echoes

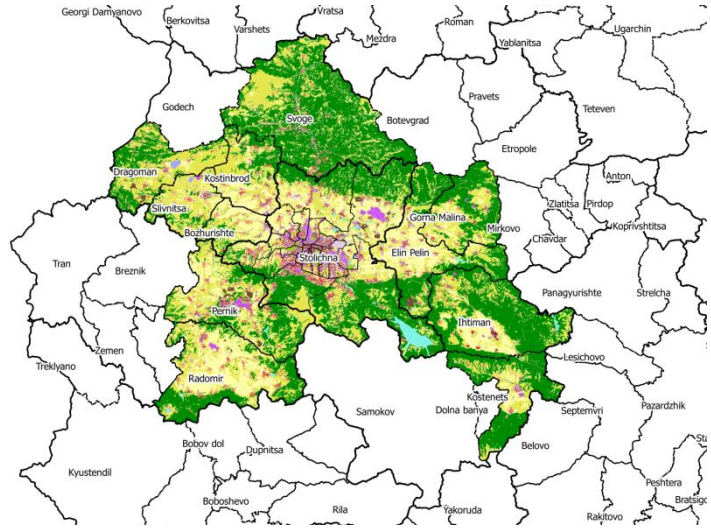
Leibniz Institute of Ecological Urban and Regional Development

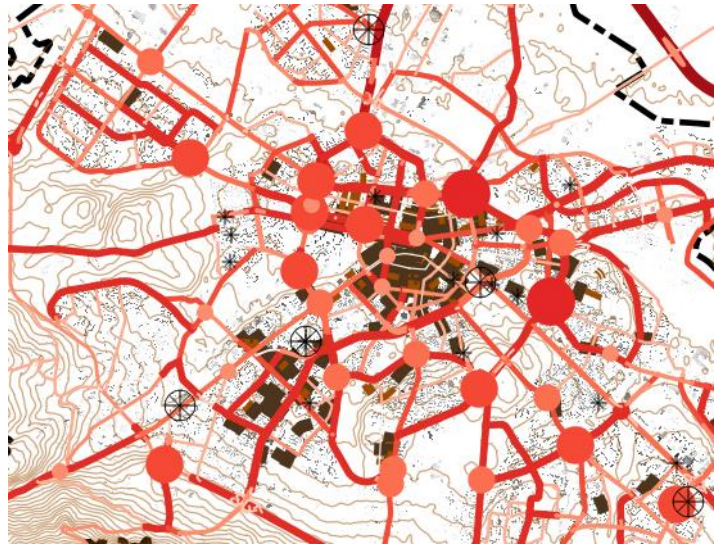
spa-ce.net
Network of Spatial Research and Planning in Central, Eastern and South Eastern Europe

SPECTRA Centre of Excellence

UNIVERSITY OF ARCHITECTURE CIVIL ENGINEERING AND GEODESY

SOFIA FUNCTIONAL AREA'S SUSTAINABLE MOBILITY PATTERNS AND INTELLIGENT TRANSPORT SYSTEM IN THE AIR QUALITY LIVABILITY AND RECREATION PERSPECTIVES





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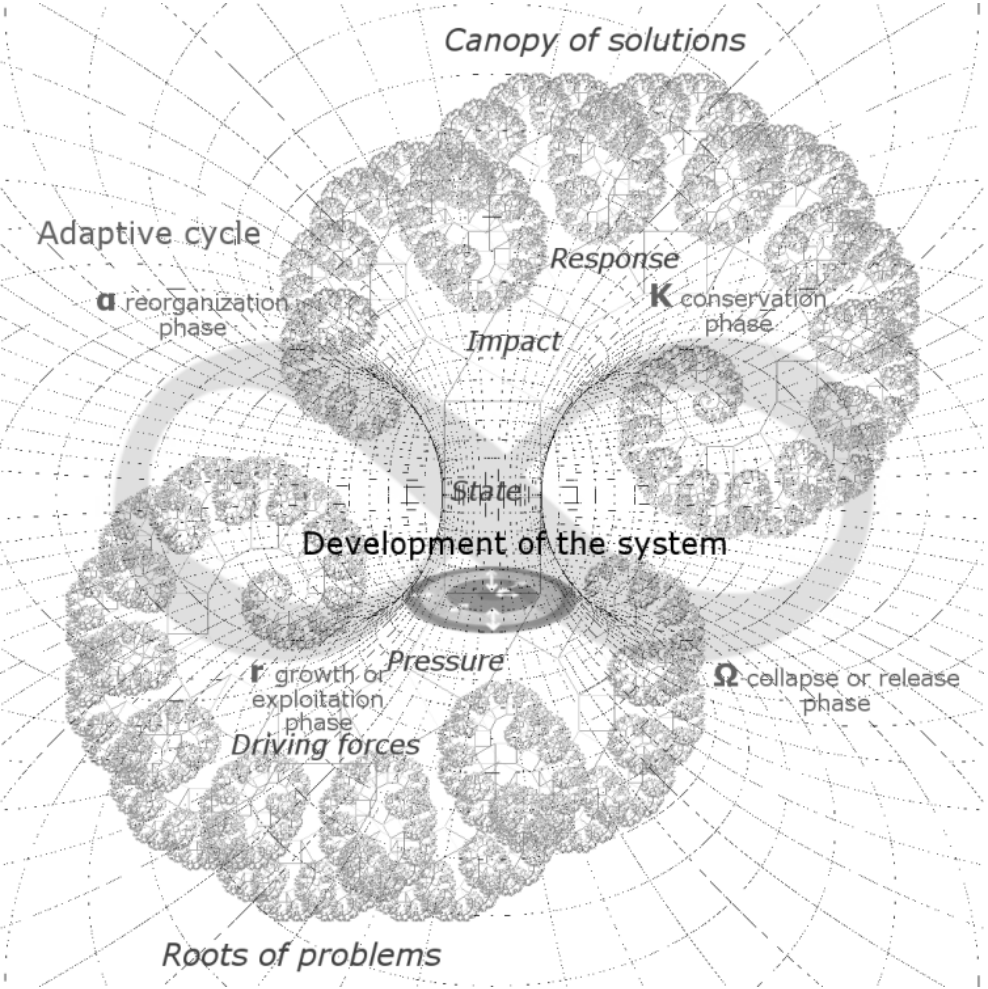
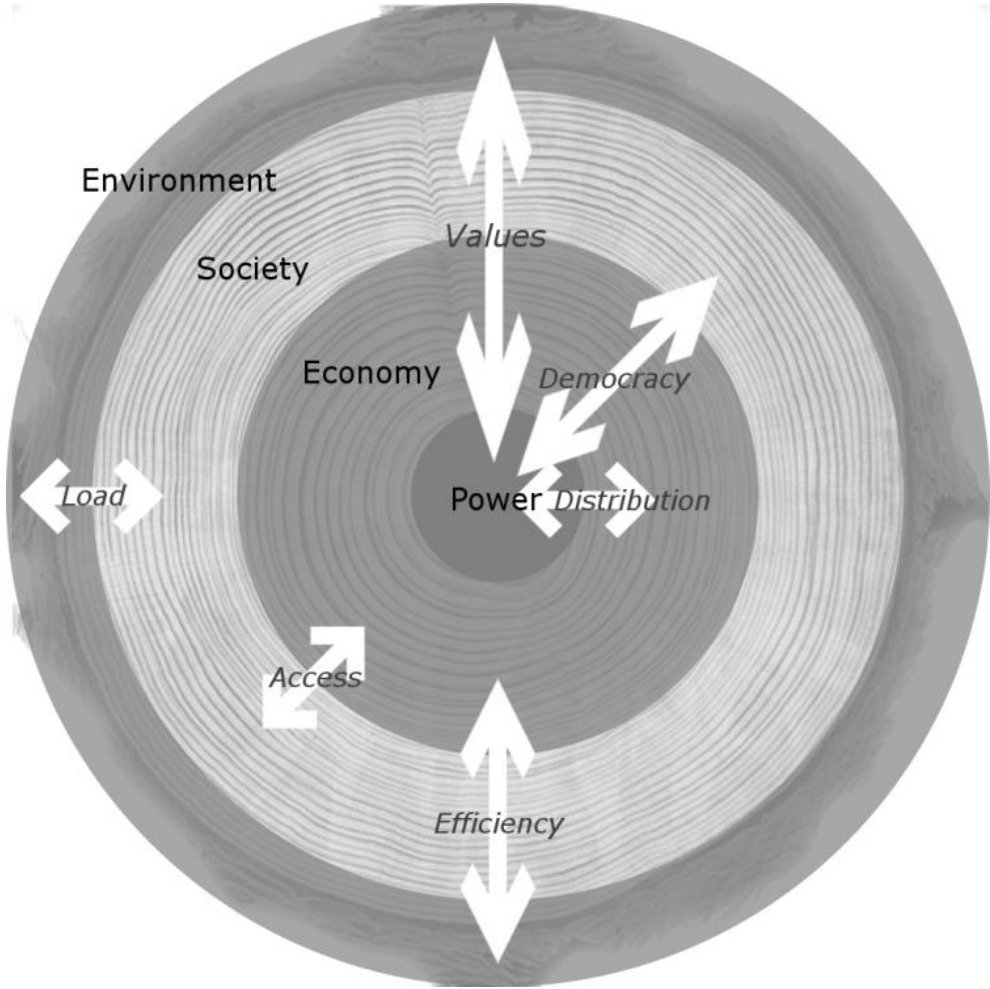
Overview

