Transport and Environment
Effects, loads, interactions II.

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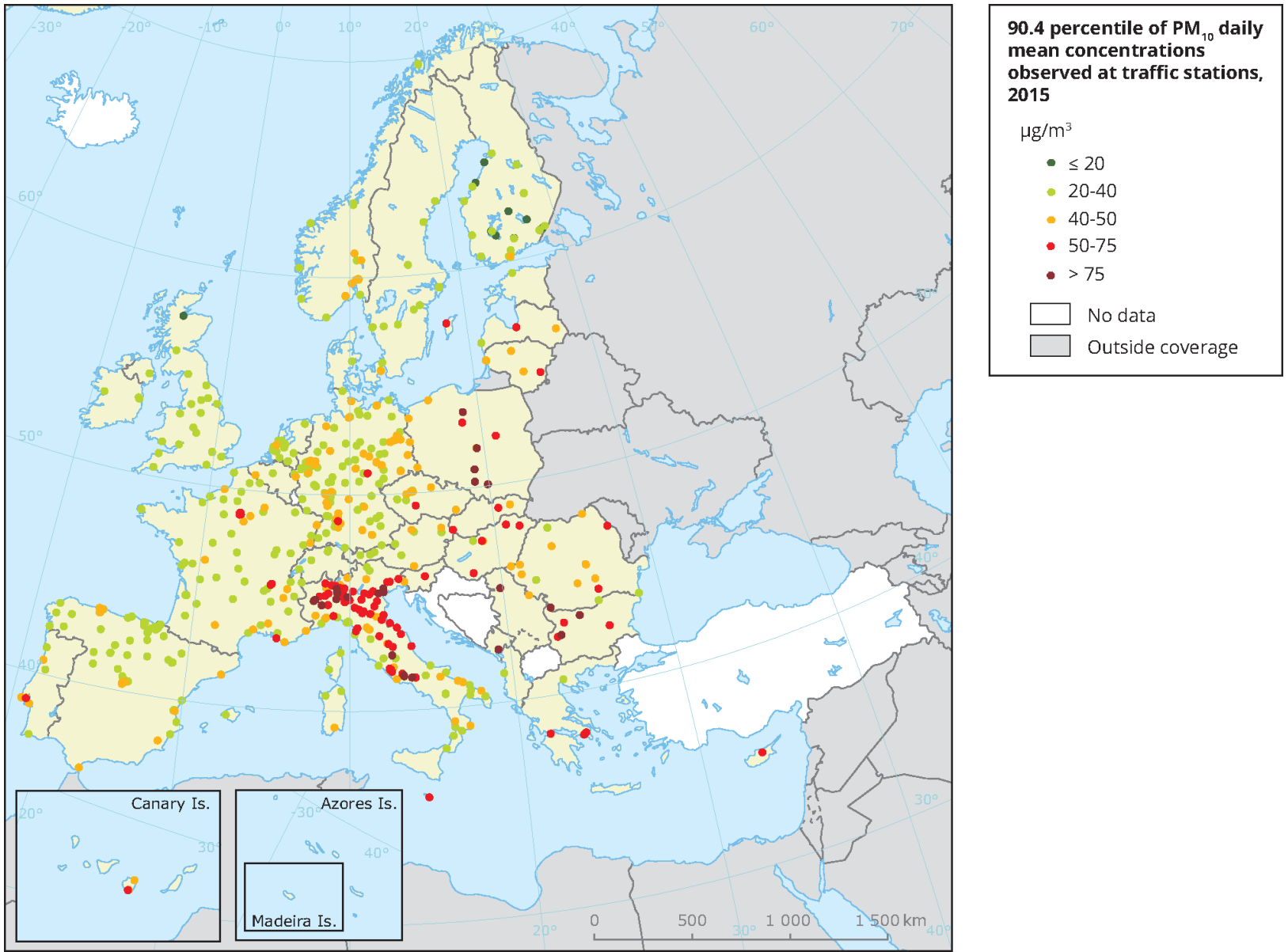
- Transport and Environment – relations, interactions, conflicts,
- Means, approaches, on sectoral levels, conflict and effect management
- Presentations, internal, and external consultations, students' abstracts
- Individual themes, literature surveys, semester paper,

Air pollution

- **Transport air pollution** is characterised, traditionally by carbon monoxide (CO), sulfurdioxide (SO_2), nitrogenoxides (NO_x), benzene and other volatile compounds, hydrocarbons (C_mH_n), fine particles emissions and concentration (PM_x), - soot, and dust -.
- Air pollution **endangers** beside human health, also built environment and agriculture, and natural environment,
- Human effects are fairly clear, here we use **indicators** for characterization of air pollution, while the harmful effects are more difficult to recognise at built, natural and agricultural environment.

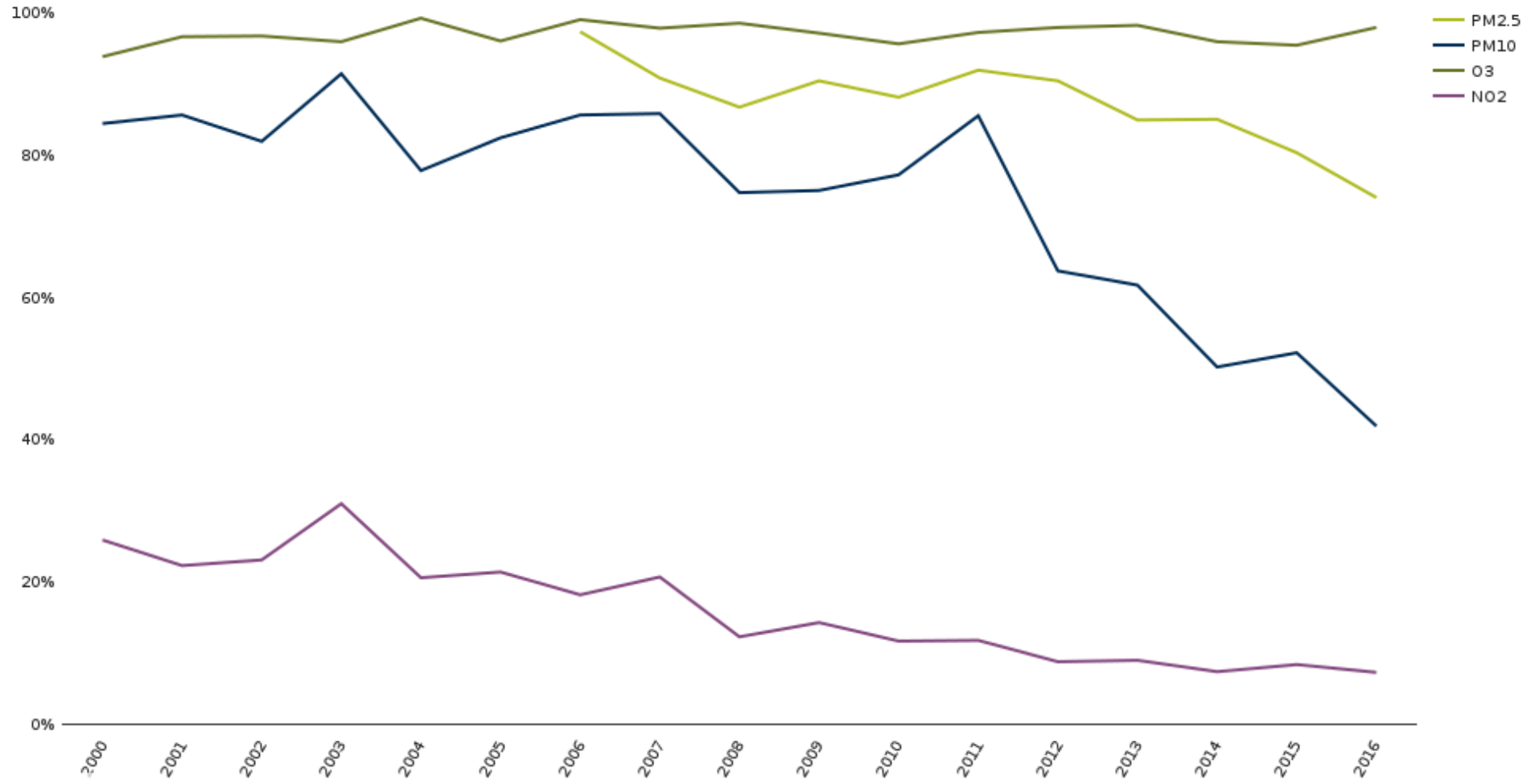
Daily mean PM10 concentrations at traffic stations. This represents the 36th highest value in a complete series. It is related to the PM10 daily limit value, which allows 35 exceedances of the 50 µg/m^3 threshold over a 1-year period. The red and dark-red dots indicate stations with concentrations above this daily limit value.



