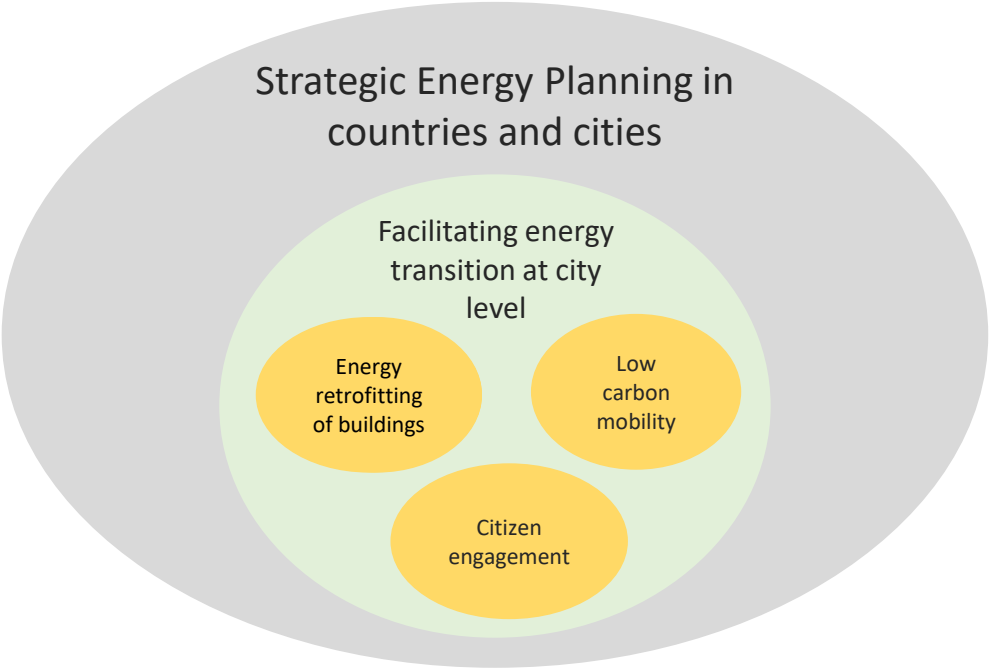
SmartEnCity Network webinar series

1. Strategic Energy Planning in countries and cities
2. Facilitating energy transition at city level
3. Empower your city transition – Citizen Engagement
4. Energy retrofitting of buildings
5. Low carbon mobility



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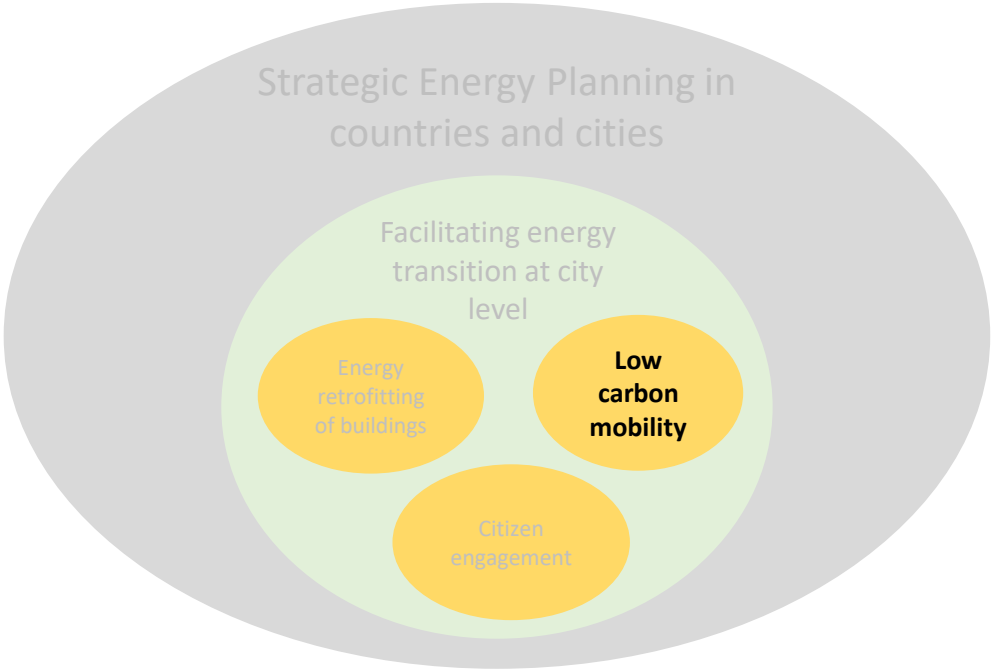

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SmartEnCity Network webinar series

You can already re-watch webinar 1, 2, 3 and 4:

#1 Strategic Energy Planning in countries and cities

#2 Facilitating energy transition at city level

#3 Citizen Engagement

#4 Energy Retrofitting of Buildings

online at

www.smartencity.eu

→ Publications → webinars

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Overview of today's webinar

- Introduction to presenters and topic
- Part 1: Role of mobility system in overall system transition
- Part 2: Mobility strategy in Sonderborg – experiences and results
- Part 3: Vitoria-Gasteiz mobility transition – experiences and results
- Questions and future webinars

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Introduction to presenters and topic

AALBORG UNIVERSITY DENMARK www.aau.dk

Brian Vad Mathiesen

- Professor in Sustainable Energy Planning at Aalborg University in Denmark.
- Over 10 years' experience in renewable energy analysis and planning
- Research about the role and focus areas of future mobility systems in overall transition

Sønderborg www.sonderborgkommune.dk

Kurt Prehn

- Assistant Project Manager for Sustainable Transportation at Sonderborg Municipality
- Transport services and public transport as main working areas
- Involved in the transition of Sonderborg's mobility system towards Low Carbon Mobility.

Bright Green Business ProjectZero www.projectzero.dk

Peter Rathje

- CEO at ProjectZero in Sonderborg
- Both systemic and user perspective on mobility strategies.
- Involved in the development of Sonderborg's mobility strategy

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Introduction to presenters and topic

Centro de Estudios Ambientales
CEA
Ingurugiro Gaietarako Ikastegia

www.vitoria-gasteiz.org/cea

Aitor Albaina

- Environmental technician at CEA – a part of Vitoria-Gasteiz City Council
- Background as PhD in Ecology working with sustainable development strategies in Vitoria-Gasteiz
- Involved in development of Low Carbon Mobility strategy in Vitoria-Gasteiz

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Introduction to presenters and topic

Questions?
If you have questions please write them in the “Question box” and we will try to answer at the end of the webinar

You can also email questions afterwards to sss@planenergi.dk

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@SmartEnCity project partners are organising a series of webinars which will present practical experience and provide knowledge about the low carbon transition of cities

Towards Smart Zero CO2 Cities across Europe

2. June 2017 • online

SmartEnCity Network Webinar 5: Low Carbon Mobility

Create a Low Carbon Mobility system in your city to improve the livability and to support your integrated transition towards a smart zero carbon city. Learn about the future role of city mobility systems, and learn from best practice examples from Denmark and Spain.

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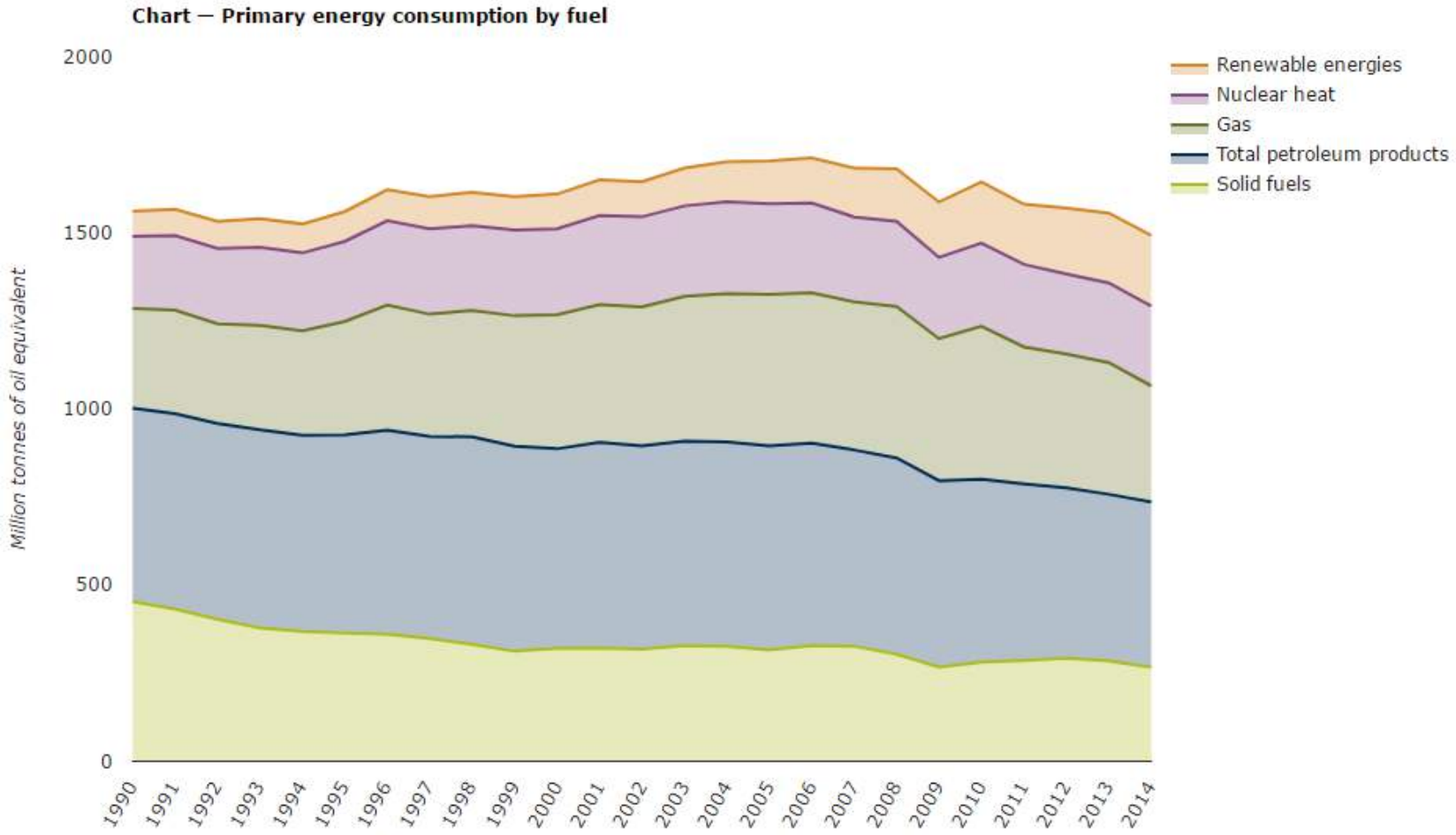
The European transport challenge



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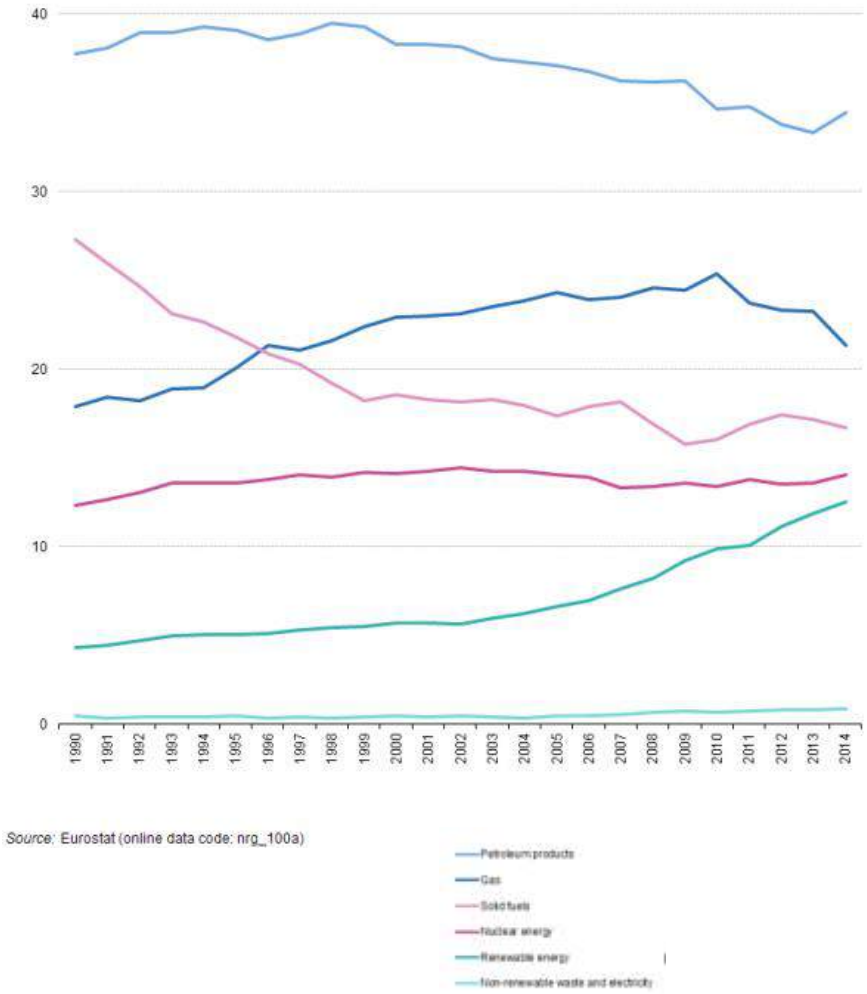
The European transport challenge