- **Sustainable mobility – smart or wise?**
- **The functional urban area (FUA) of Sofia – the city attracting commuters and returning visitors**
- **Change in the mobility patterns and lifestyles in time and space … policy critique**
  - **Quality of the air in the city** – internal differencies
  - **Everyday livability and 'ecology' of streets and nodes** – centre-periphery contrasts
  - **Weekend access to outdoor recreation opportunities** – intra-, peri- and extra-urban
- **Concept and discussion - low emission zones, new electric fleet and incentives at the demand side changing lifestyles and choices, levels of application**

Sustainable mobility – smart or wise?

➢ Evaluation system (Dimitrova, Tasheva, Burov, Mutafchijska, 2017)





Sustainable mobility – smart or wise?

- Evaluating mobility patterns in transition, challenges between the environment, society and economy:
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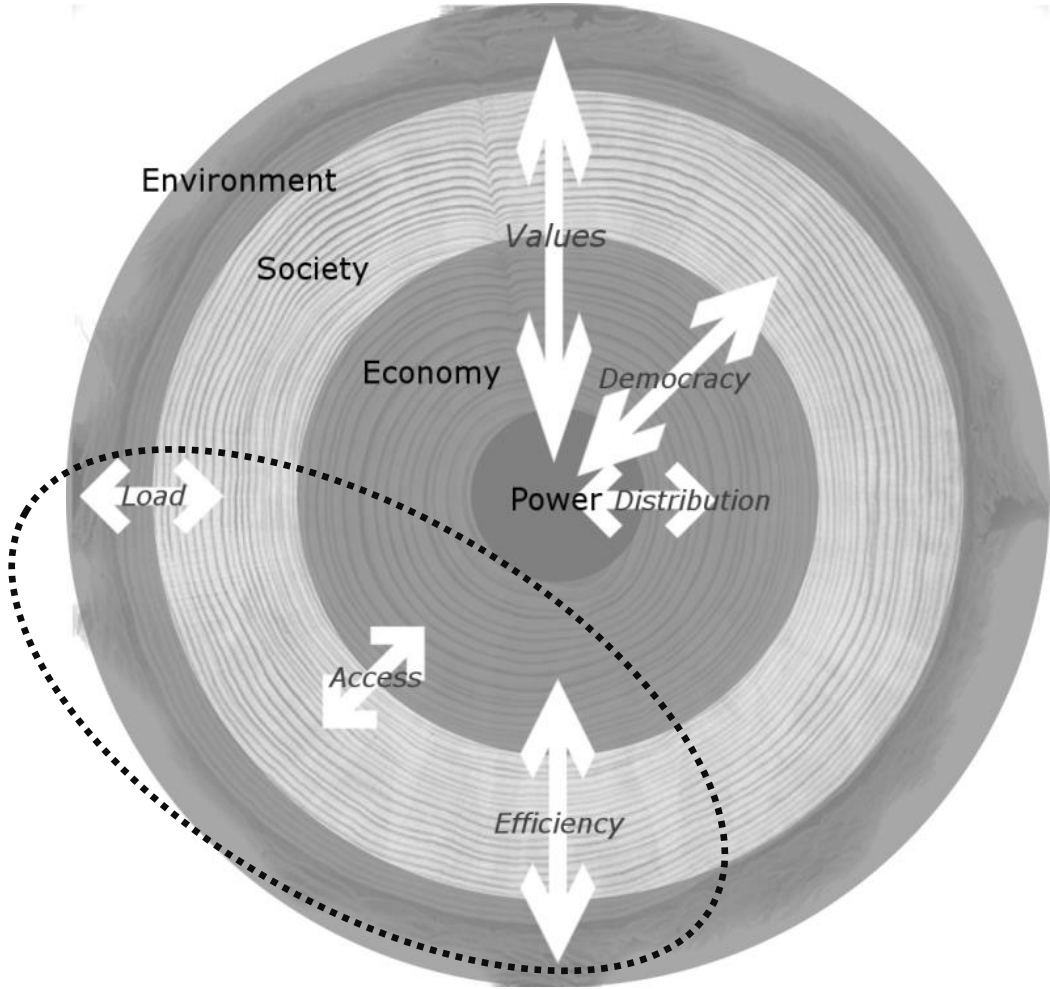
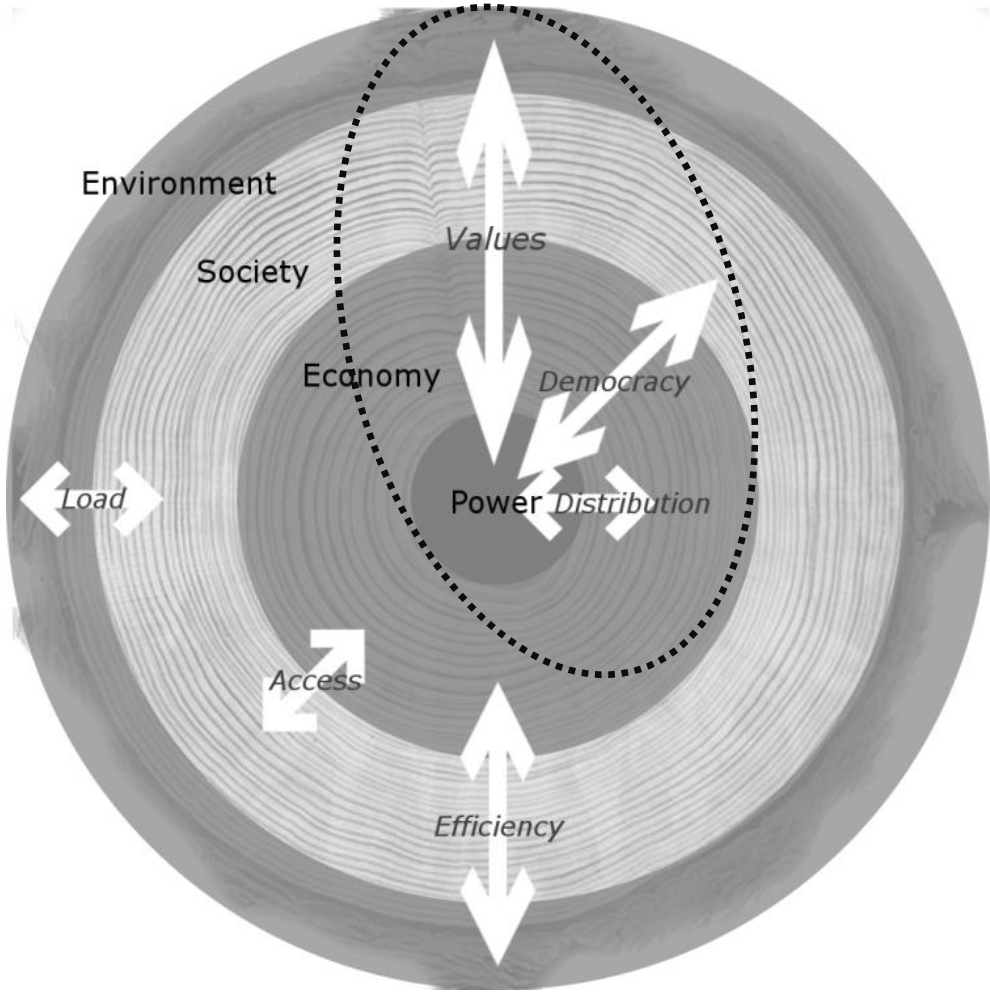
  - How resource and energy efficient are the modes with their infrastructure and means of operation?
  - What level of accessibility is provided?