Host dust concentration – PM10 hour average – Budapest, this morning

Public health limit value: 50µg/m^3, annual average limit value: 40 µg/m^3

Chart — Urban population exposed to air pollutant concentrations above WHO air quality guidelines



European Environment Agency

Air pollution control

		Emission (kg/1000 tkm, kg/1000 pkm)		
		CH	CO	NOx
freight	rail	1	0,1	0,6
	road	13,6	2	3,7
	rail/road	**13,6**	**20**	**6,1**
passenger	rail	0,47	0,07	0,1
	road	3,5	0,55	0,47
	rail/road	**7,4**	**7,8**	**4,7**

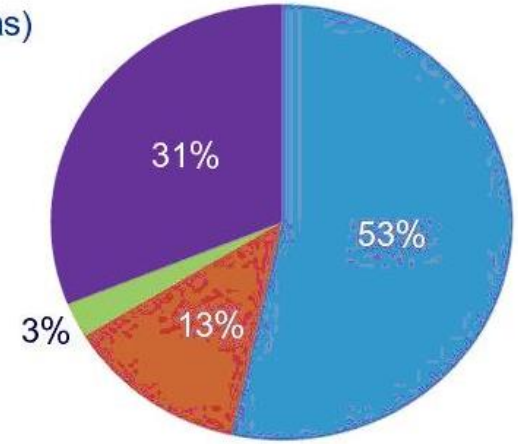
Engine, and non combustion oriented particle emission

Transport mode	Non-combustion PM_{10} emission g/vkm.	Engine PM_{10} emission rate (%)	Non-combustion PM_{10} emission rate (%)
Car	0,12	12	88
Bus	1,2	37	63
Light truck	0,21	56	43
Heavy truck	1,2	31	69
Passenger train	2	49	51
Freight train	2	61	39

Origin of Transport PM10 emissions

- Jármű eredetű (kipufogó, fék-, gumikopás)
  Vehicle oriented – exhaust, brake, tire wear
- Felkavart por
  Dust stirred up
- Útfelület kopása
  Abrasion of road surface
- Ismeretlen eredetű

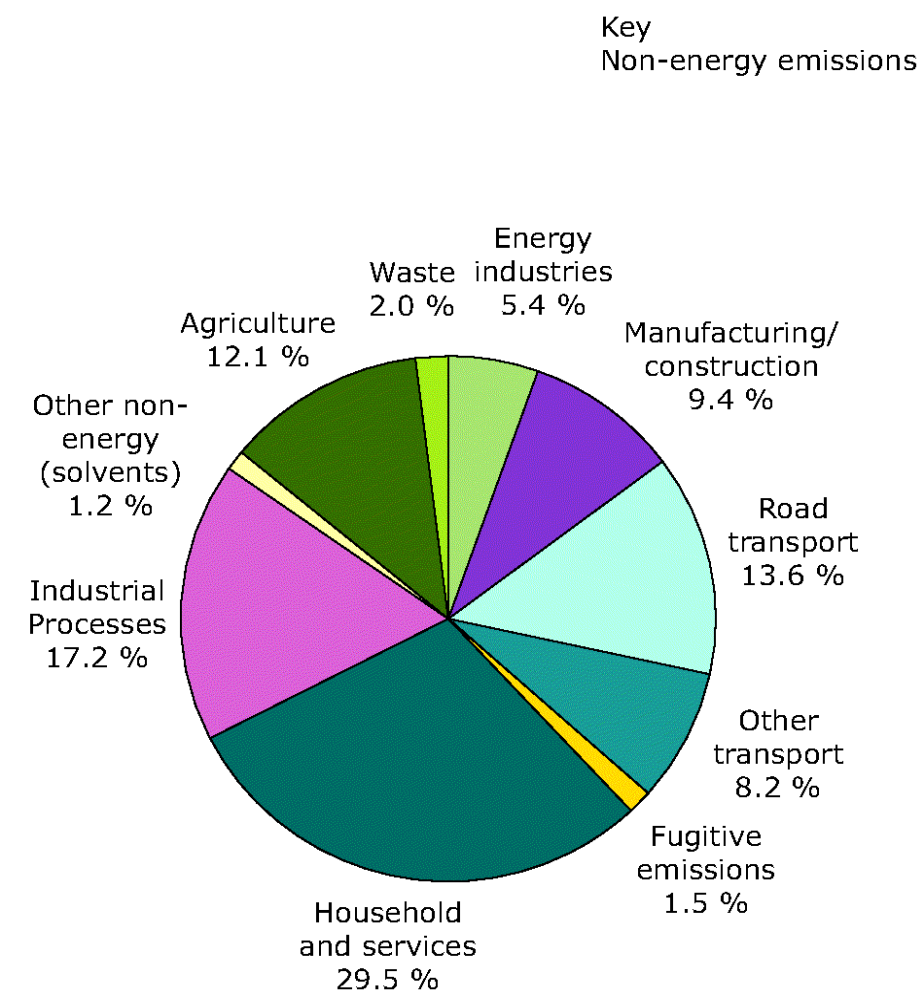
Unknown origin



The tire abrasion PM10 emission could be 5-10-times higher than combustion oriented (Euro5/6 vehicle)

PM_x emission by sectors

EEA-32 NOx PM10 (Total: 2.195 kt)



EEA-32 2008 PM2.5 (Total: 1.455 kt)