- Transport accounts for most oil demand in Europe and this demand is very large
- This leads to significant carbon emissions and other negative impacts on health
- This oil is burned in comparatively inefficient private vehicles and in heavy vehicles, e.g. trucks, ships, planes
- There is a massive potential to save energy by reducing oil based vehicle transport and replacing with more efficient technologies, e.g. electric vehicles
- Most of the light vehicles will need to be replaced in the future whereas heavy vehicles could use new fuels



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The European transport challenge

DTU Danmarks Tekniske Universitet

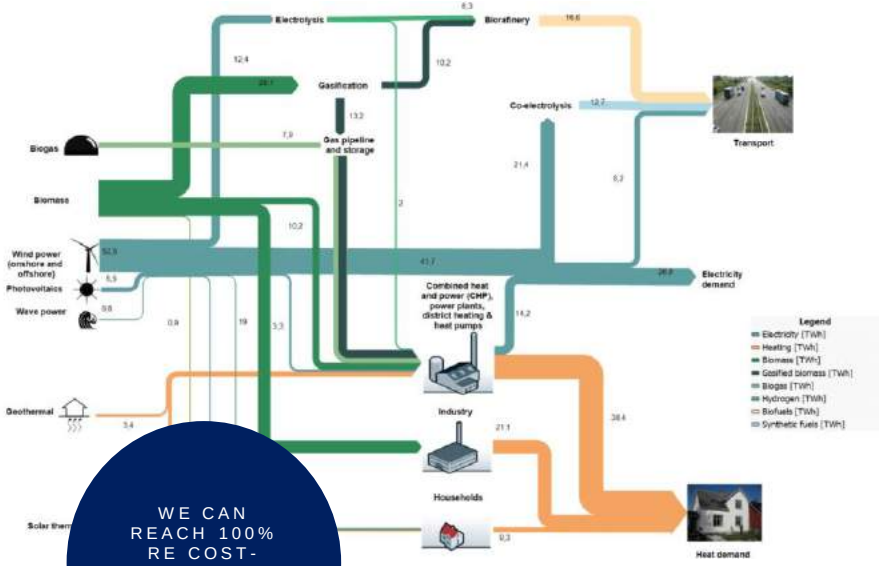
KØBENHAVNS UNIVERSITET

CBS COPENHAGEN BUSINESS SCHOOL HANDELSHØJSKOLEN

AALBORG UNIVERSITY DENMARK

SYDDANSK UNIVERSITET

CEESA PROJECT 2011/2012
DENMARKS 100% RENEWABLE ENERGY TRANSPORT SYSTEM IN 2050



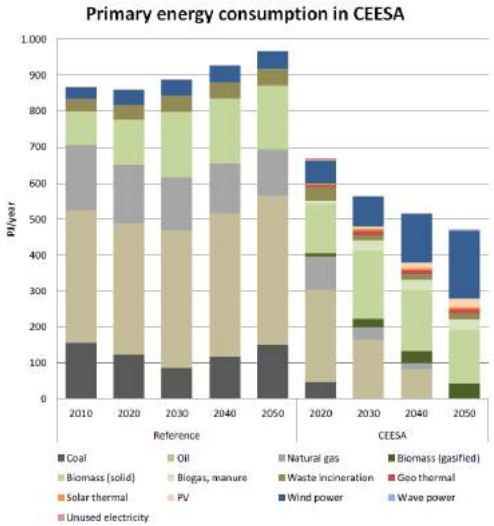


Figure 2: Primary Energy Supply in CEESA.

WE CAN REACH 100% RE COST-EFFECTIVELY - NO LATER THAN 2050

Info on Smart Energy Denmark and Smart Energy Europe:
www.smartenergysystems.eu

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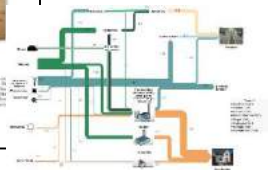
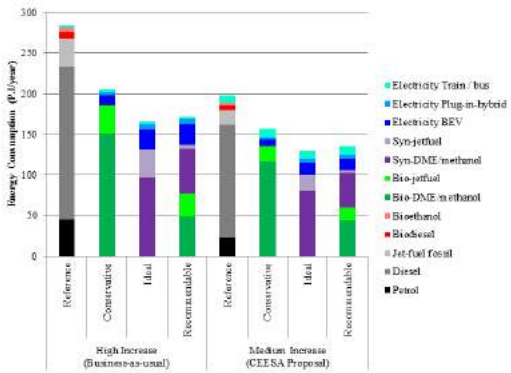
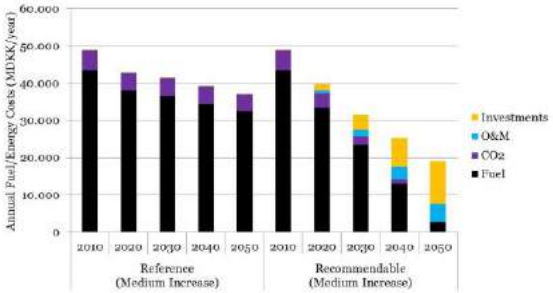
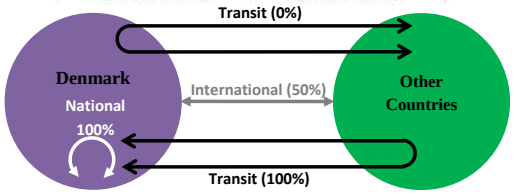
100% RE IN THE TRANSPORT SECTOR IS POSSIBLE

1. Lower increase in transport needs through urban planning
2. Changed investment strategy and modal shift
3. More efficient vehicles
4. Take advantage of the potential of electric cars
5. Renewable energy for heavy transport









CEESA

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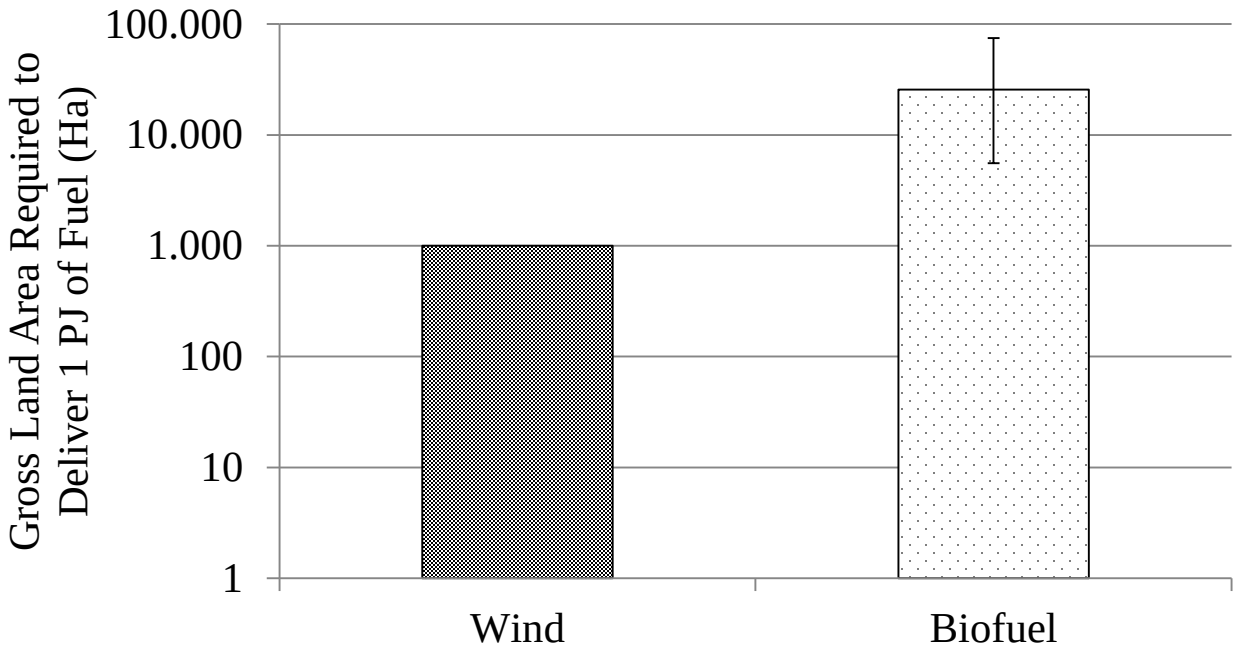
AREA CONSUMPTION FOR 1 PJ (0.5% OF TRANSPORT)



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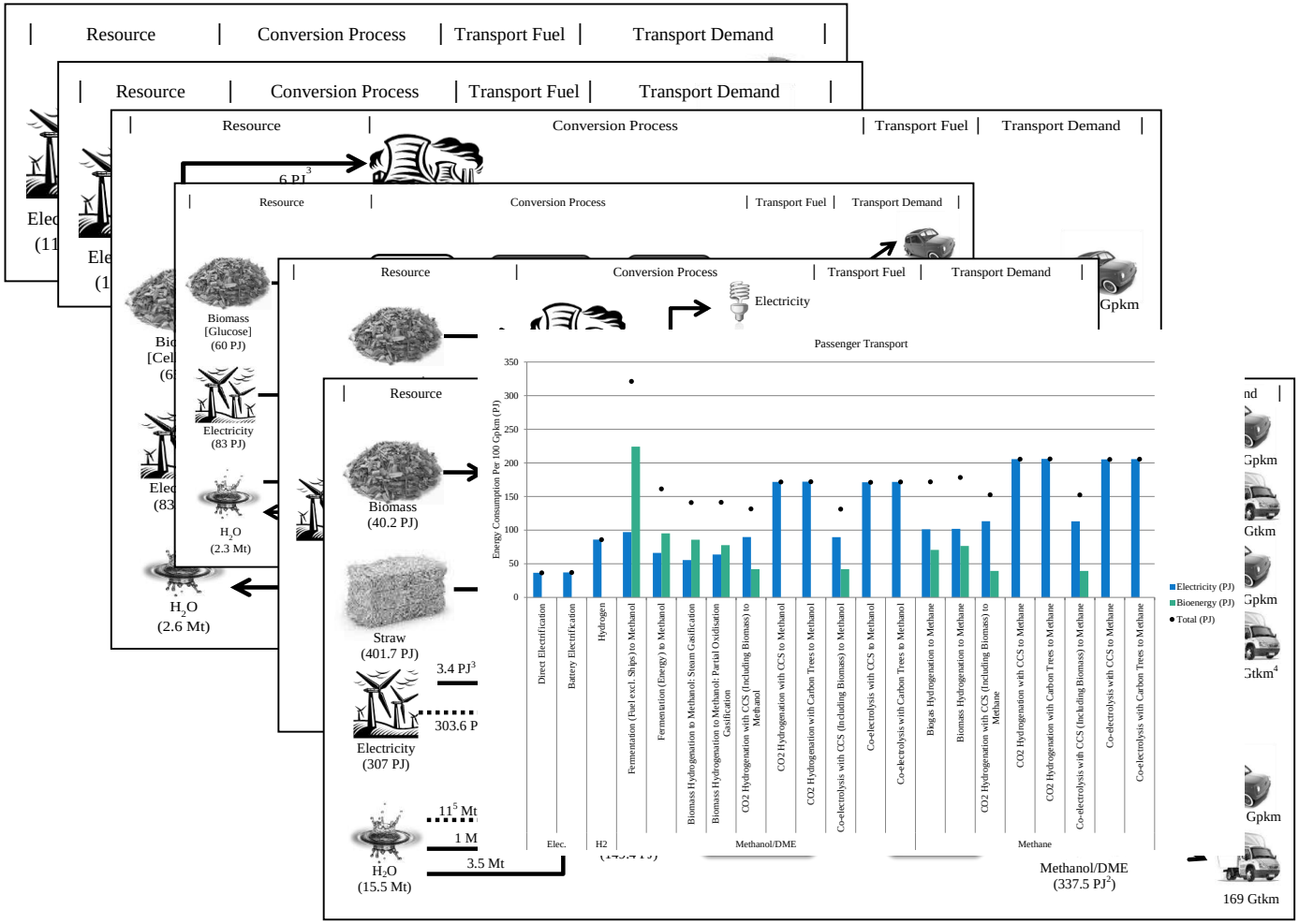