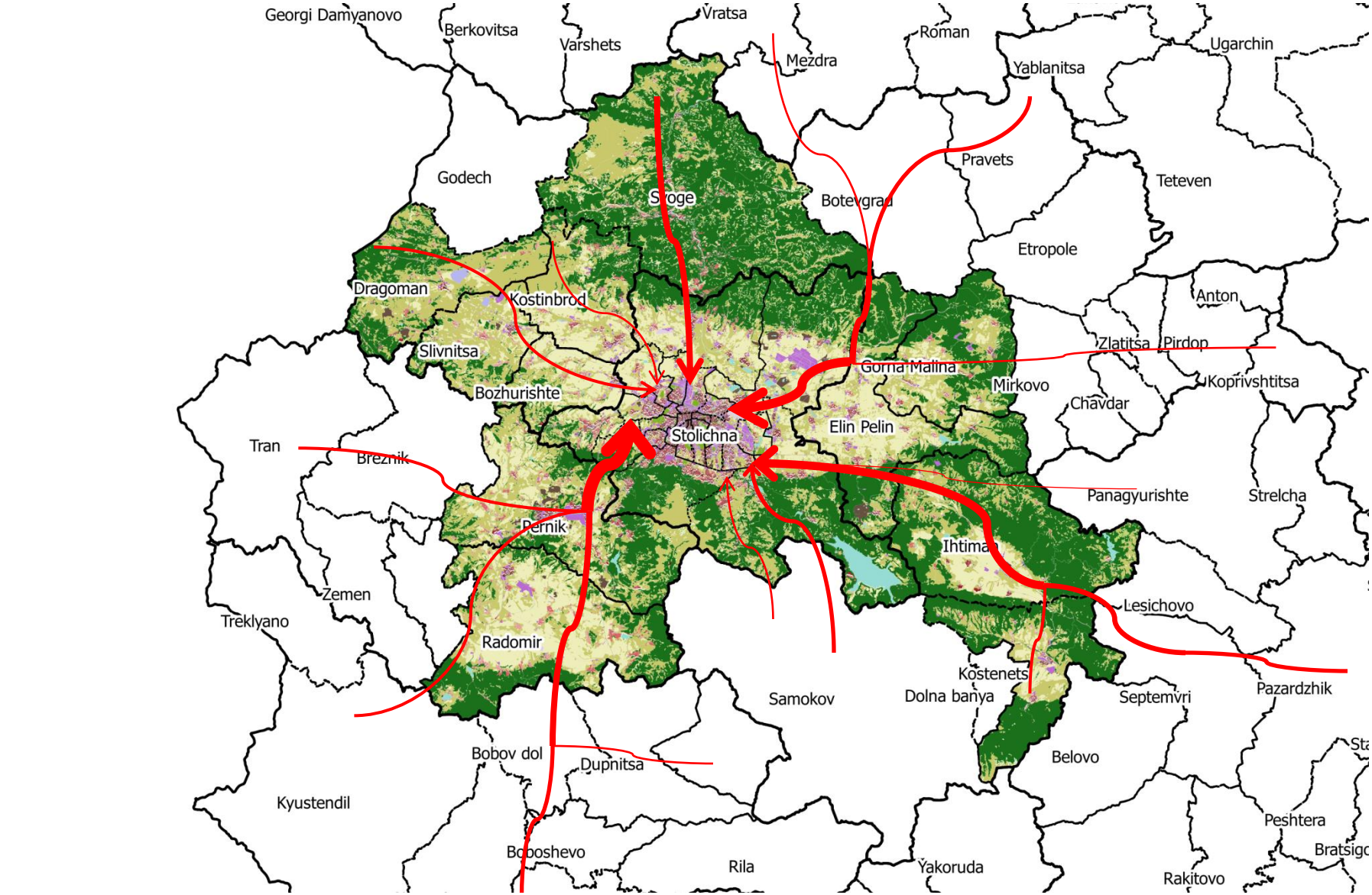


Sustainable mobility – smart or wise?