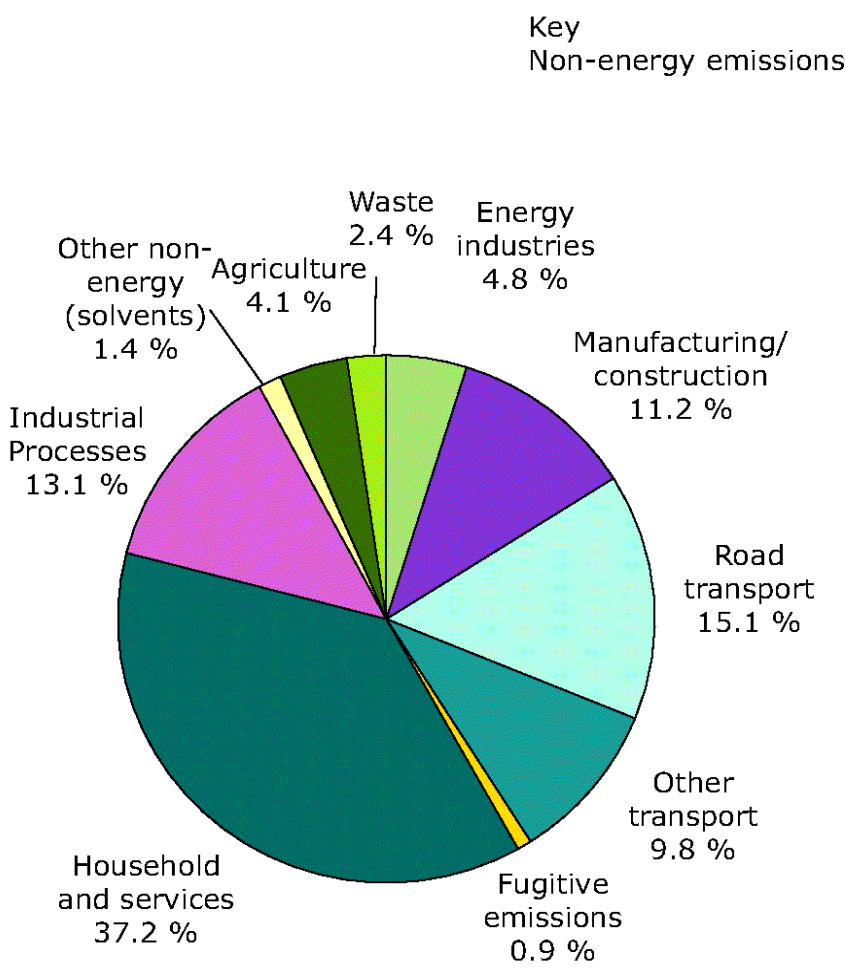
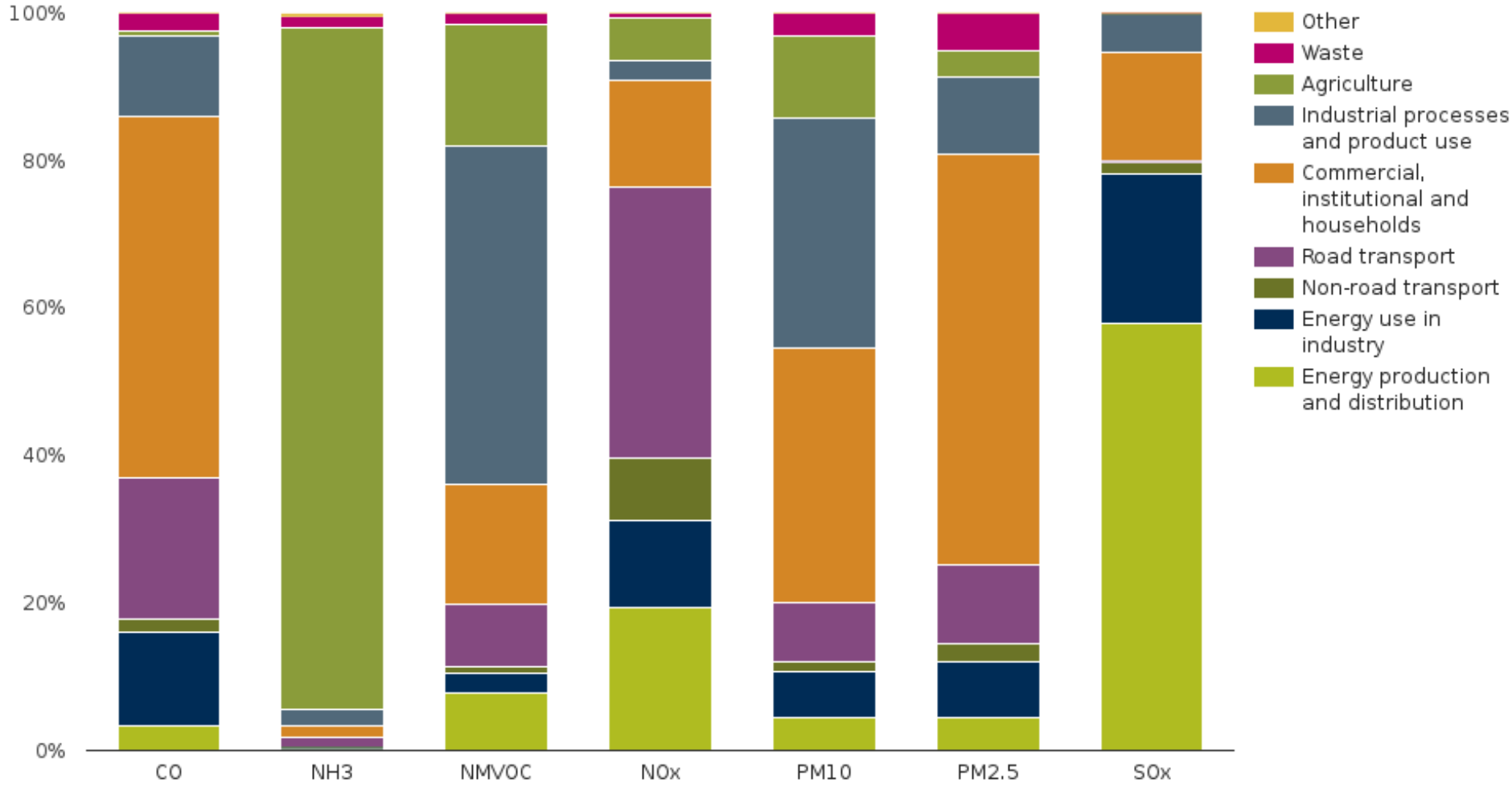