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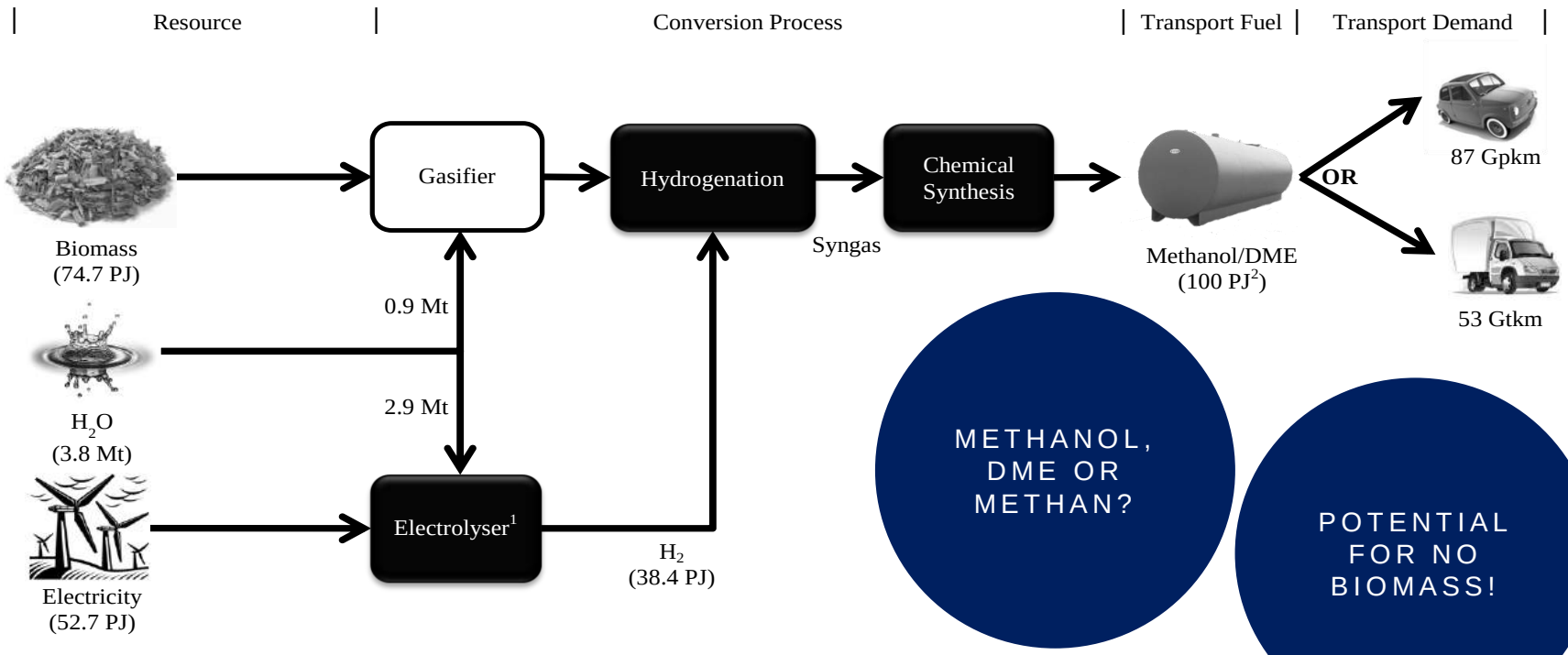
HYDROGENATION OF GASIFIED BIOMASS
(FOR HEAVY TRANSPORT)



METHANOL, DME OR METHAN?

POTENTIAL FOR NO BIOMASS!

has received fu

esearch and in

Co-benefits from addressing transport

- Improve congestion saving time and money
- Reduced health effects from harmful emissions and transport accidents
- Cost savings from new technologies and new methods of transporting people and goods

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Two main problem areas

- Light vehicles
  - Cars
  - Vans
  - Motorbikes

- Heavy vehicles
  - Trucks
  - Ships
  - Planes
  - Trains

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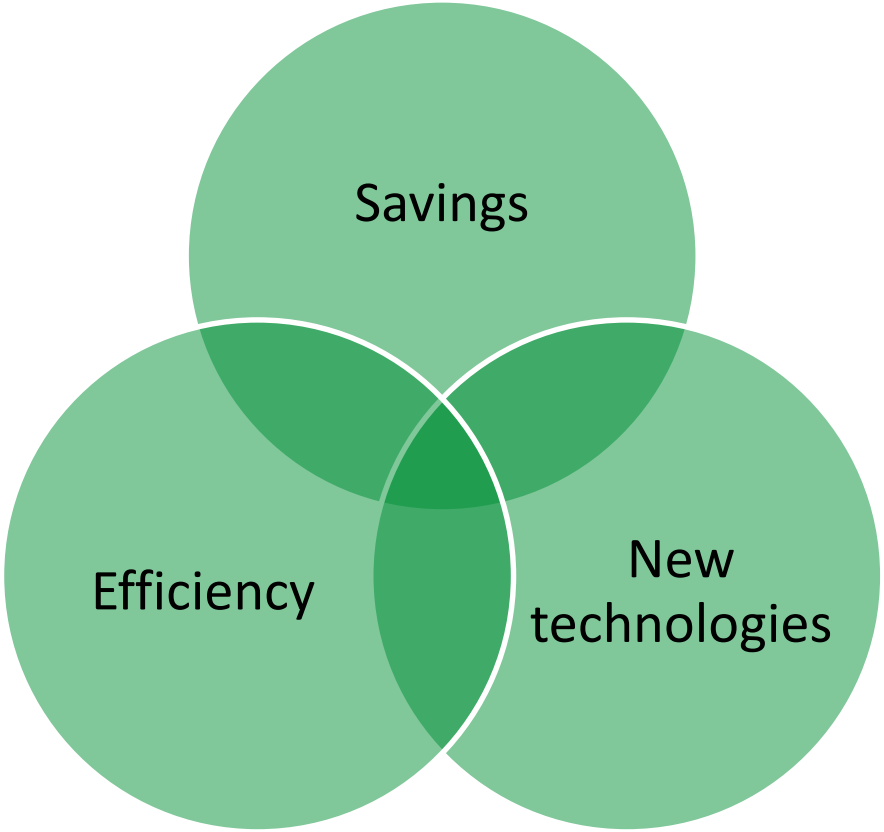
Two main problem areas and three areas to focus on

- Light vehicles
  - Cars
  - Vans
  - Motorbikes

- Heavy vehicles
  - Trucks
  - Ships
  - Planes
  - Trains



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Three focus areas and options - timeline

	Starting point	Short term (today- 2020)	Medium term(2020 – 2030)	Long term (2030 – 2050)
Savings	Public transport, cycling, walking	✓		
	Increased rail transport for heavy goods	✓		
	Car sharing	✓		
Efficiency	Self-driving vehicles		✓	
	Smart electric vehicle charging		✓	
	Electrified rail		✓	
New technologies	Electric vehicles	✓		
	Electrofuels			✓

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Three focus areas and options - benefits

	Benefit and impact on system Low ✓ Medium ✓✓ High ✓✓✓	Reduction of total energy demand	Increased consumption of renewable energy	Optimal use of renewable electricity	System energy flexibility benefits
Savings	Public transport, cycling, walking	✓✓			
	Increased rail transport for heavy goods	✓✓			
	Car sharing	✓✓			
Efficiency	Self-driving vehicles	✓			
	Smart electric vehicle charging			✓✓	✓✓
	Electrified rail	✓✓	✓✓		
New technologies	Electric vehicles	✓✓✓	✓✓✓		✓✓
	Electrofuels	✓✓✓	✓✓✓	✓✓✓	

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Summary

- Transport carbon emissions can be reduced significantly by reducing demand in light vehicles and switching to electric vehicles – this can be done today

- Heavy transport can be fuelled with electrofuels when more renewable electricity is integrated into the grid – this will happen in the next decade

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smart city

Low Carbon Mobility Sonderborg

Peter Rathje, ProjectZero &
Kurt Prehn, Sonderborg Municipality
2. June 2017

TOWARDS SMART ZERO CO_2 CITIES ACROSS EUROPE
VITORIA-GASTEIZ + TARTU + SONDERBORG

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SONDERBORG

- Framing the presentation
  - Key challenges in transportation
  - 4 focal areas for green transportation
- How we created the **S**trategic **E**nergy **G**reen **M**obility strategy
- How we execute the SEGM-strategy
- Selected cases
  - New Biogas-busses
  - Ambitions to improve biking
- Learnings and recommendations

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Sonderborg´s ProjectZero
- a holistic approach to change

Policy

Solutions

Society Participation

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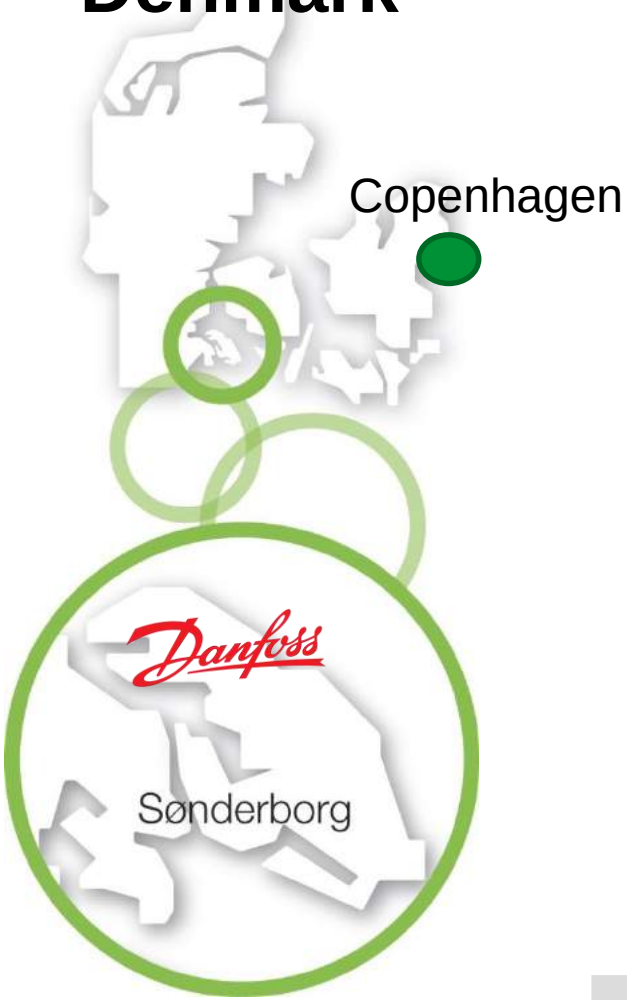
Mobility challenges & opportunities

- 76.000 citizens,
  - 2/3 living on the island of Als
  - 20.000 citizens in rural areas
- Municipal territory is 497 km2
  - 240 km coastline
- Danfoss HQ on top of the island
  - Biggest DK industrial group
- Pig-farming and food industry
- Transport accounts for app. 33% of Sonderborg´s CO2-emissions
  - What are the green solutions?
- The ProjectZero vision for 2029
  - 35% carbon already reduced