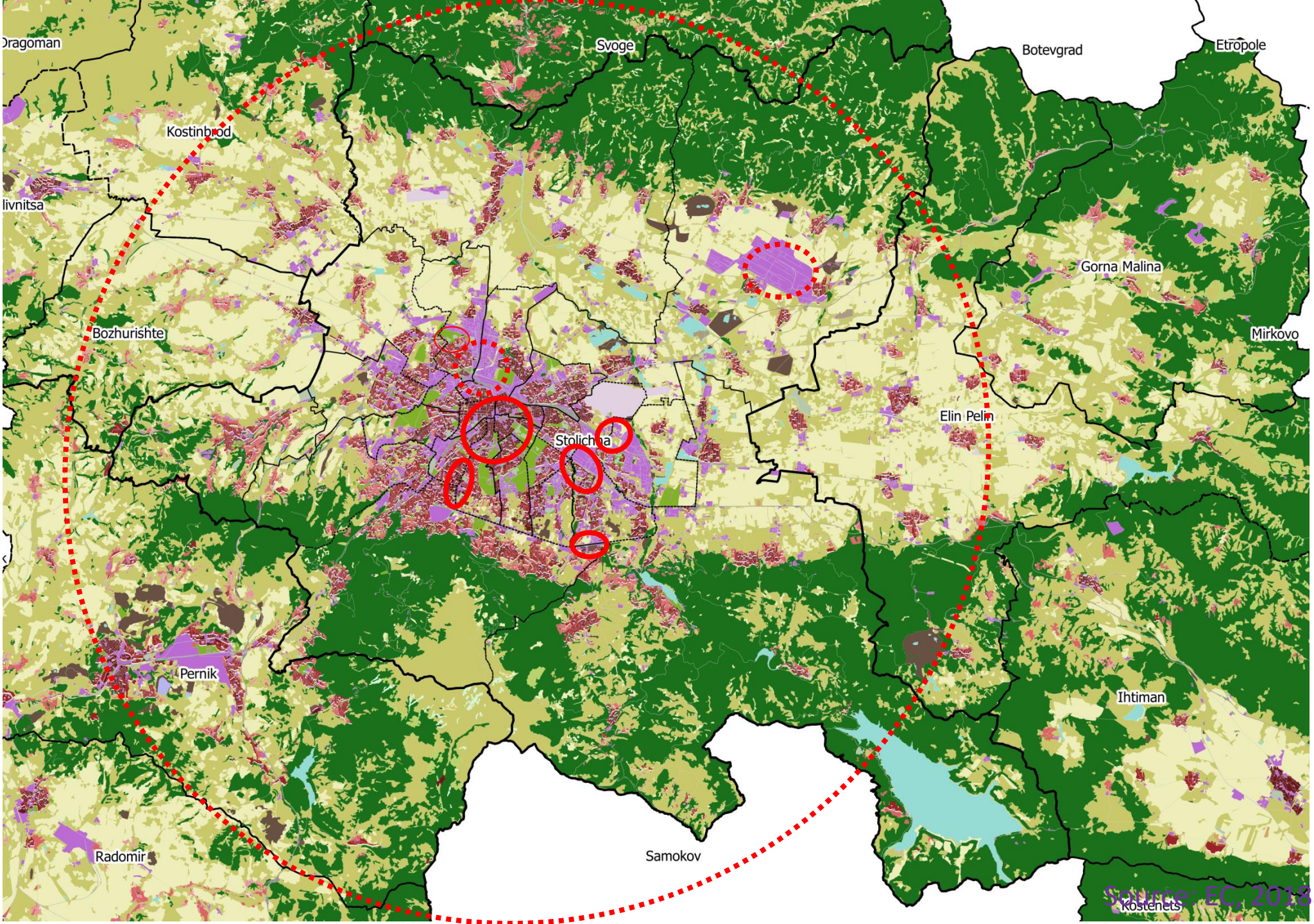
- Evaluating mobility patterns in transition, challenges about common choices:
  - How public resources and private spending are redistributed in the name of mobility?
  - Is democratic choice about the balanced modes of travel achieved, are major groups neglected by their ‘representatives’?
  - What values are incorporated in the political discourse, are there specific distortions?