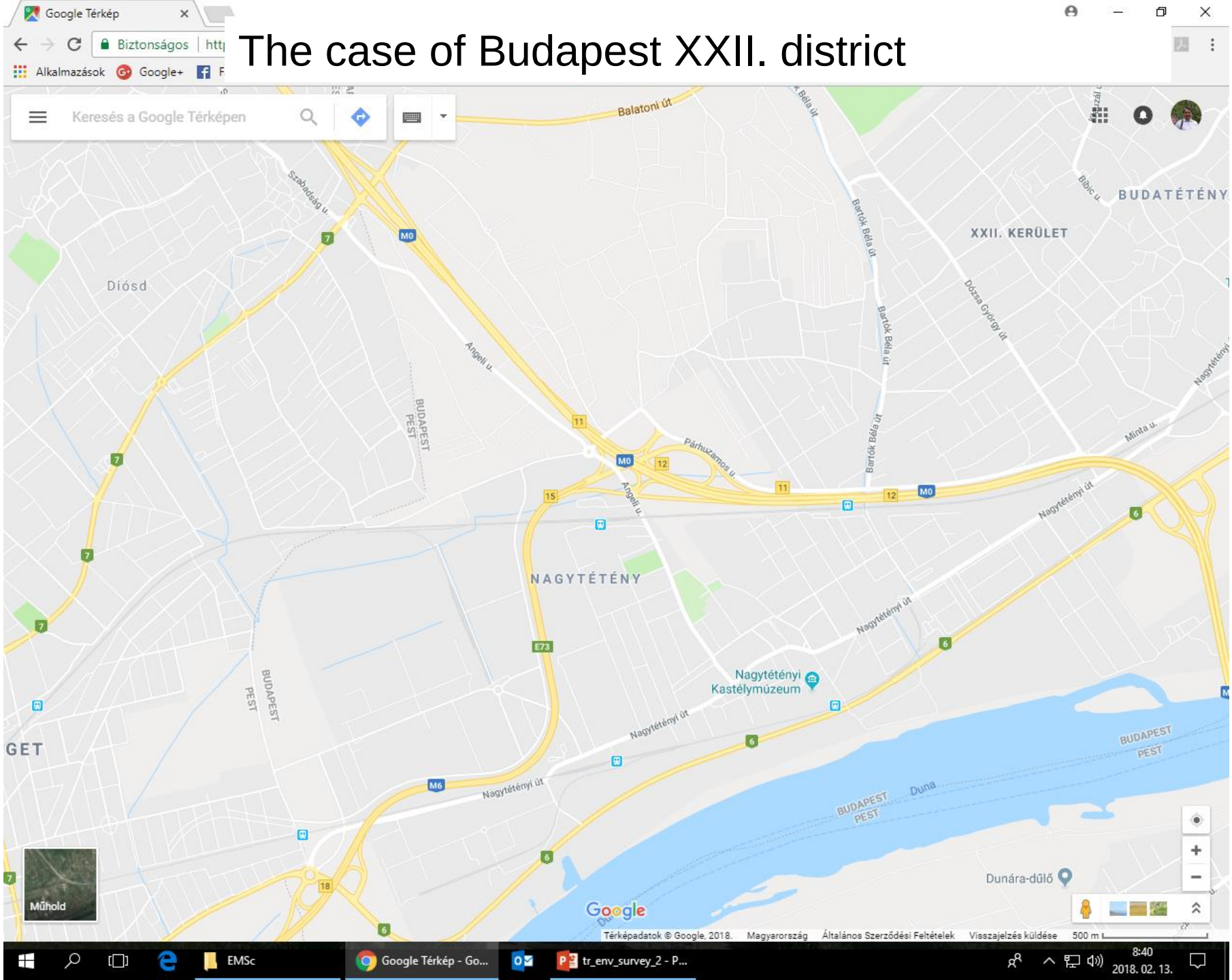
Chart — Emissions of the main air pollutants by sector group in the EEA-33



Disturbance of natural environment and landscape

- Implementation of transport infrastructure elements – roads, rails, dams, airports etc.
  - **Separation, and barrier effects**, influencing also by the use of infrastructure,
  - **Deterioration of the landscape** quality, tourism value, intact approach,
  - **Loss of nature values**, habitats, protected species,
- Effects by the **use** of the infrastructure,
  - Soil, and water pollution,
  - Accidents, emergency cases – hazardous materials' emissions,

The case of Budapest XXII. district



Passageway, overpass for wild animals, - big games - in Netherland – deers, boars, etc.

Isolation of urban areas

- Transport infrastructures have strong isolation effects in **urban regions**, particularly expressways, influencing also social connections,
- This element was in the background in the former period in urban planning, the basis of urban existence is a kind of **social coherence**,
- These considerations are indispensable at cost benefit investigations and **impact analyses.**

Lack of urban space

- Space in urban areas is a **value**, where we have often shortage, and we need it in several reasons,
- Transport use of urban areas leads to **shortage situations**, including negative social and economic impacts,
- In the case of transport development projects, this is an important **evaluating factor** at preparation and decision making.

Accidents

- Accidents are manifested as **environmental impacts**, acting by injuries of people,
- The background is an emerging **social cost**, a part of it is not covered by insurances, so the loss of production, social elements, and additional congestion, emission and other environmental loads should be calculated,

The Commission has adopted an ambitious **Road Safety Programme** which aims to cut road deaths in Europe between 2011 and 2020. The programme sets out a mix of initiatives, at European and national level, focussing on improving vehicle safety, the safety of infrastructure and road users' behaviour.

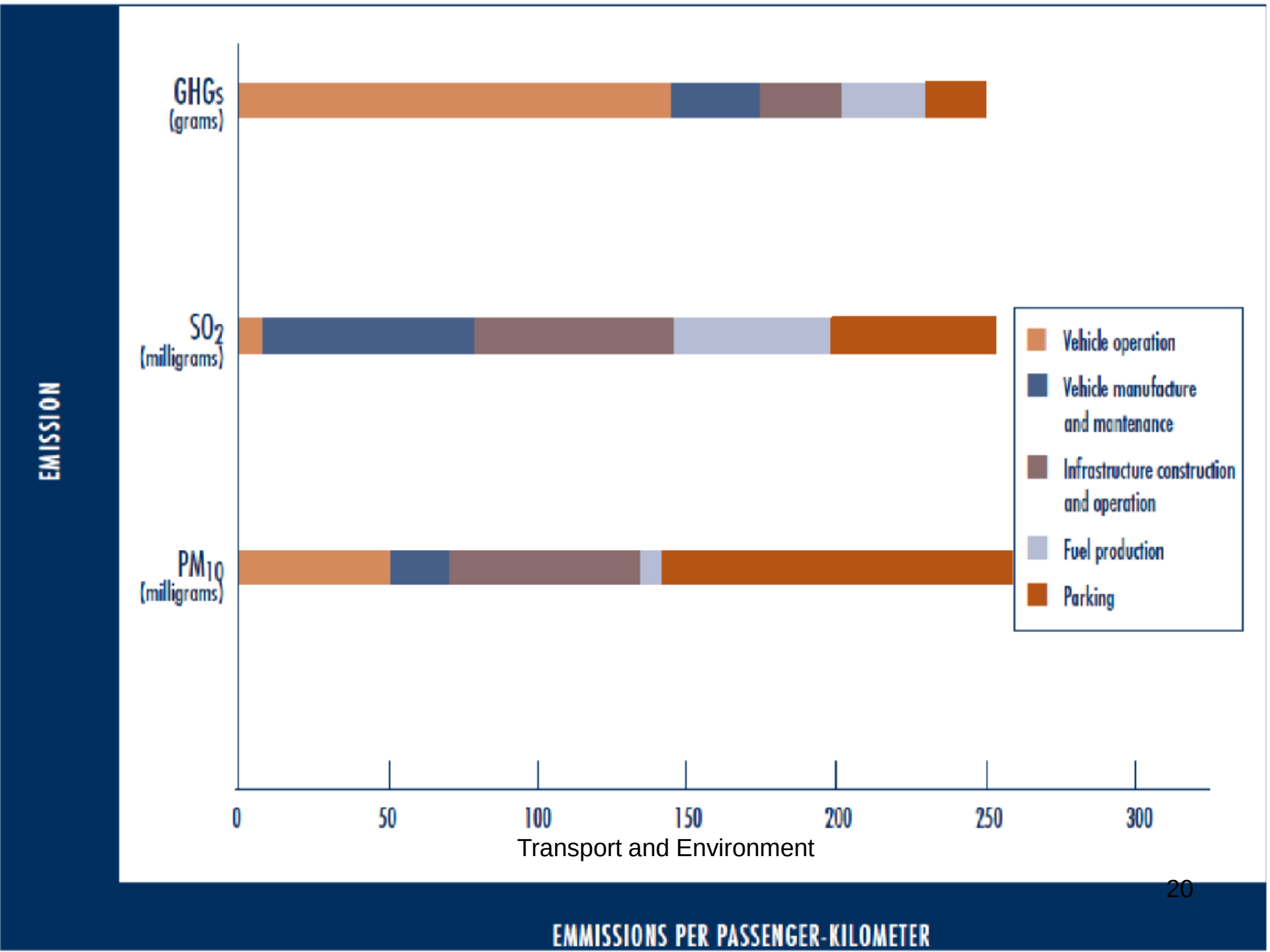
Key figures:

Road Safety is a major societal issue. In 2011, more than 30,000 people died on the roads of the European Union, i.e. the equivalent of a medium town.

For every death on Europe's roads there are an estimated 4 permanently disabling injuries such as damage to the brain or spinal cord, 8 serious injuries and 50 minor injuries.

Additional effects of background processes

- **Production of energy**, related to transport, with those vertical, additional elements, impacts effects,
- **Production** and **maintenance** of **vehicles**, by its pollution, waste emission effects,
- Construction and operation of **transport infrastructure**, significant elements of transport environmental loads are external costs of infrastructure, maintenance of existing facilities, and new developments.


EMISSION
GHGs
(grams)
SO2
(milligrams)
PM10
(milligrams)
Vehicle operation
Vehicle manufacture and mantenance
Infrastructure construction and operation
Fuel production
Parking
0
50
100
150
200
250
300
Transport and Environment
EMMISSIONS PER PASSENGER-KILOMETER

Basic principles of management of environmental loads

Emphasizing the basic methods and principles of ecological economics:

- **The supplementary character of nature and economy,**

The nature could not be subordinated to economic advantages, on a long term,

- **The irreversible approach,**

The nature can not be utilized temporarily, and later converting to an environmental friendly approach, the destructions could not be fully compensated,

- **The holistic approach**,

The ecologic and economic systems are complex ones, and could not be separated in small units, optimized, by elements,

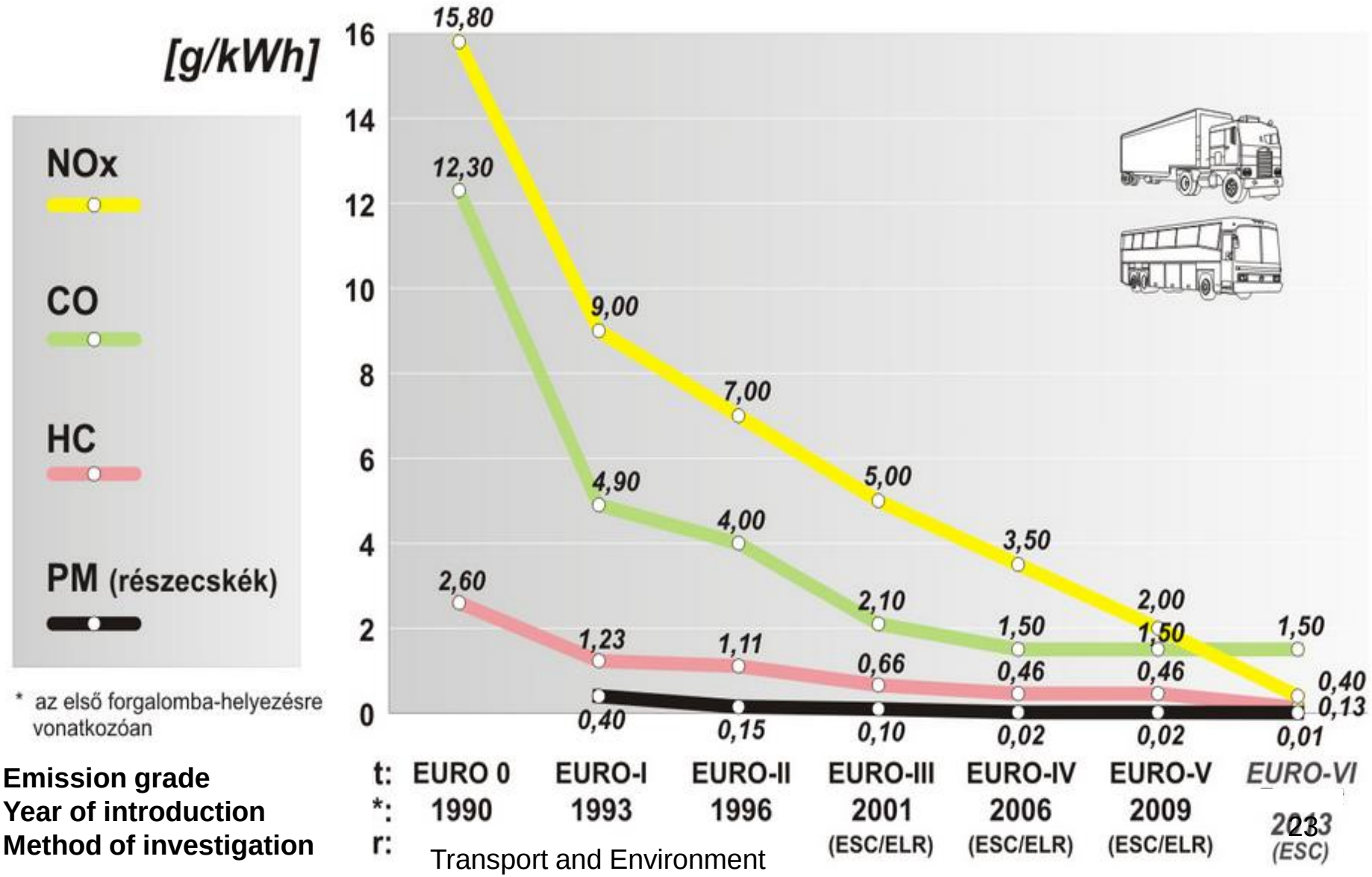
- **Dynamic feedback**,

Important factor is the investigation, analysis, and identification of ecologic and economic systems' motivating elements, factors.