Denmark



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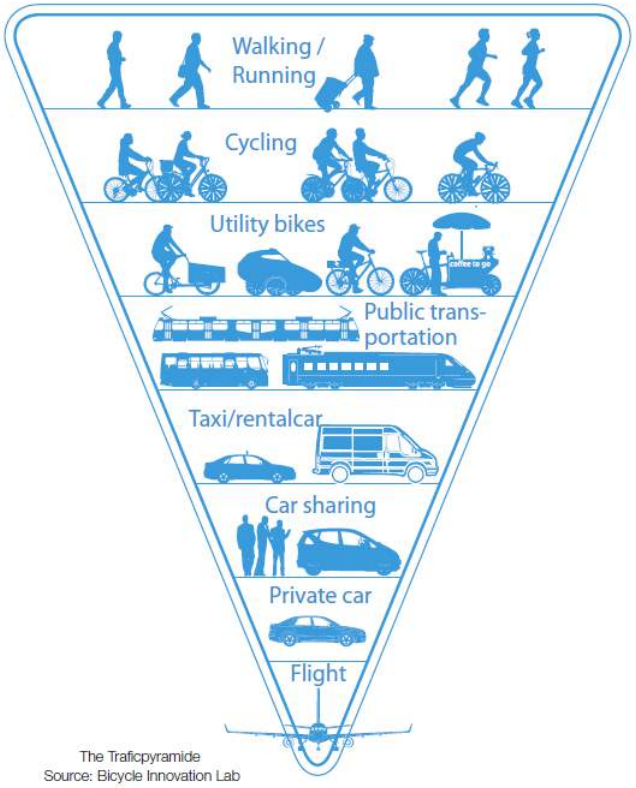
Mobility
- four areas of intervention

- Biking and sustainable transportation
- Public transportation
- Personal cars

- Heavy transportation



The Traficpyramide
Source: Bicycle Innovation Lab

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691883

The green transport strategy
- the creation process

- Four thematic stakeholder workshops:
  - Idea-generation
  - Idea selection & qualification
  - Compilation of initiatives
  - Evaluation and selection

- Presentation in public
- Political discussion and approval

public → biking → cars → heavy

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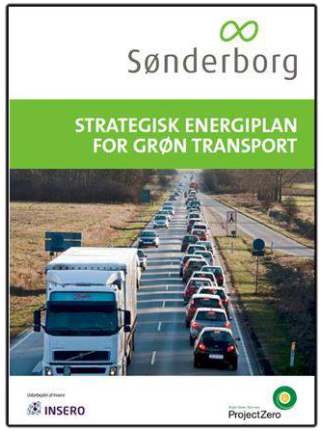
The SEGM-strategy - impact

- **Outline**
  - 21 initiatives to be implemented before 2020
  - 6 initiatives to be implemented before 2022
- **Rating of each initiatives**
  - Easy to implement
  - Potential job creation
  - CO2-reductions
  - Synergy with existing strategy
- **Impact**
  - Expectation is to reduce carbon emissions by 25% before 2022



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Linking transport with policy

CityCouncil Meeting

Economic Committee

Technical Committee

Transport Committee

- Rural area citizen representatives x 2
- Business representatives x 1
- City-admin x 2
- City council members (Chairman)
- ProjectZero representative x1

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Two Sonderborg cases

- new biogas busses
- biking for all (and more)

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Case 1
- New biogas busses

- **Challenges**
  - Wide geographical distances
  - Need to improve attractiveness
  - Zero or low carbon solution

- **Sonderborg`s approach**
  - Biogas fuel driven busses
    - can be fueled by local bio-fuel
  - Space for four bikes on board
  - Continued improvement of timetable
  - Electronic display at major hubs
  - Campaigns and communication

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A new charging infrastructure - in construction

to be ready to charge by 24. June 2017

New NGF biogas plant (2019+)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691883

Case 2
- biking for all

- **Challenges**
  - Min 20% of citizens shall use their bike minimum 5 km per day
    - Today´s figure is 14% decreasing
  - Wide geographical distances
    - topography, open land issues
  - Awareness, values ..
  - Cheaper cars ☹, but also cheaper e-bikes ☺

- **Sonderborg`s approach**
  - Improve biking infrastructure
    - More biking lanes
    - Give priority to bikers
  - Campaigns and communication

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Changing society thinking and mindset

creating 16.000 young smart ambassadors

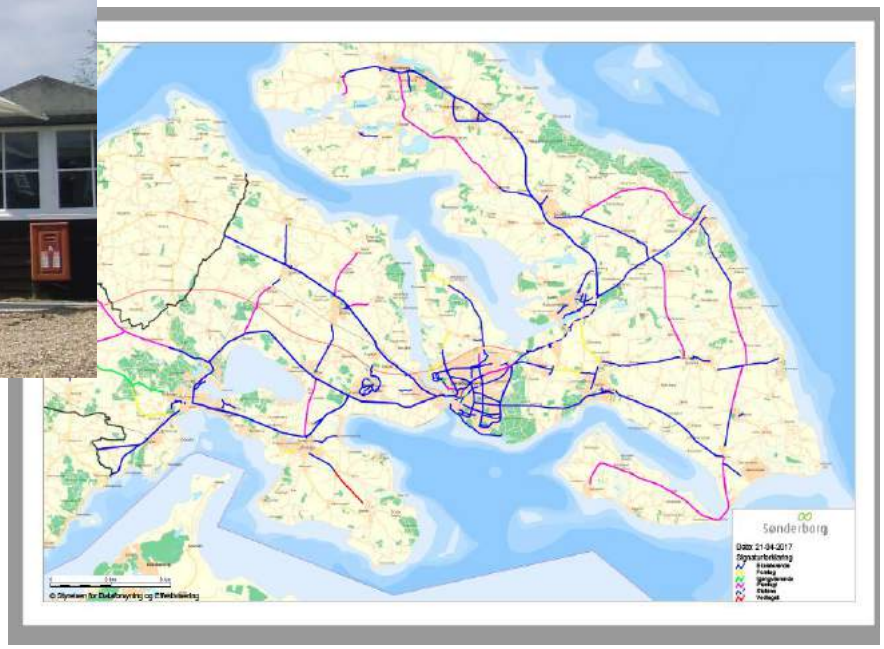
University

High Schools

Elementary & Mid school

Kindergarten

Biking
- requires infrastructure



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Biking
- give priority to bikers

Super bike lane

2 minus 1

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Let´s BIKE
- campaigns addressing all segments

- Health is a key driver
  - Biking improves your life!

- “Cykelforum”
  - A new local anchor for biking initiatives

- Let´s all bike campaigns
  - Biking to School
  - Biking to Sport
  - Biking to Work
  - Let´s e-bike
  - Bus board your bike

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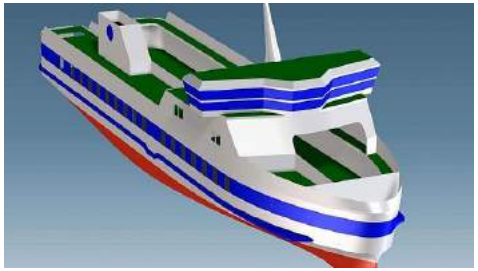
Learnings
- and recommendations

- Secure political support
- Create a strategic plan – a roadmap for transportation - in partnership with stakeholders and industry
- Set ambitious goals
- Secure resources for the implementation
- Create awareness through campaigns and communication
- Do, check and correct
- Communicate progress and start new initiatives



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Contact

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smart city

Low Carbon Mobility Measures in Vitoria-Gasteiz (Spain)

AITOR ALBAINA
Environmental Studies Centre (CEA), 2nd June 2017

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A medium-sized city.

- Administrative Capital of the Basque Country (Spain)
- 246,042 inhabitants
- 276.81 km^2.
- European Green Capital 2012

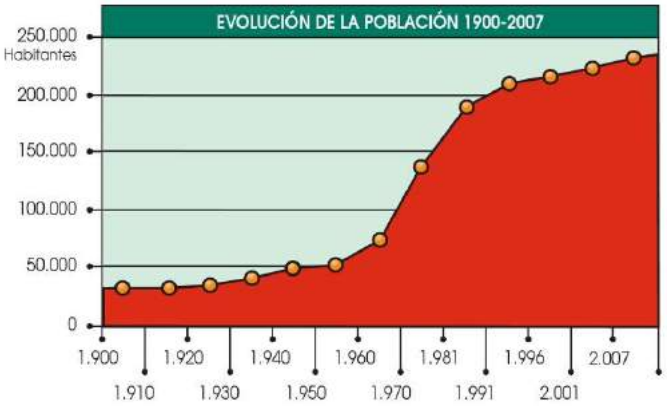

Gráfico 1. Evolución de la población 1900-2007.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691883

A compact, pedestrian scale city until recent growth and latest urban developments

- 46 homes/ha.
- ~100 inhabitant/ha (residential areas)
- A city where everything is at hand, accessible on foot and by bicycle.

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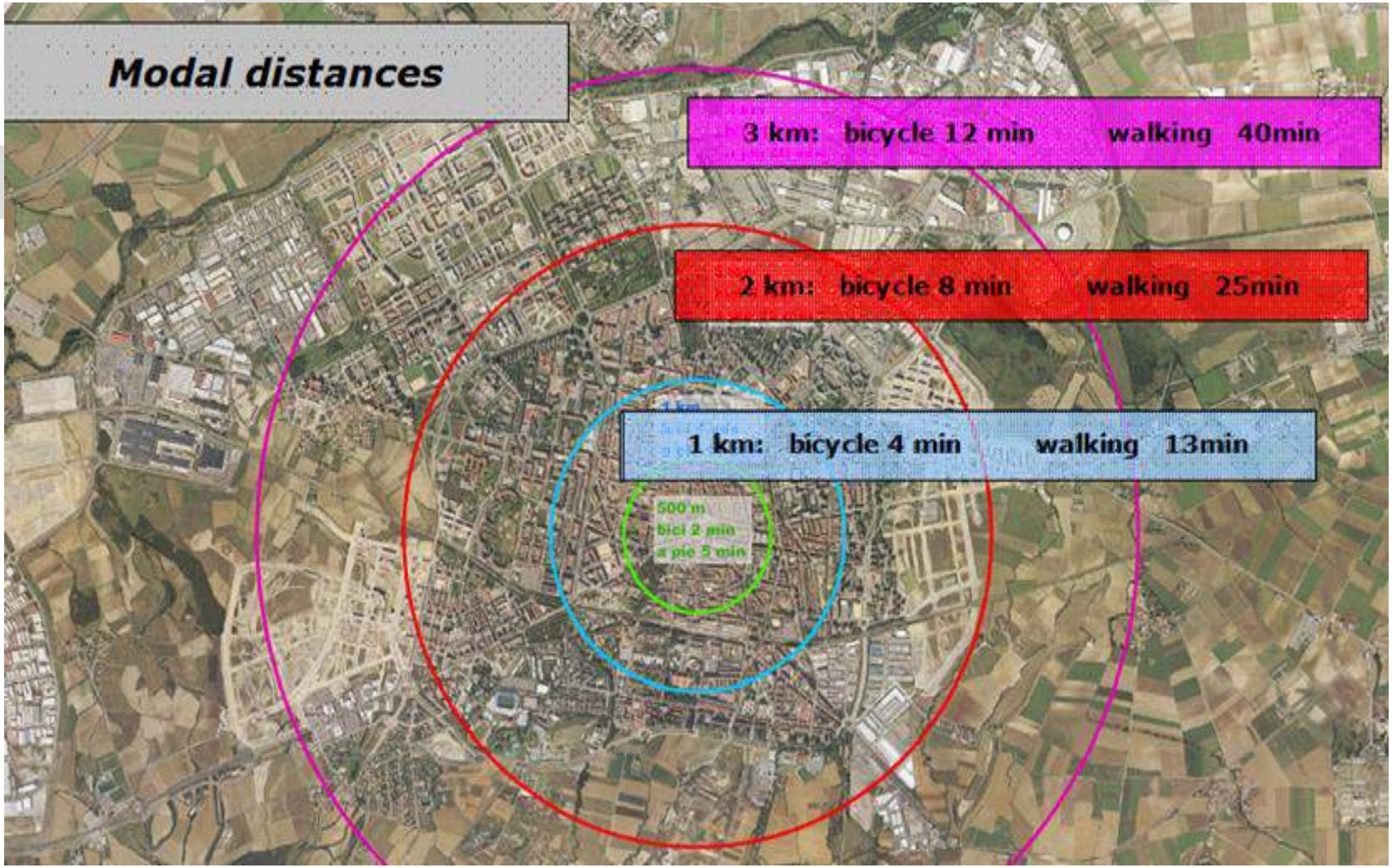
A small, compact and flat city: optimum for active mobility