FUA of Sofia - attracting

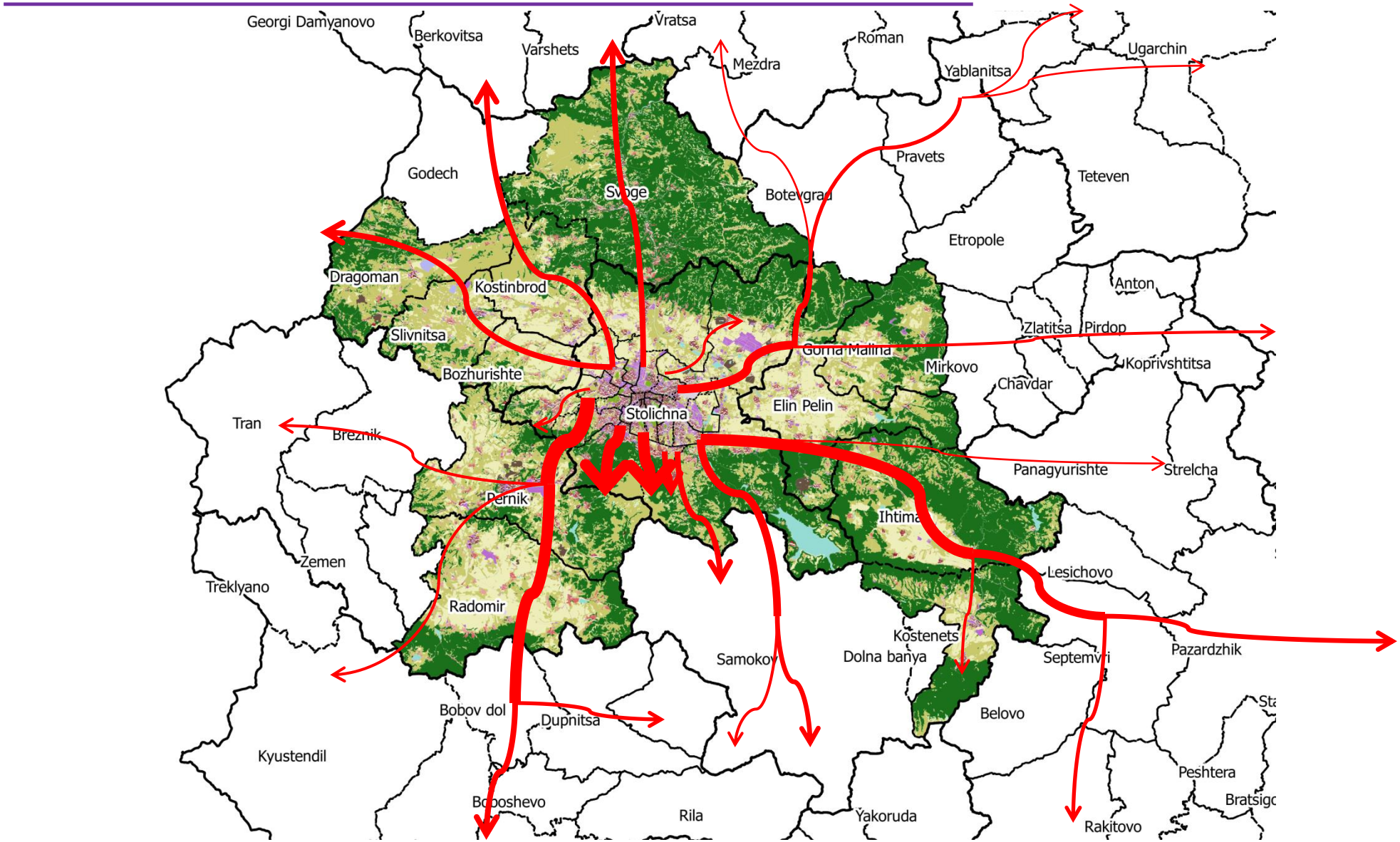


Source: EC, 2018a

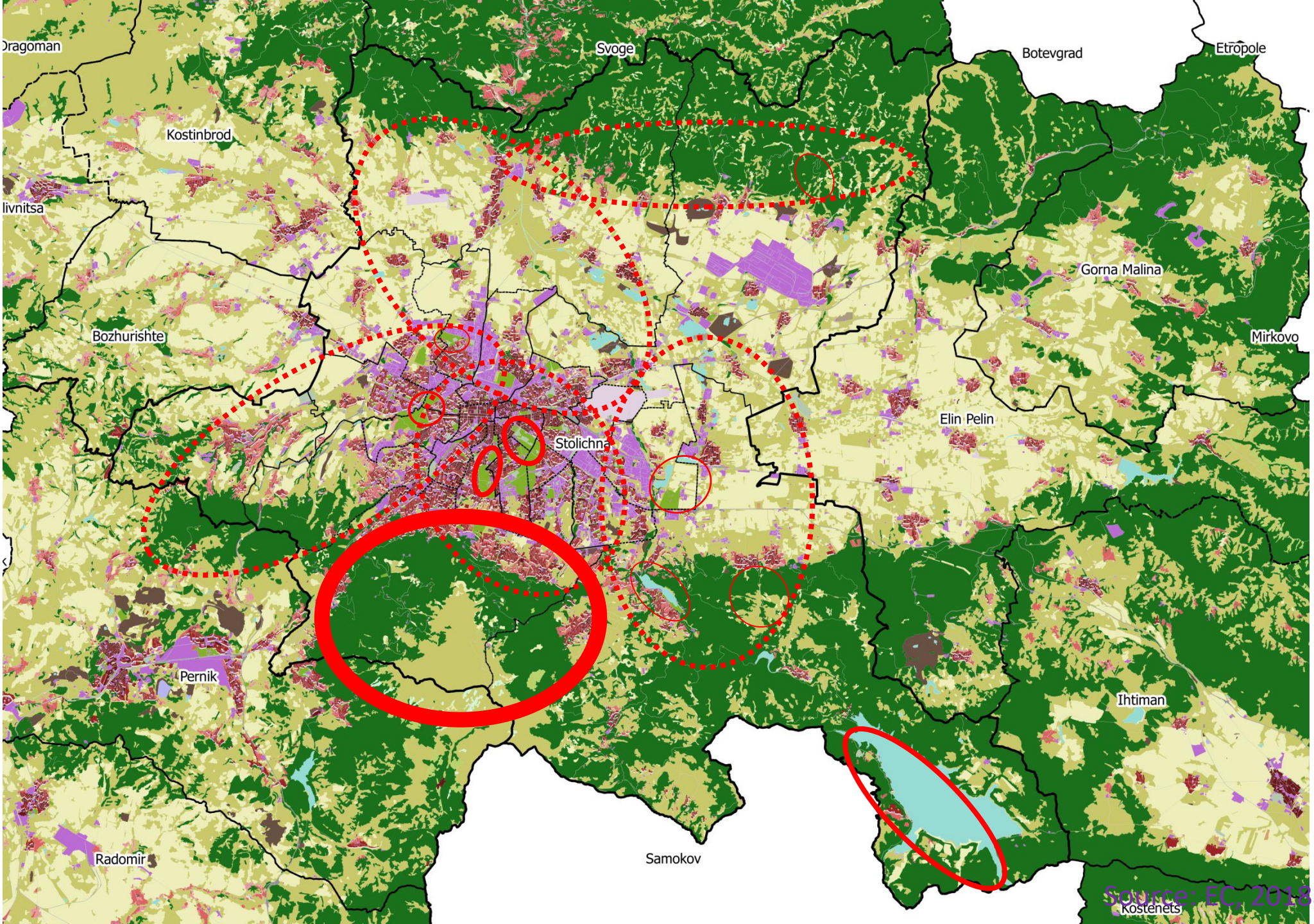


Source: EC, 2018a

FUA of Sofia - returning



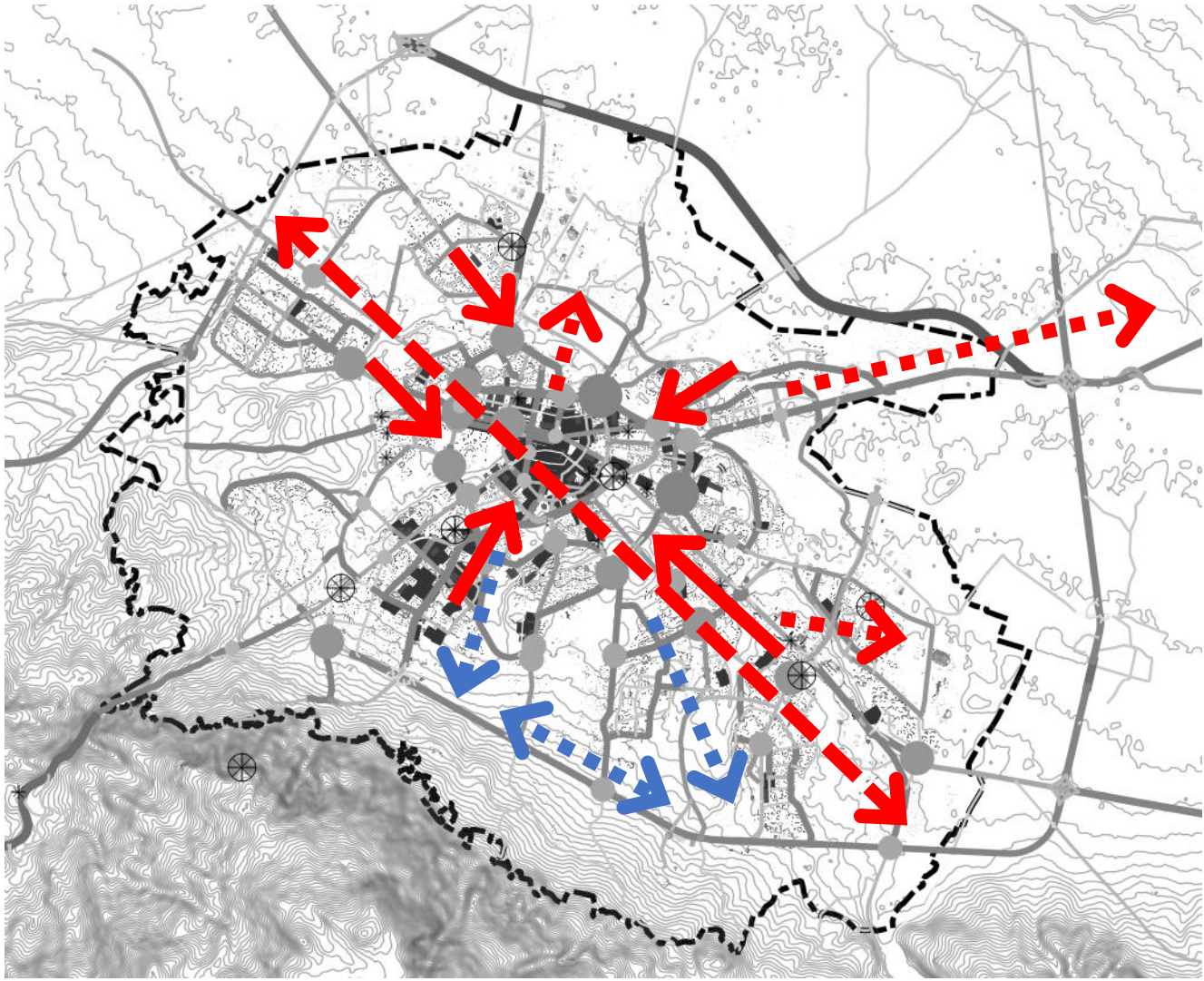
Source: EC, 2018a



Source: EC, 2018a

Change mobility patterns and lifestyles

- Spaces of change
- Modelling
- Inherited and envisaged supply
- Induced and reduced demand
- Costs – internal and external
- SUMP 2035 – prevent, demand mgt
- Vision for Sofia 2050