Instruments of management of environmental loads

- The **mission of environmental protection** is the safeguarding of the society from serious losses, of unknown probability,
- It could be assisted by determination of **safe limit values**,
- The extremely strict limit values could have negative impacts on the economy, even endangering the population's well being, while the loose limits can lead to **environmental risk**s,
- The limit values, and emission levels have been developed in the recent years, in the frame of **WHO and IPCC** (public health and climate protection) beside other efforts.

The emission aspect:
Emission limit values of heavy road freight vehicles



Emission grade
Year of introduction
Method of investigation

Environmental law, and regulations

- The basis of the European legislation is the Treaty of Rome (1956) and its amendment, the Maastricht Treaty (1994), followed by **recommendations, directives** supervised and followed by the European Commission,
- A good sample is on the field of Transport, the Directive 85/3850, regulating the environmental **impact assessment** of certain **transport development projects**, and the elements of the TEN-T network are subjects of comprehensive impact assessment, also on corridor, network level, in a more complex approach,

Management, and approaches of environmental impacts, on economic basis,

Welfare approach

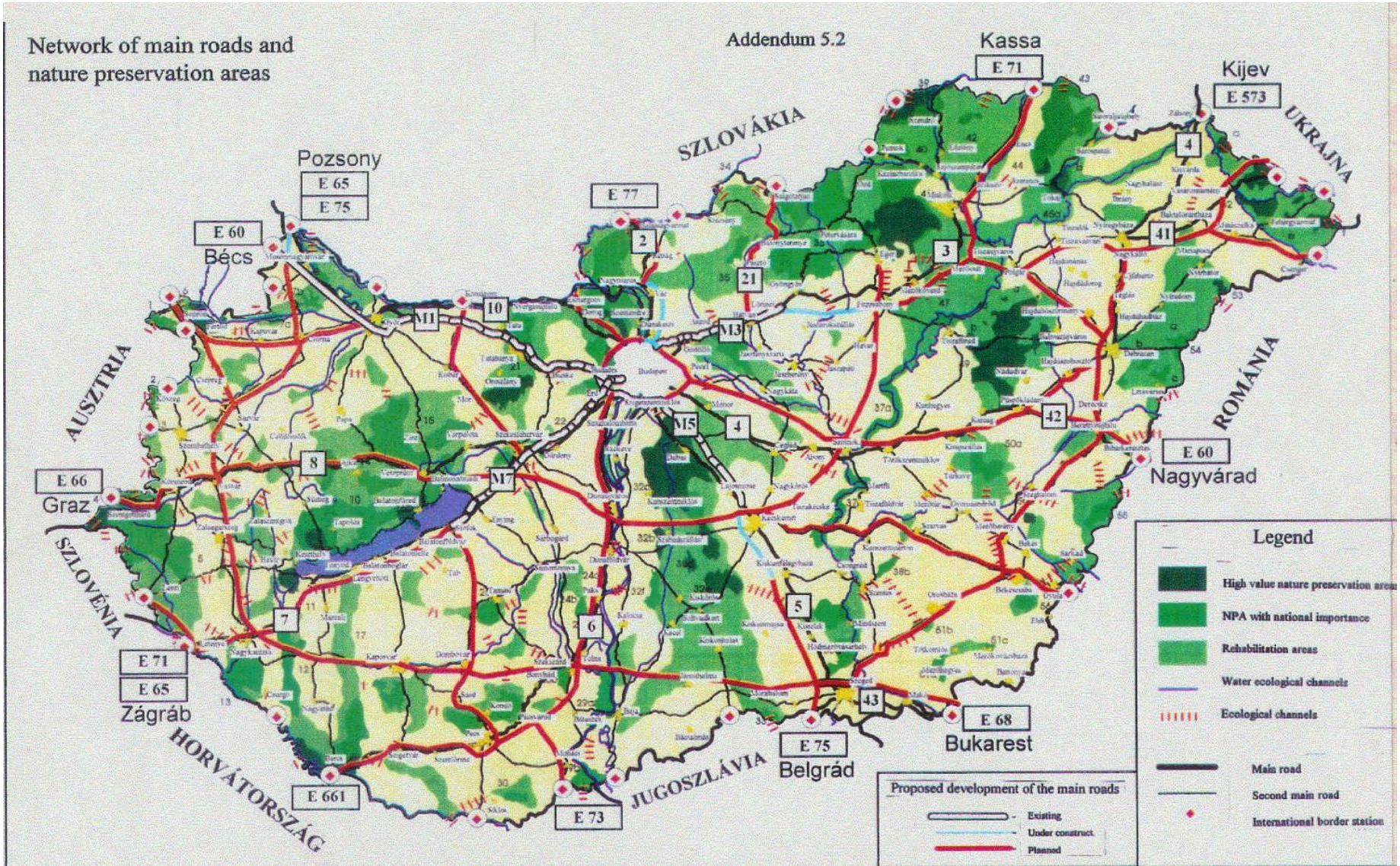
- The environmental impacts and damages are predictable, by a high probability and reliability, those basic elements:
  - The material and production goods, and the environmental, human resources are **interchangeable**, and are **replaceable** by each other,
  - The social values are also **expressible by market prices**, so also the environmental costs,
  - The changes in environmental resources could also be **expressed by financial notions,**

Management, and approaches of environmental impacts, on economic basis,

The basis of **the risk approach** is more oriented to ecological economics, where the **precautionary** approach is dominating,

- **Risk spreading**. Like the management of public transport systems, which is naturally lossmaking, but the risk is shared on the level of the society, a public burden.
- **Insurance approach**, for the management of the accident and emergency cases, the calculation contains the compensation of injuries, with stimulating and premium elements,
- **Precautionary approach**, we can guarantee, long term sustainable economic and social systems by safe **emission and load levels**, values.