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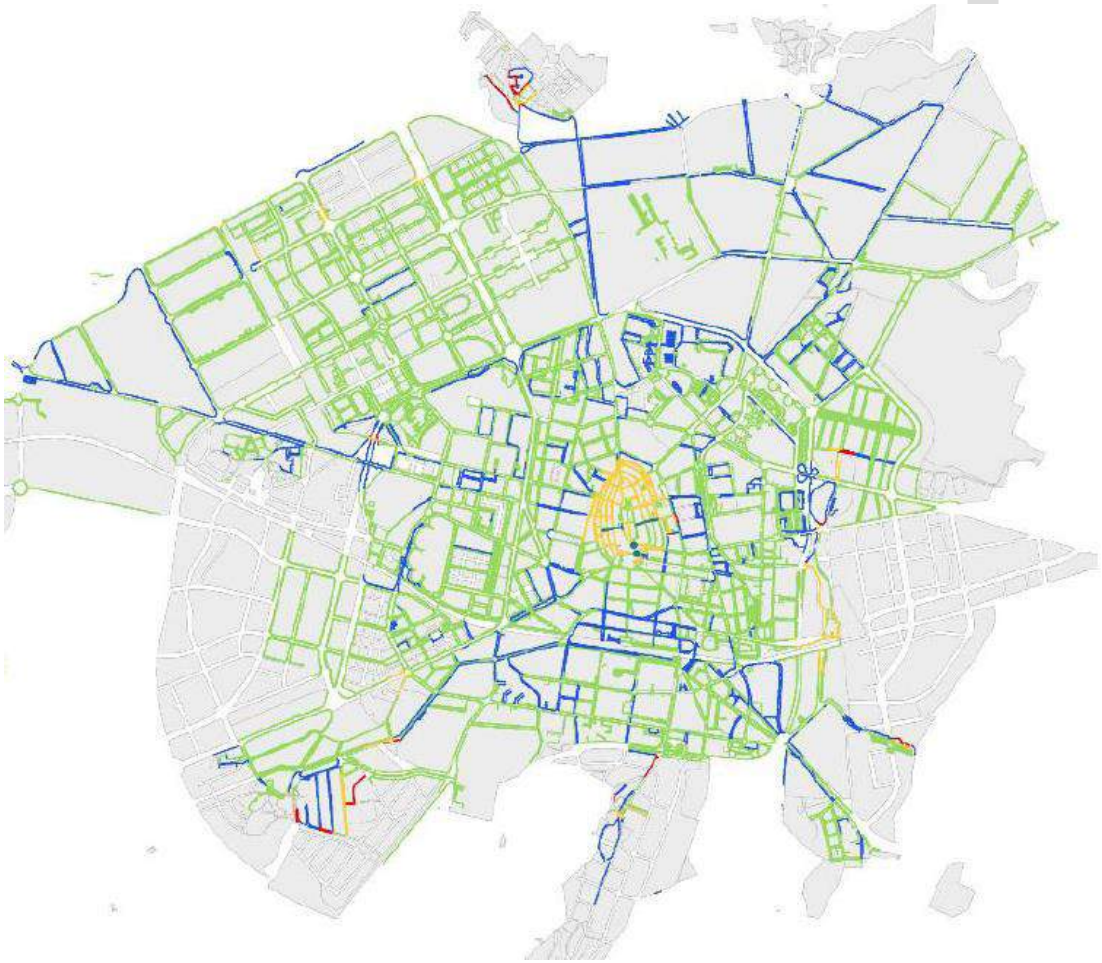
A small, compact and flat city: optimum for active mobility



Adequate accessibility

- *Width > 2.5 m and Slope < 5%*
- *Moving walkway*

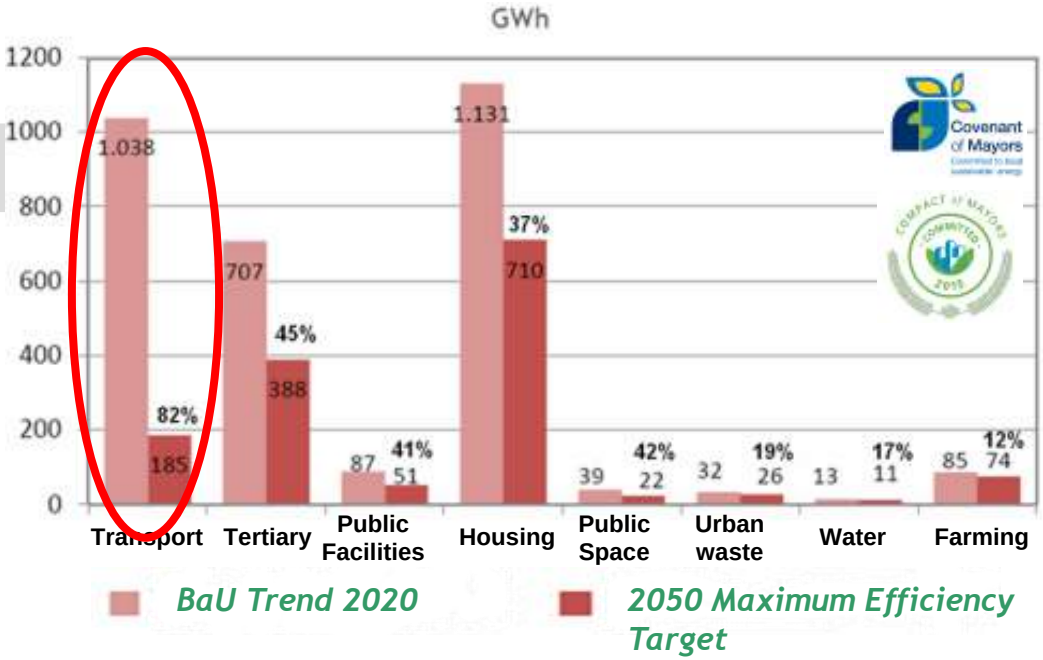
Inadequate accessibility

- *Width < 2.5 m and Slope > 5%*
- *Slope > 5%*
- *Width < 2.5 m*

Accessibility map.
Source: Sustainable Mobility and Public Space Plan of Vitoria-Gasteiz

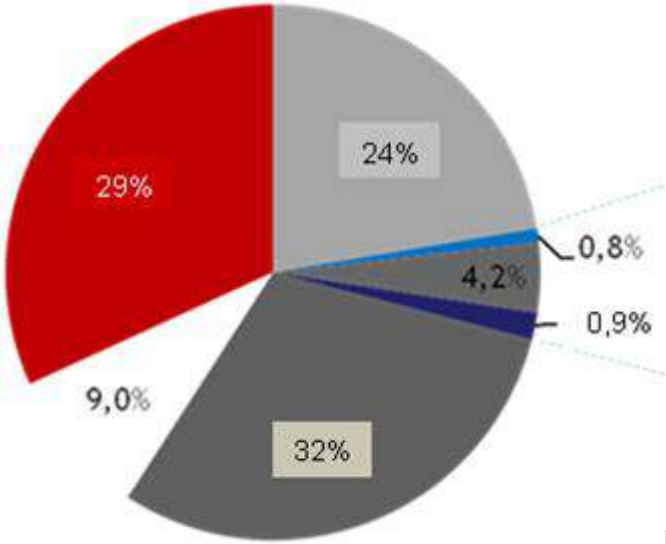
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691883

How to become a Carbon Neutral City by 2050?



Private transport:

29% of CO_2 Emissions in 2006



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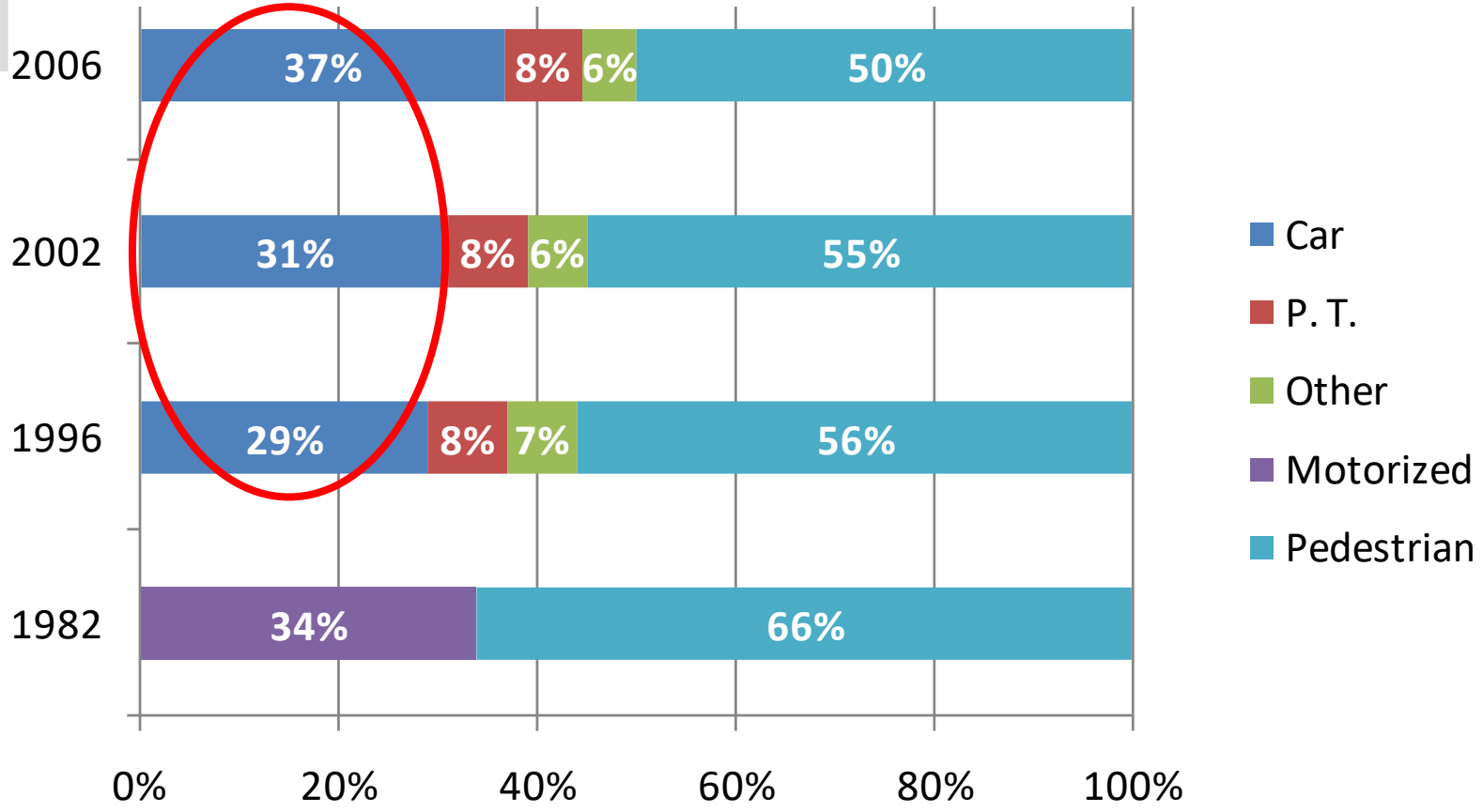
However, 2006 situation & possible trend…

Modal Split trend.
Changes in urban scale forces a quick motorization in the daily mobility



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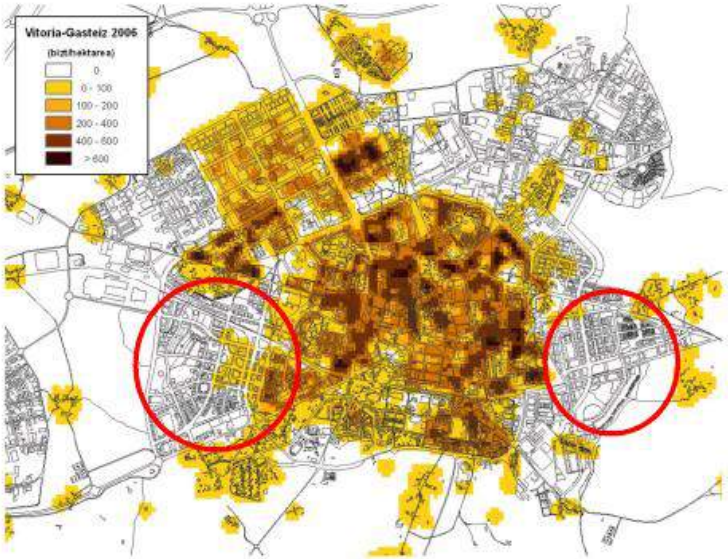
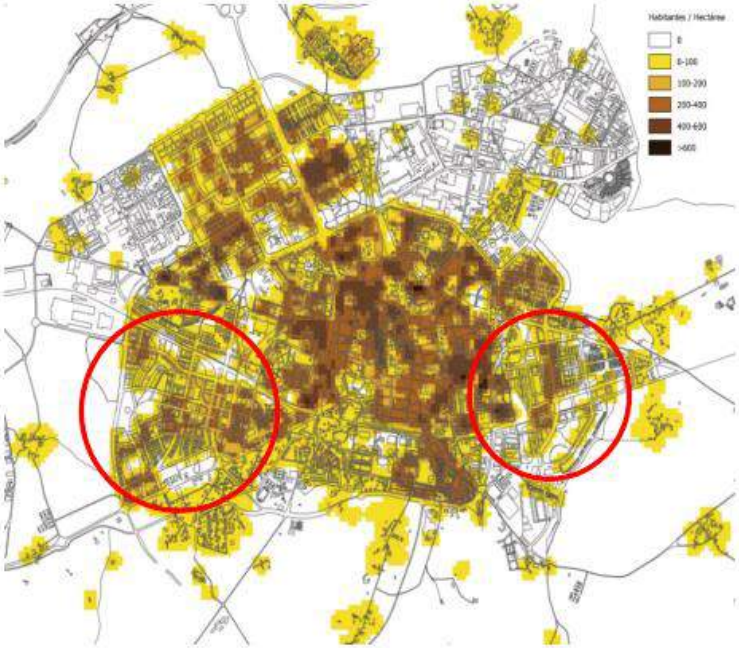
An the average trip length was to be increased…





Current Master Plan (2003) programmed a major urban development in the short to medium term. In the last decade, about 16,000 homes have been built, expanding the city in another 9 million square meters.