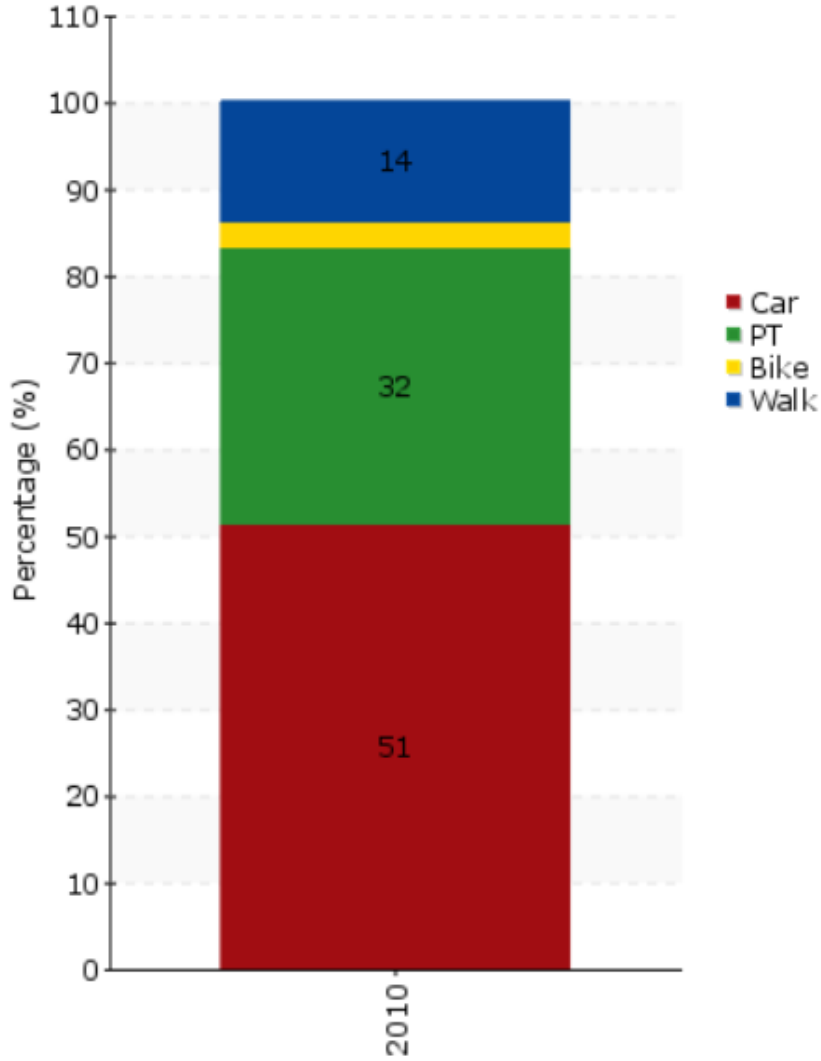
Source: GIS Sofia, 2017; DMAT, 2018; ABURP, 2018

Change mobility patterns and lifestyles

- **The Bulgarian context of moving**
  - **Cars per capita?** … from 277 to 443 passenger cars per 1000 inh
  - **Modal split**:
    - Trains - 2,3
    - Passenger cars - 83,2
    - Motor coaches, buses and trolley buses - 14,5
  - **Passenger kilometers traveled in the city** – no data
  - **Car ownership** - many old cars (second hand parts market, scrappage), only one (e-)car sharing scheme (Spark), intensive individual use of company cars beyond the working days (weekend taxation)
  - **The car fleet** - old petrol and diesel cars, removed catalyzers