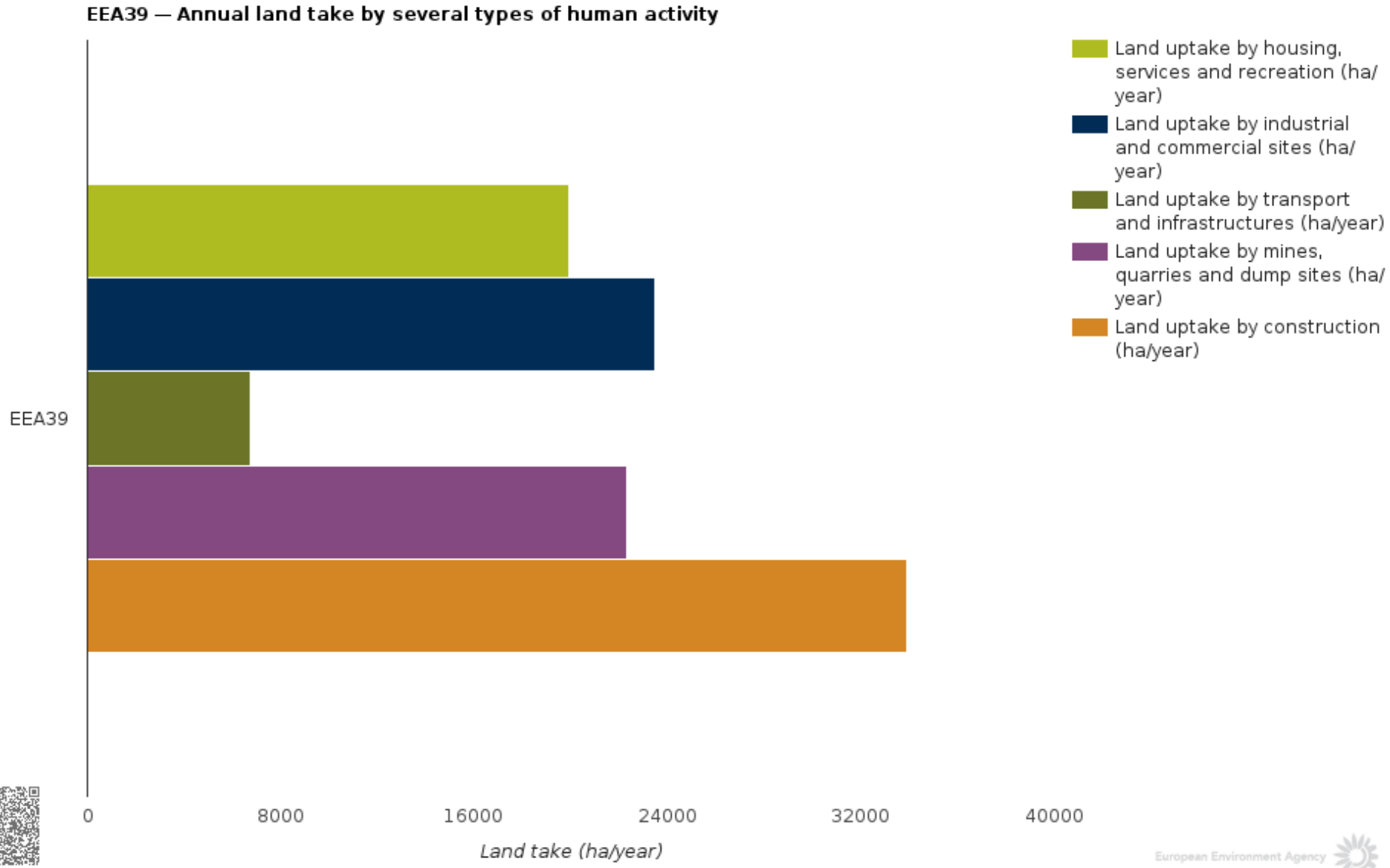
Relation of protected areas and the highway network development plans



Land use - efficiency

Here we should also calculate an additional 200-200 m wide area with increasing air and noise pollution, the soil is one of the most valuable resources, which is irreplaceable. In the case of rail, the existing network should only be rehabilitated.

European land use tendencies



European Outlook

WHITE PAPER 2011 - 2020

Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system

COM(2011) 144 final

White Paper

- The European Commission adopted a roadmap of 40 concrete initiatives for the next decade to build a competitive transport system that will **increase mobility, remove major barriers (!)** in key areas and fuel growth and employment.
- At the same time, the proposals will dramatically reduce **Europe's dependence** on imported oil and cut carbon emissions in transport by 60% by 2050.

By 2050, key goals will include:

- No more **conventionally-fuelled cars** in cities.
- 40% use of sustainable low carbon fuels **in aviation**; at least 40% cut in shipping emissions.
- A 50% shift of medium distance intercity passenger and freight journeys **from road to rail** and waterborne transport.
- All of which will contribute to **a 60% cut** in transport emissions by the middle of the century.

Vision – the transport system

- **Transport**: employs 10 million people and accounts for about 5% of GDP.
- „**Resource efficient** Europe”, less and clean energy use, decreasing ecosystem effects,
- **New mobility models**, individual mobility - use of cars - only on the last km-s, by clean vehicles,
- The users pay the **whole costs** of transport,

Vision – the transport system

- **Multimodal** logistic chains,
- **Traffic management** and information systems (ITS, SESAR, ERTMS, SafeSeaNet, RIS)
- **Integrated European Rail Market**,
- Medium, long distance and urban **levels – of mobility,**
- Road freight only **until 300 km**, + engine and fuel technologies,

Vision – the transport system

- **Fair competition of transport modes –** passenger and freight – optimized airport capacity and high speed rail network,
- **Clean urban transport and commuting** – gradual phasing out of conventionally powered vehicles form the urban environment, network density, land use planning approaches + facilitating walking and cycling as integral part, low emission city logistics,

TEN-T Problems

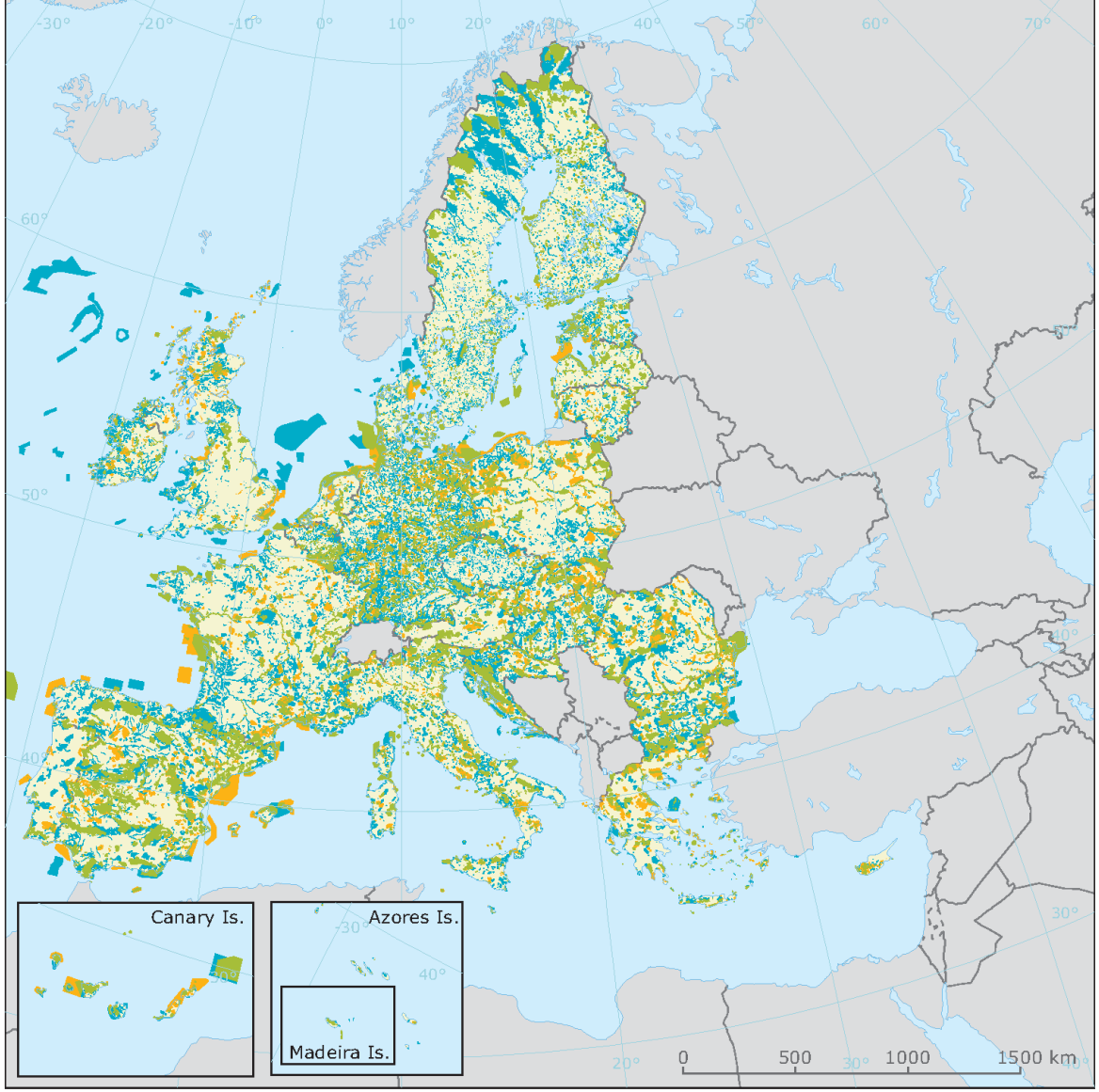
- **Over investments** in transport infrastructure,
- Good use of **taxpayers' money**?
- Individual calculations **correctness**?
- Really needed „**Elephant" project** ?
- Costs **under estimated**,
- Benefits **over estimated**,