Population trend by neighbourhoods (2001-2013).

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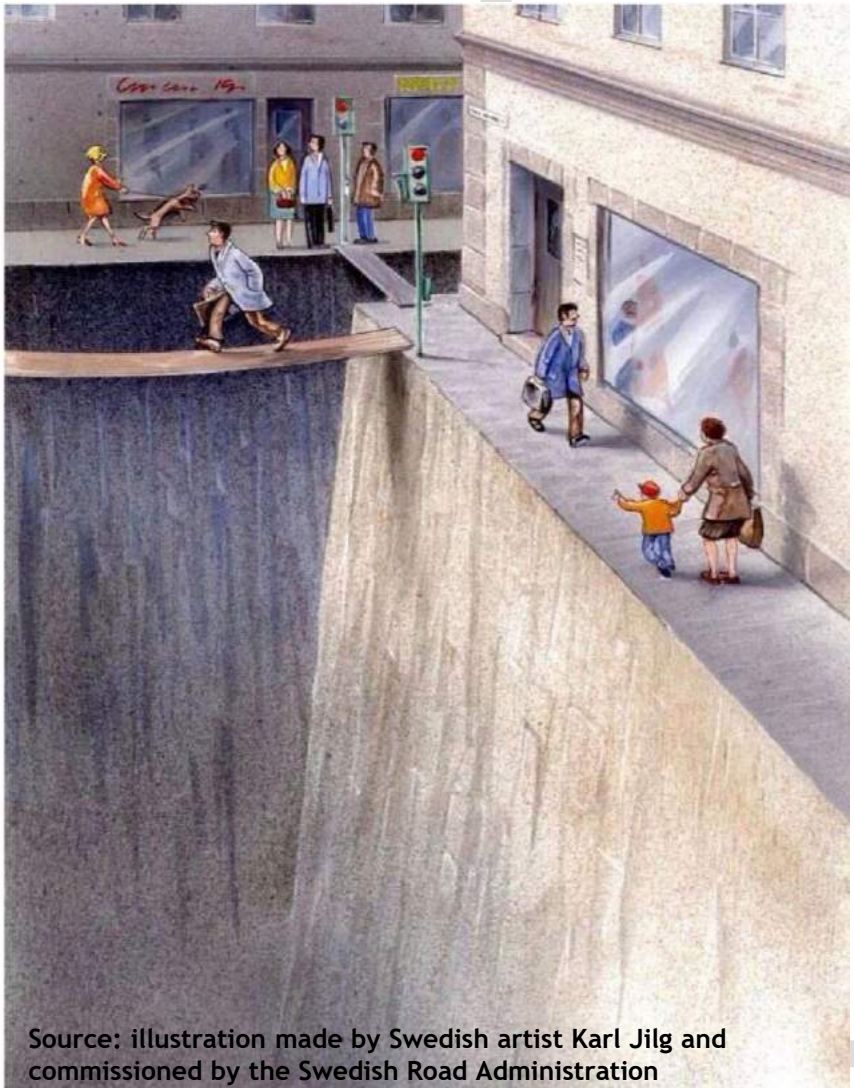
Sustainable Urban Mobility and Public Space Plan

SUMPSP was launched in 2008 (with political consensus!):
Sustainable Urban Mobility measures in Vitoria-Gasteiz + giving back the Public Space to the people

HOW?

Discouraging private vehicle use whilst, at the same time, improving public transport and promoting active mobility modes (walking/cycling)



Source: illustration made by Swedish artist Karl Jilg and commissioned by the Swedish Road Administration

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A new (improved) public transport network

In 2009 Vitoria-Gasteiz created a new bus &tram network: the old one, based on 18 bus lines, was replaced by a totally new integrated grid based on 2 tram lines and 9 bus lines (currently 10).

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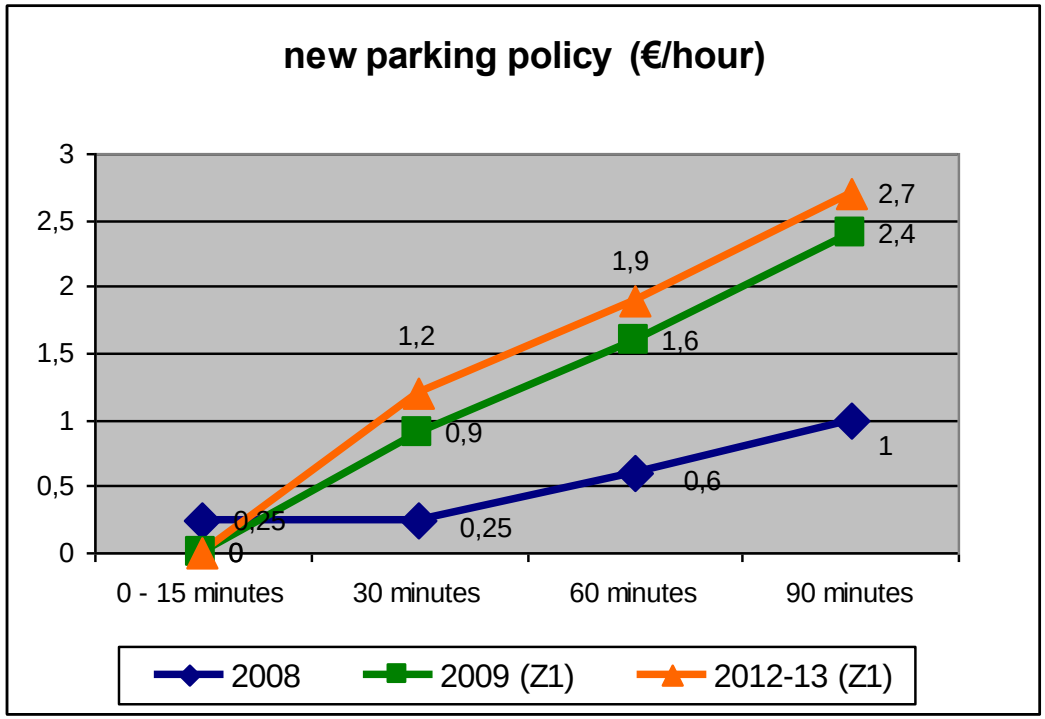
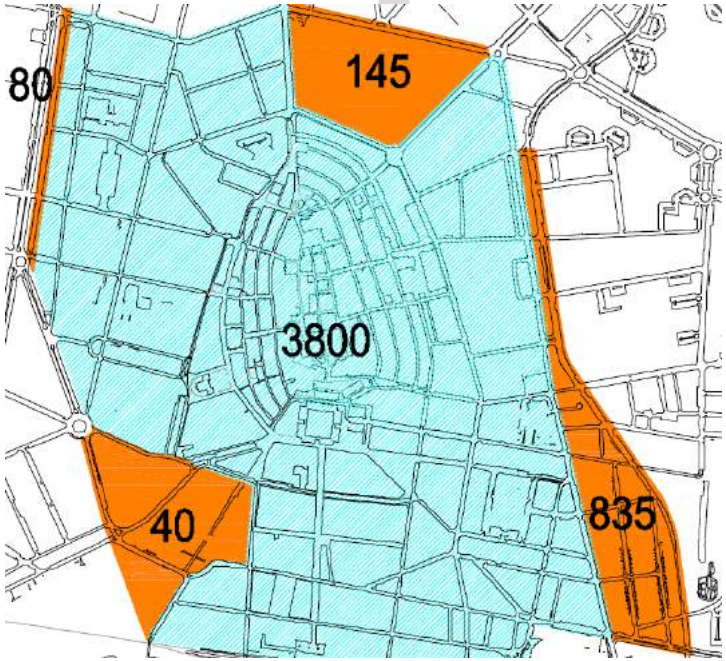
A new on-street parking policy

The very same day Vitoria-Gasteiz nearly tripled parking tariffs in the city centre (plus increased by ~30% the regulated area extension).

Higher prices:





Extended area: 29%

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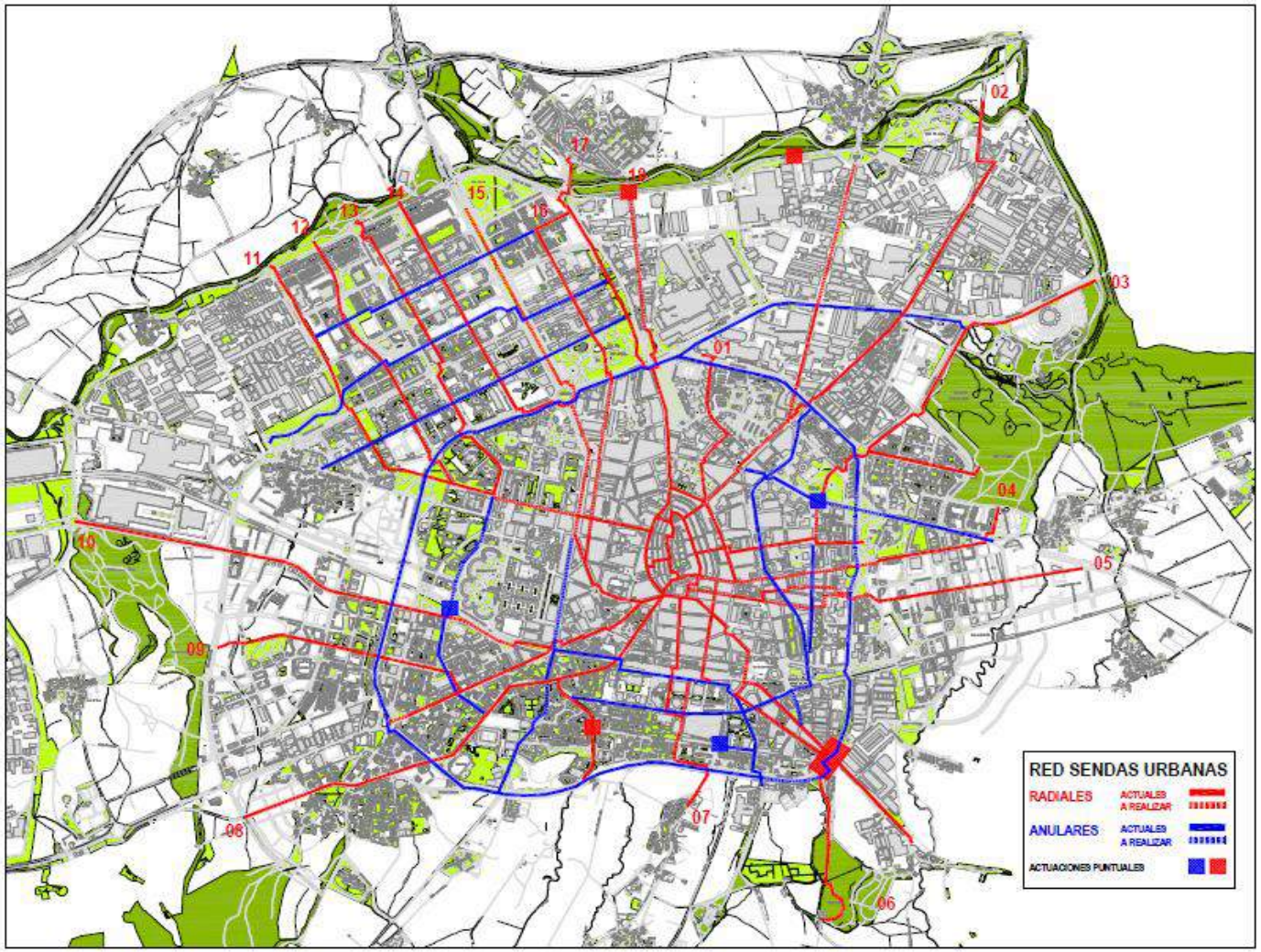
An improved pedestrian network



The car free area started in 1976!, and in 1993 reached up to 40,000 m^2. Nowadays, it represents around 0.5M m^2. Plus 33 km of urban pathways.