Change mobility patterns and lifestyles

Sofia



Source:
CSDCS research under BENEFIT project

Area concerned is a: City

Data based on: Unknown

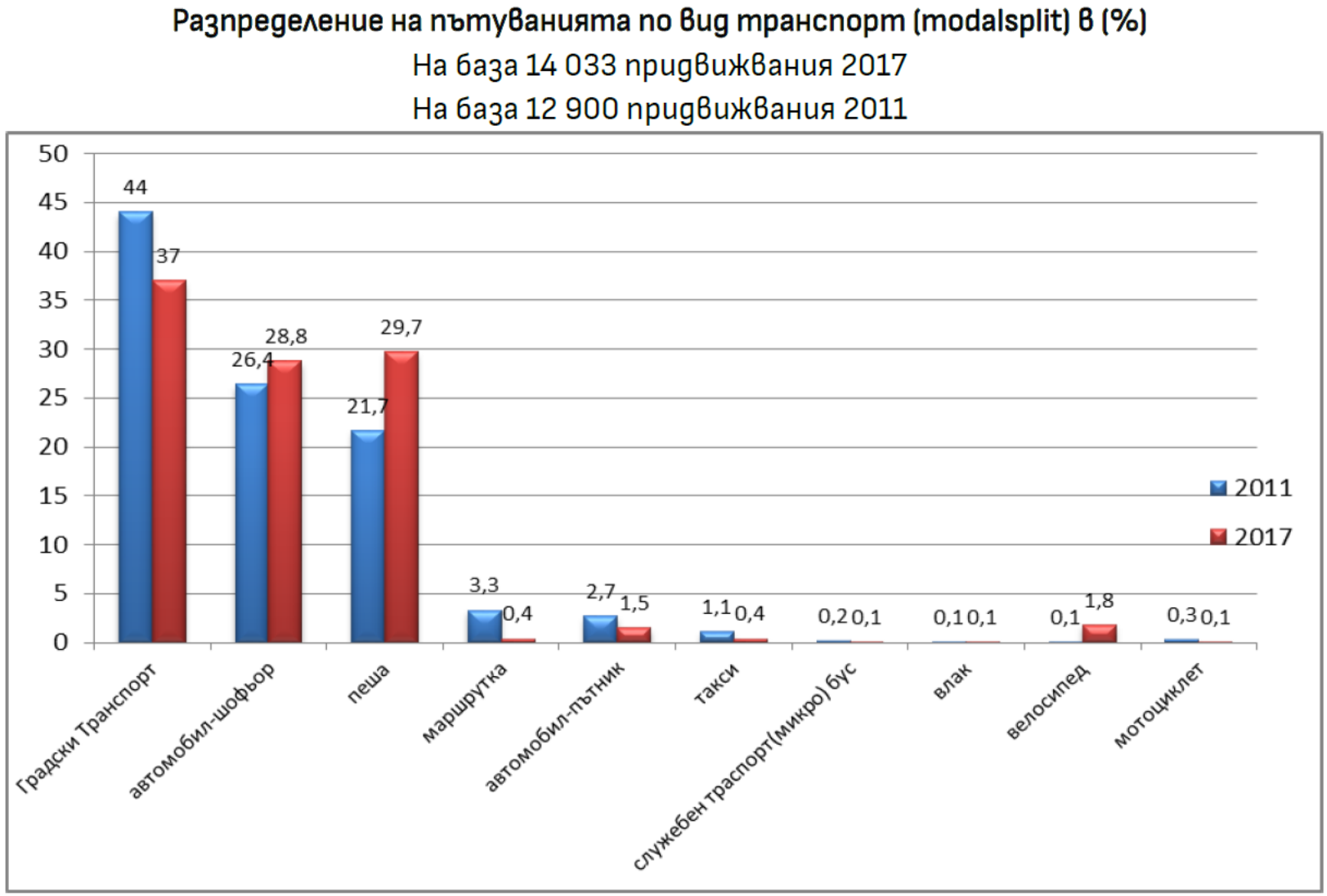
Survey held to: Unknown

Year:
2010

Population:
1.211.348

Source: EPOMM, 2018

Change mobility patterns and lifestyles



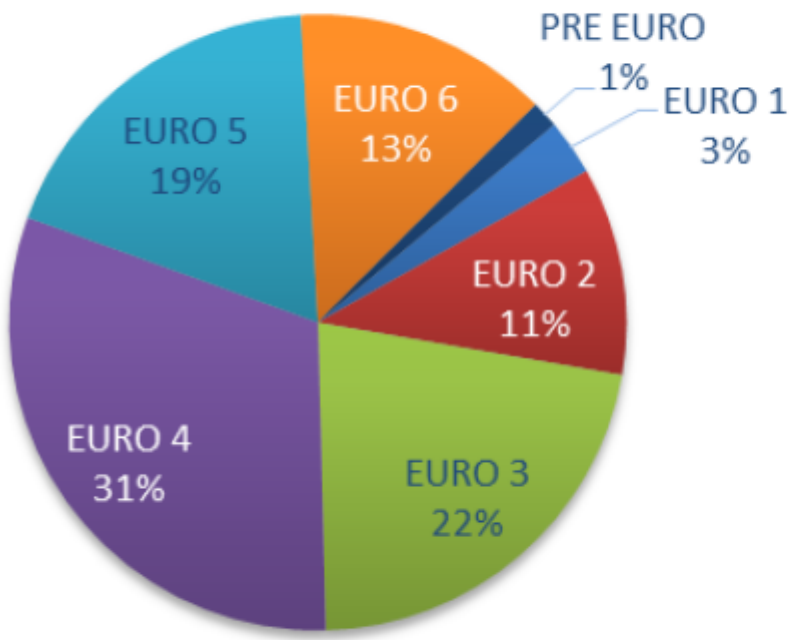
Source: SUMP Sofia, 2017

Change and quality of the air

➢ Sofia's car fleet based on 20 000 records

SOFIA

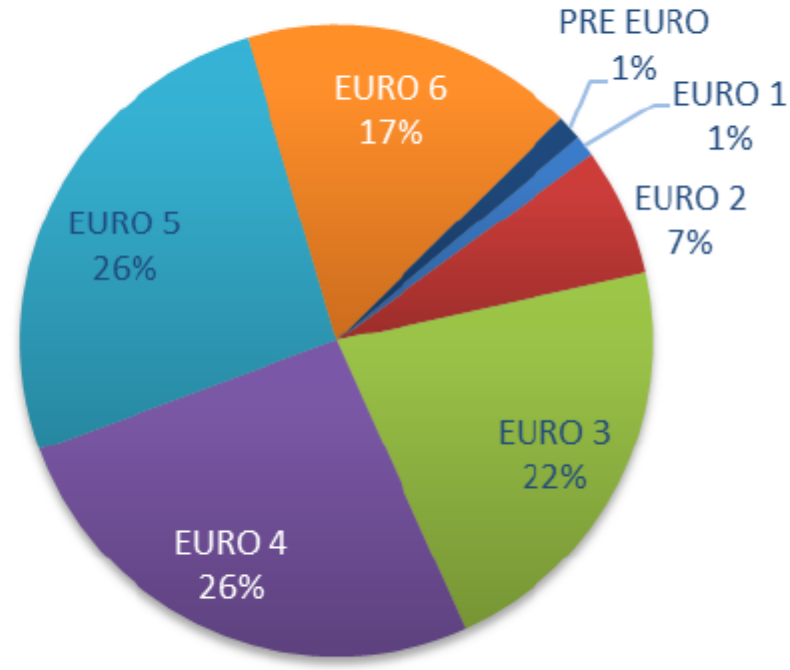
DIESEL **51%** GASOLINE **41%**



Average Fleet age: **11 years**

WESTERN EUROPE

DIESEL **70%** GASOLINE **30%**

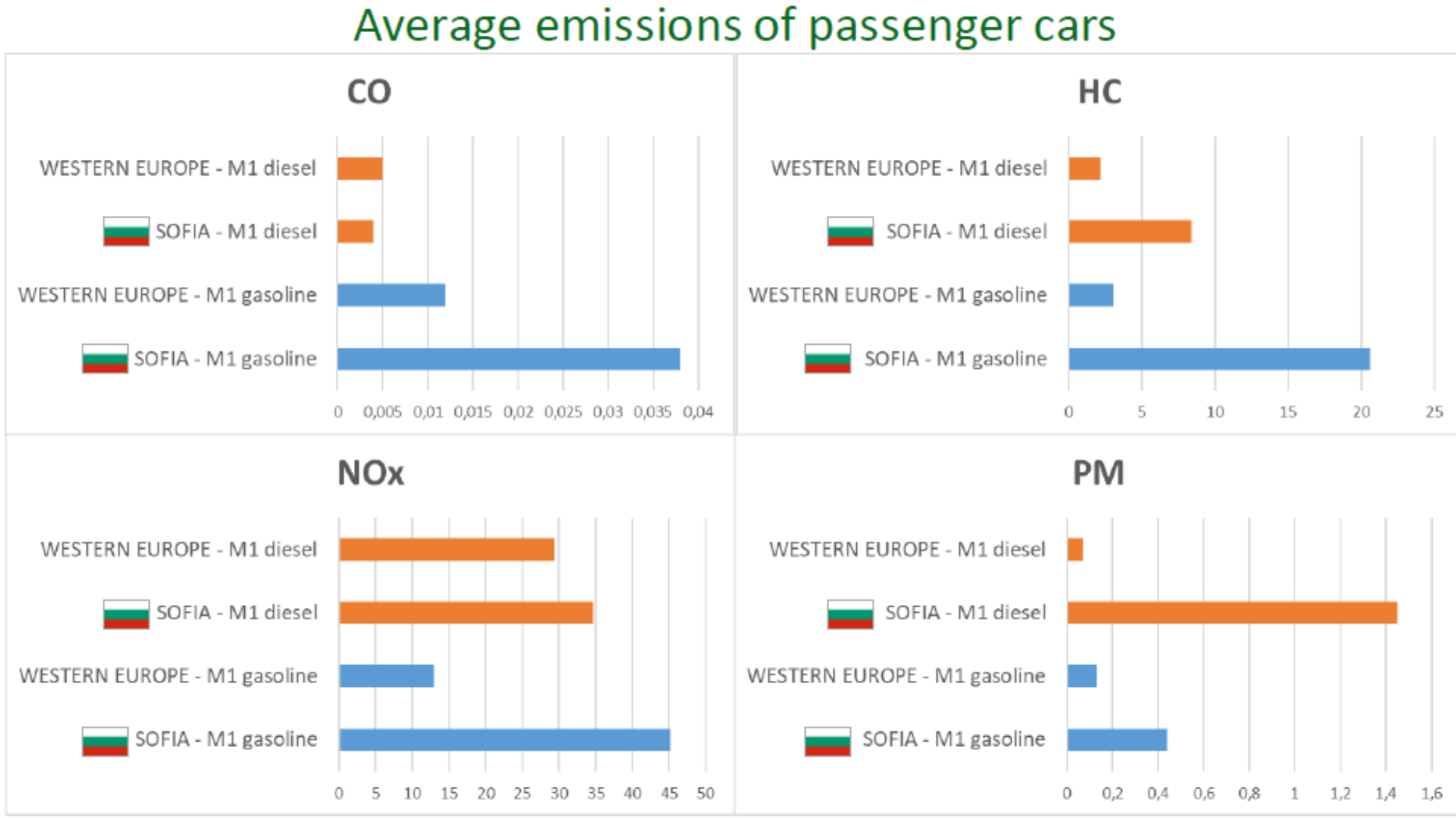


Average Fleet age: **8 years**

Source: OPUS RSE, 2017

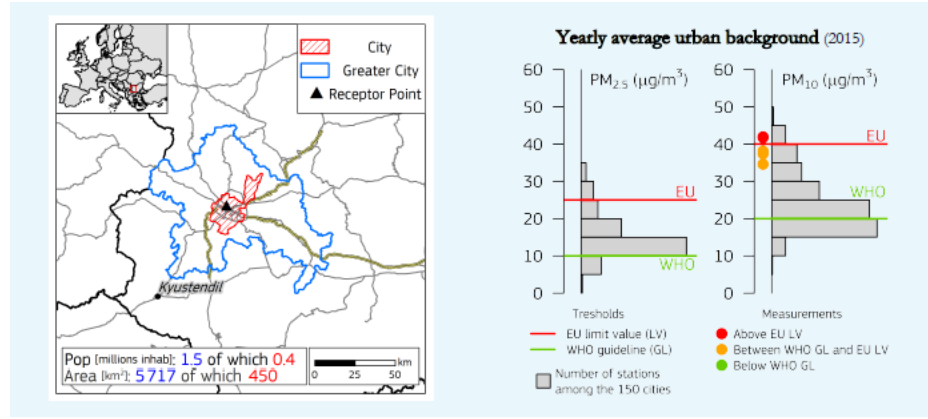
Change and quality of the air

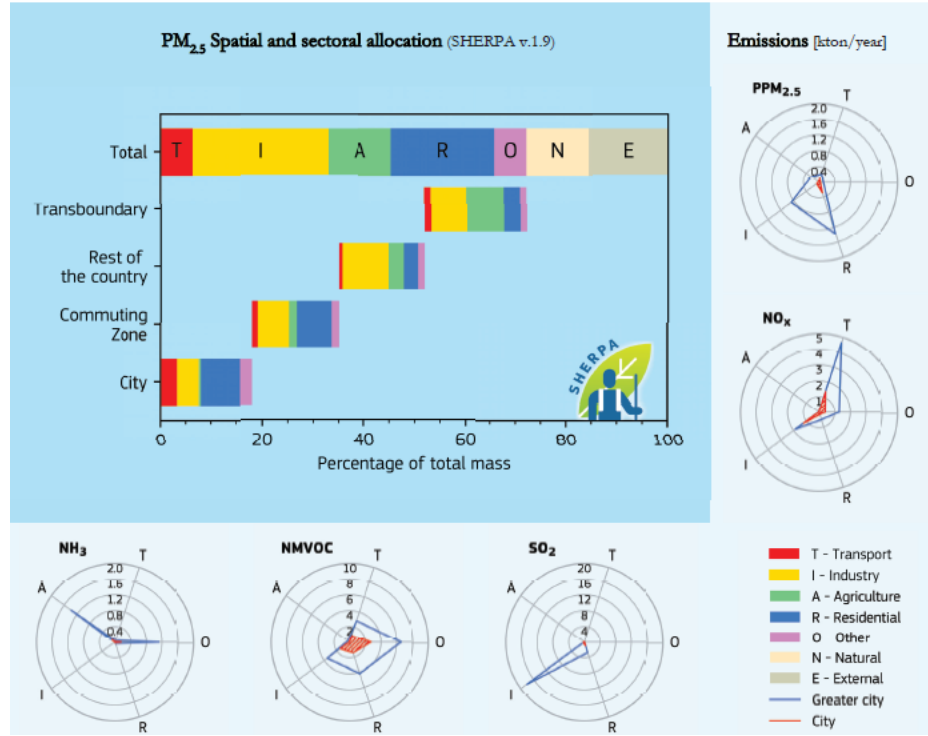