TEN-T Problems

- More transport infrastructure, **more traffic growth,**
- Declining **Socio-economic benefits**,
- Local **economic cycles**' destruction,
- Growing **energy demand** and environmental loads from transport,
- **Conflicts** with landscape planning, nature conservation and cultural heritage,

Requirements

- **Full SEA** for the whole network,
- **Local networks**' priorities,
- Real **cost-benefit** analysis,
- **NATURA 2000** needs, integration into TEN-T
- NO EIB special fund until full **access** to information and environmental procedures,

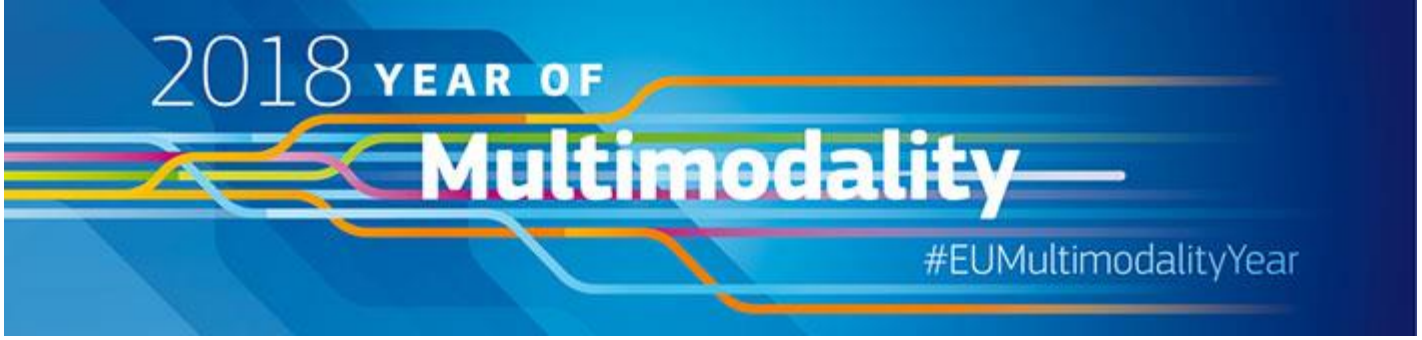


NATURA 2000

- Sites–or parts of sites–belonging to both Directives
- Habitats Directive sites, pSCI, SCI, SAC
- Birds directive sites (SPA)
- Outside coverage

European Environment Agency

NATURA 2000



- Background: reduction of CO_2 emissions, congestion and air pollution,
- The **Paris Climate deal**: a long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels,
  - comprehensive **national climate action plans** to reduce their emissions,
  - every 5 years to set **more ambitious targets** as required by science,
  - support climate action to reduce emissions and build resilience to climate change impacts in **developing countries**.

Multimodality

- the use of **different modes** (or means) of transport on the same journey,
- driven on by the growing trend towards **digitalisation**,
- taking advantage of the **strengths** of the different modes, such as convenience, speed, cost, reliability, predictability, etc.
- easing the pressure on **congested roads**, and making the whole sector more **environmentally friendly**, safer, and cost efficient.

Key thematic areas - multimodality

- **Digitalisation** with focus on the electronic transport documents, digital corridor information systems and multimodal travel information and ticketing;
- The use of **economic incentives** to promote multimodality and internalisation of external costs;
- Support to **multimodal infrastructure**

  and **innovation**, physical and digital,
- **Passenger rights** in multimodal journeys;
- The promotion of '**active mobility**' integrated with other modes in particular in an urban and smart cities context.

Proposed subjects to semester paper, essay work:

- Decision problems and methodology for infrastructure development projects,
- Opportunities for soft mobility issues, walking and cycling, in urban suburban areas,
- Urban parking, and P+R systems, models, policies,
- Alternative vehicles, and driving modes, new sustainable fuels,

- Demand management approaches in transport systems, road prices, parking fee systems,
- Management of transport oriented noise pollution, regulations, active and passive methods,
- Preference of public transport in urban traffic, regulations, environmental and social benefits,

- The real costs of transport, internalisation of externalities, environmental efficiency,
- Regulation of road freight transport, traffic calming, charging systems, management of environmental and infrastructure impacts,
- Traffic calming and demand management, tools, environmental efficiency,

- Suburban transport, commuter traffic issues, energetic, land use, regional development issues, the role of rail, environmental efficiency,
- Regulation methods of urban freight transport, city logistics, technical and regulating tools,
- Certain elements, of transport safety, passenger and freight transport, active and passive methods, regulations, tools, technologies.

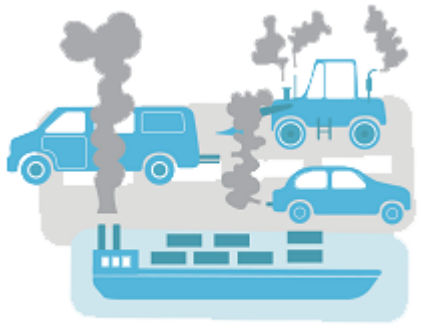
http://kukg.bme.hu/eng/study/msc/bmekokum210/

Lecture and other materials available on the Department's website

Further materials, like:

https://www.transportenvironment.org/what-we-do/air-pollution
https://www.eea.europa.eu/themes/transport/indicators#c7=all&c5=all&c10=TERM&c13=20&b_start=0

Currently: Air Pollution Campaign at T&E



- **Why is air pollution so important?**
- An adult breathes between 17,000 and 30,000 times a day. When we breathe polluted air pollutants get into our lungs; they can enter the bloodstream and be carried to our internal organs such as the brain. This can cause severe health problems such as asthma, cardiovascular diseases and even cancer and reduces the quality and number of years of life.
- Polluted air also causes eutrophication and acidification of our ecosystems, which result in the loss of agricultural productivity, irreversible damage to ecosystems and the loss of biodiversity. Last but not least, air pollution causes severe damage to our cultural heritage by degrading architectural masterpieces that are part of the European identity.