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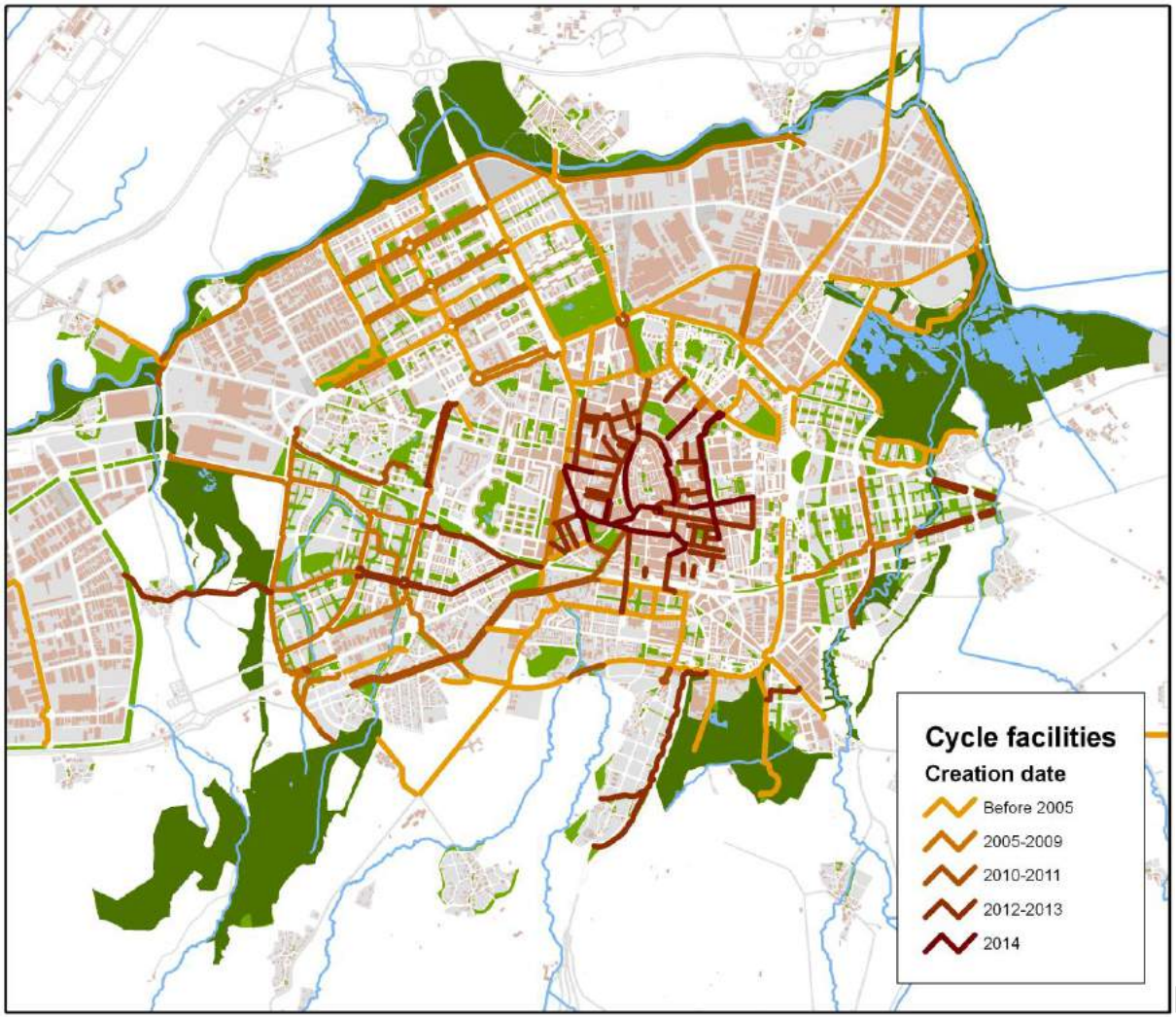
An improved bicycle network

- Improved cycling infrastructure (~140 km).
- Contra-flow cycling lanes in one way streets.
- Installation of parking lots (up to 5.000 places).
- Regulatory changes to promote cycling.
- Safe cycling courses for students and for adults.
- Traffic calming measures.



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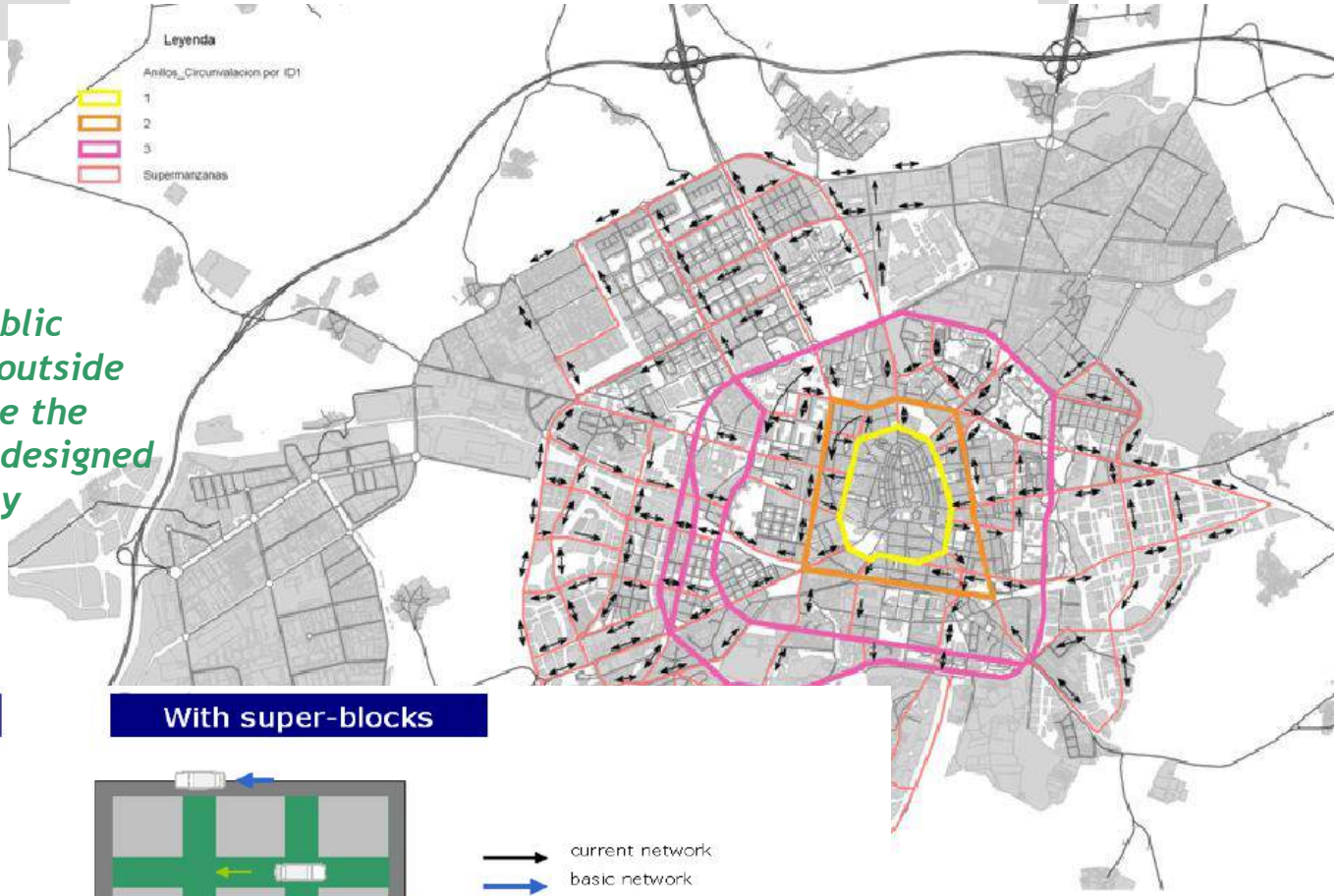
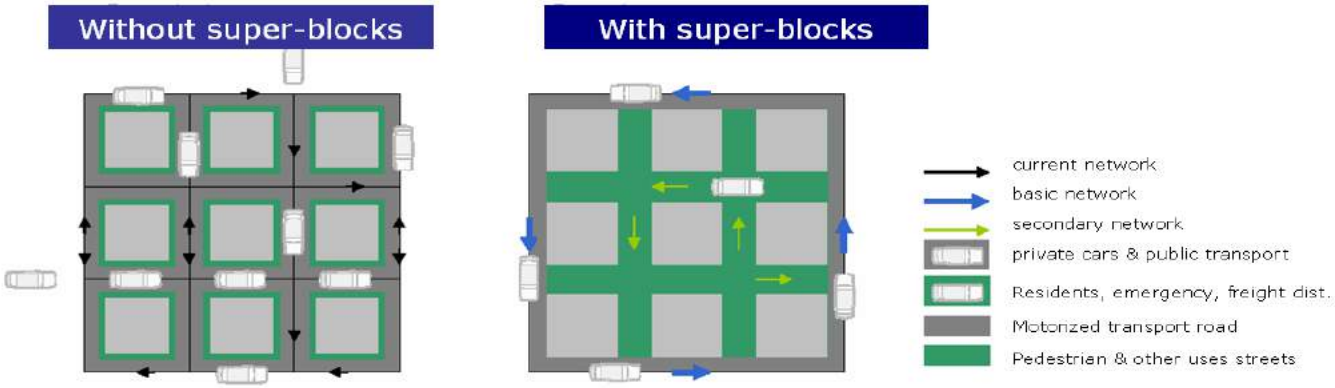
A new urban cell: Superblocks and main roads

Private cars and public transport are kept outside the superblock while the inner streets are redesigned to be mainly used by pedestrians





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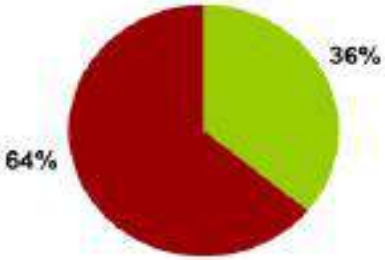
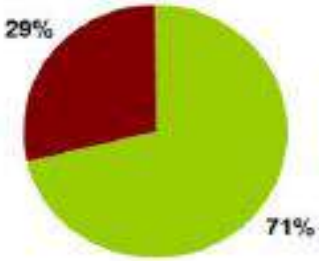
Allocation of public space

2006 Scenario



Superblocks' scenario



Public space assigned to car

Public space assigned to pedestrian

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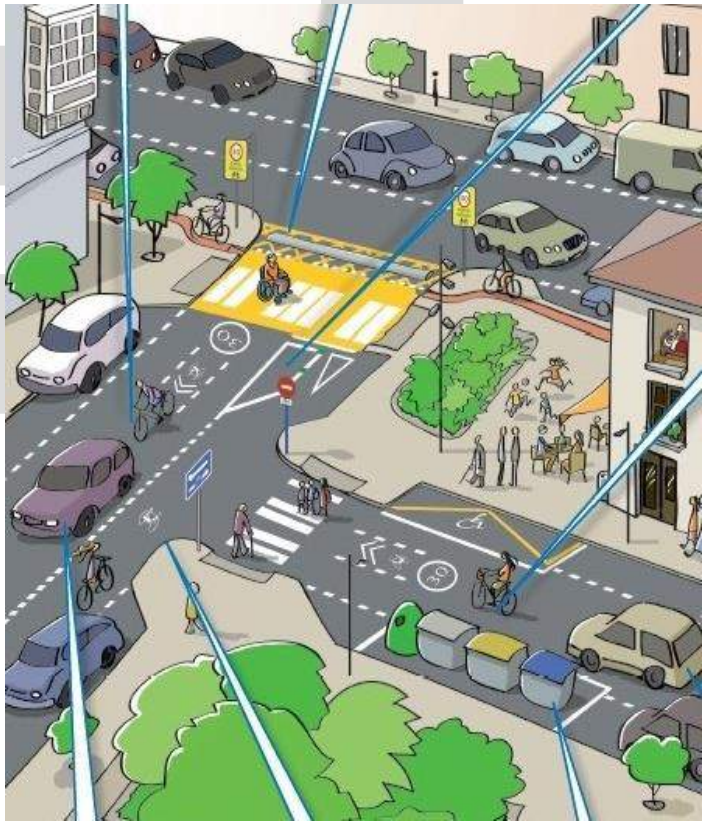
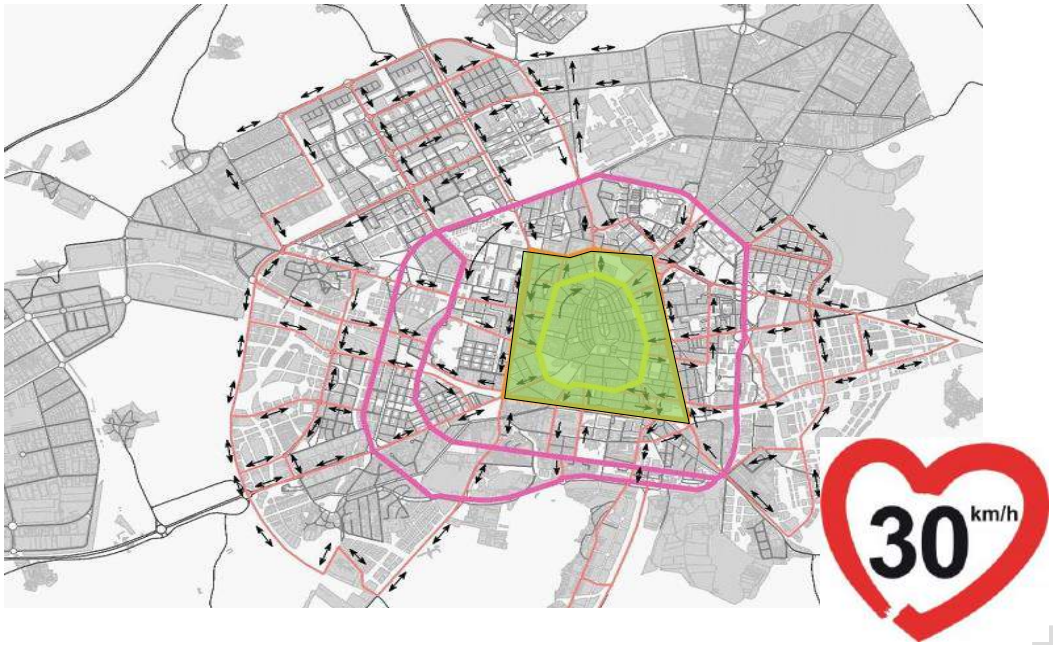
CiViTAS
Cleaner and better transport in cities
MODERN
PlanE
Plan Español para el Estímulo de la Economía y el Empleo

Traffic calming in the city centre



Traffic calming (max. 30 km/h) campaign in 47 streets of downtown with 3 objectives:

- *Improving road safety for pedestrian and cyclists*
- *Reduce emissions of pollutants*
- *Reclaim the space for pedestrians*



The measure does not end here but extends to all city.

It represents a transition (functional superblock; 30 km/h) towards the superblock scheme (10 km/h)

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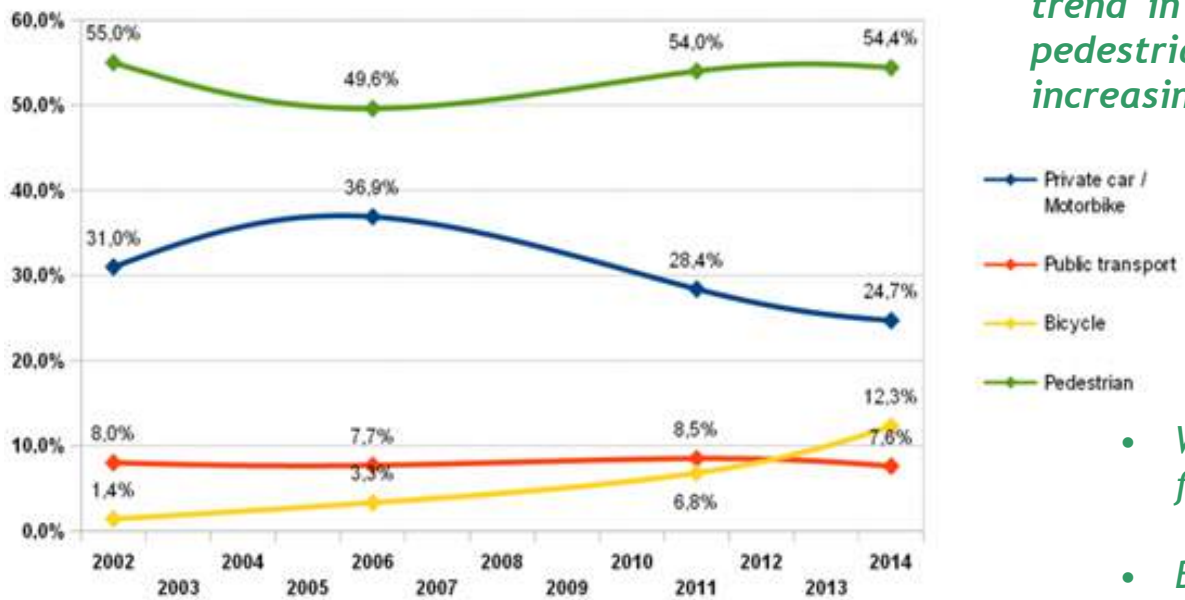
BEFORE
BAR


AFTER
BAR


30

Main figures after 8 years (2008-2016)



We succeeded in reversing the rising trend in private car use, raising the pedestrian share to 2002 levels and increasing the use of bicycle.

Trips		2006	2011	2014
GENERAL MODAL SHARE	Pedestrian	288,141	447,911	495,427
	Bicycle	19,051	56,400	111,851
	Public transport	45,045	70,854	69,491
	Car or motorbike	214,224	236,008	224,892
	Others	14,875	18,653	9,665
Trips/inhab.		*2.54*	*3.45*	*3.92*

- *Walking modal split has increased from 49.9 up to 54.4% (2002 levels)*
- *Bicycle modal split has increased from 3.4 (2006) up to 12.3% (2014; currently >13%)*
- *Private cars modal split went from 36.6% (2006) down to 24.7% (2014; last mobility survey)*

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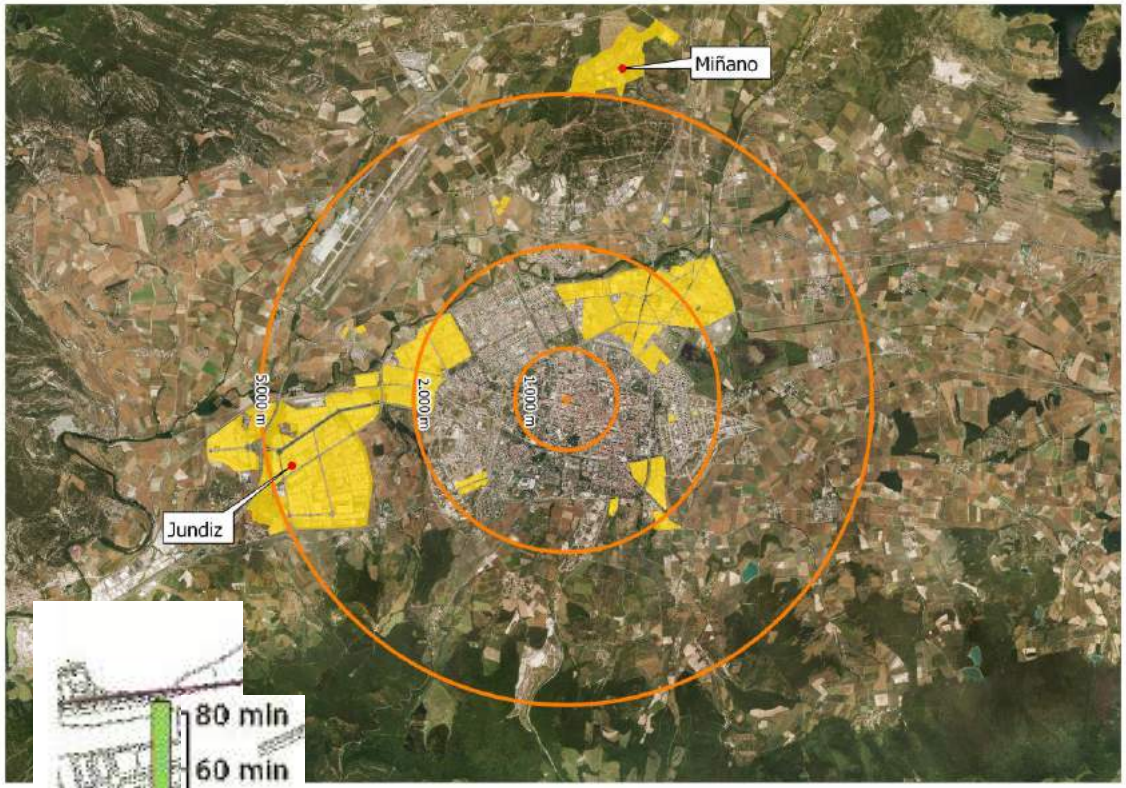
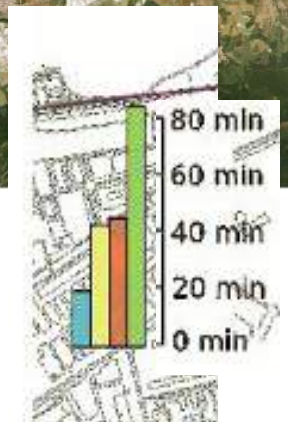
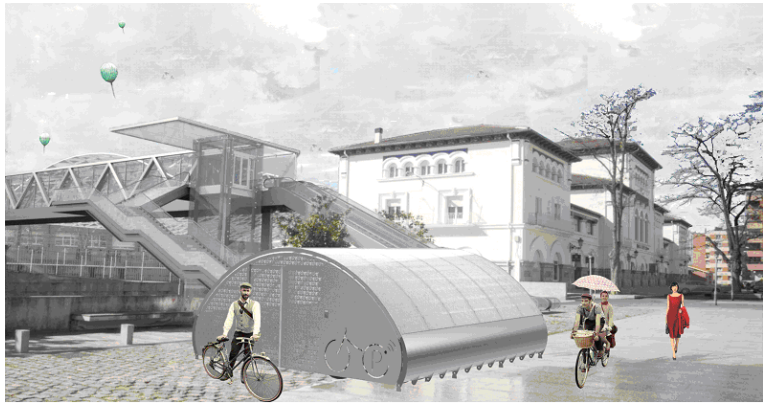
SmartEnCity: e-bike to work & safe parking







600-900 reports of bicycle theft per year (2010-2015)

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Overview of today's webinar

- Introduction to presenters and topic
- Part 1: Role of mobility system in overall system transition
- Part 2: Mobility strategy in Sonderborg – experiences and results
- Part 3: Vitoria-Gasteiz mobility transition – experiences and results
- Questions and future webinars

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Questions and future webinars

Thank you…questions?

Please write in the question box or send to: sss@planenergi.dk

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Questions and future webinars

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Questions and future webinars

Comments or recommendations for webinar topics we should address?

please email:
sss@planenergi.dk

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Questions and future webinars

You can re-watch the webinars

online at

www.smartencity.eu

→ Publications → webinars

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Questions and future webinars

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Questions and future webinars

Thank you for joining & see you!

smart city network

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