➢ Sofia's car fleet …



Source: OPUS RSE, 2017

Change and quality of the air





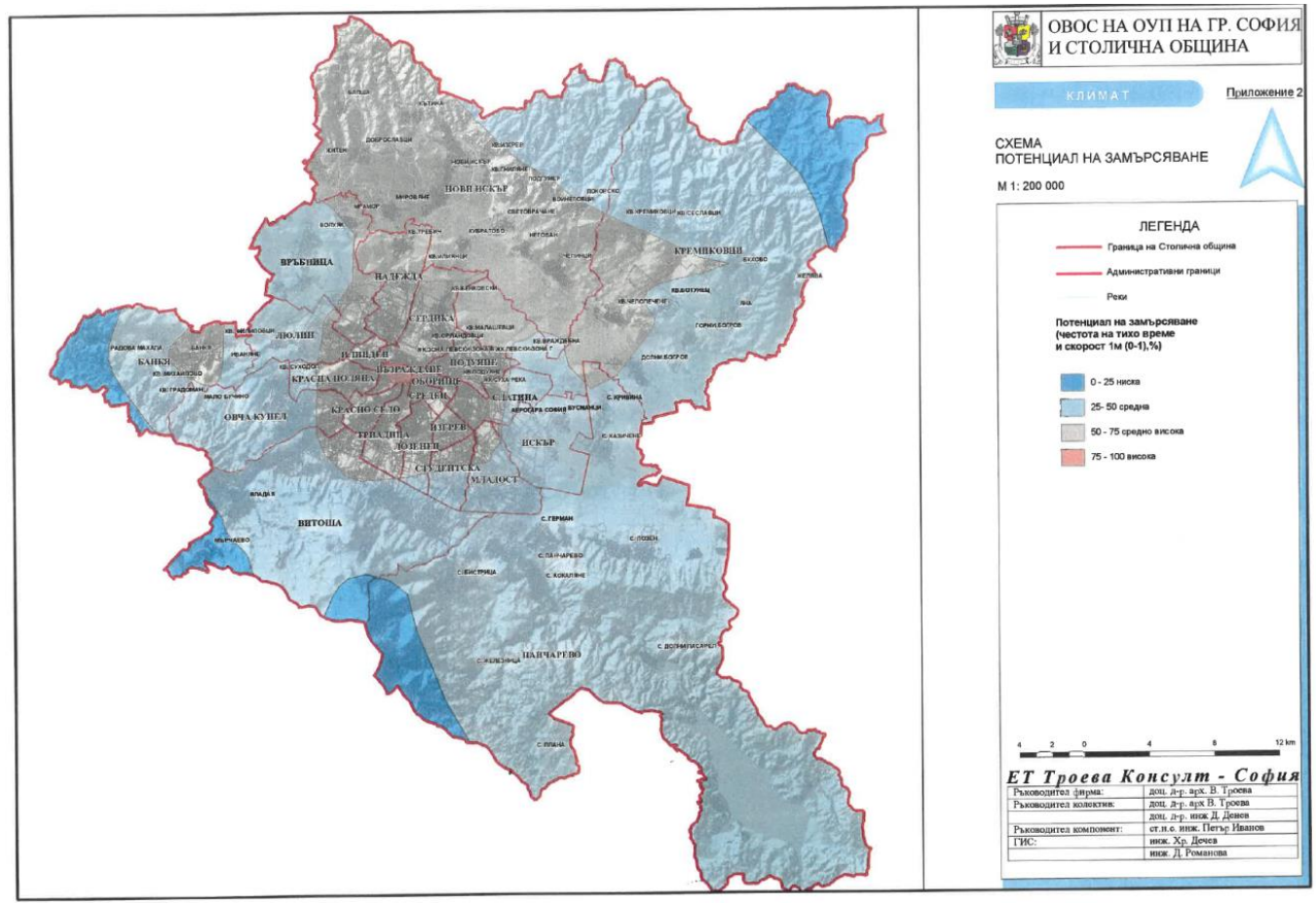
Source: Thunis et al, 2017

Change and quality of the air

- **Emissions and immissions**
  - **Cumulative pollution from various sources**
    - Background pollution – transmission (Central Europe, Western Balkans), agriculture (Sofia's valley), other such as excavation sites (Kremikovtsi),
    - Residential low stacks – poor and rich at the fringe
    - Transportation short pipes – many and old everywhere around
    - Industrial pollution – light and brand new at several sites
  - **Preconditions** – climate and atmospheric conditions, mountainous and well vegetated region, high ratio of urban green, compactness and continuity of built up areas, formation of urban street canyons, street maintenance, seasonal patterns

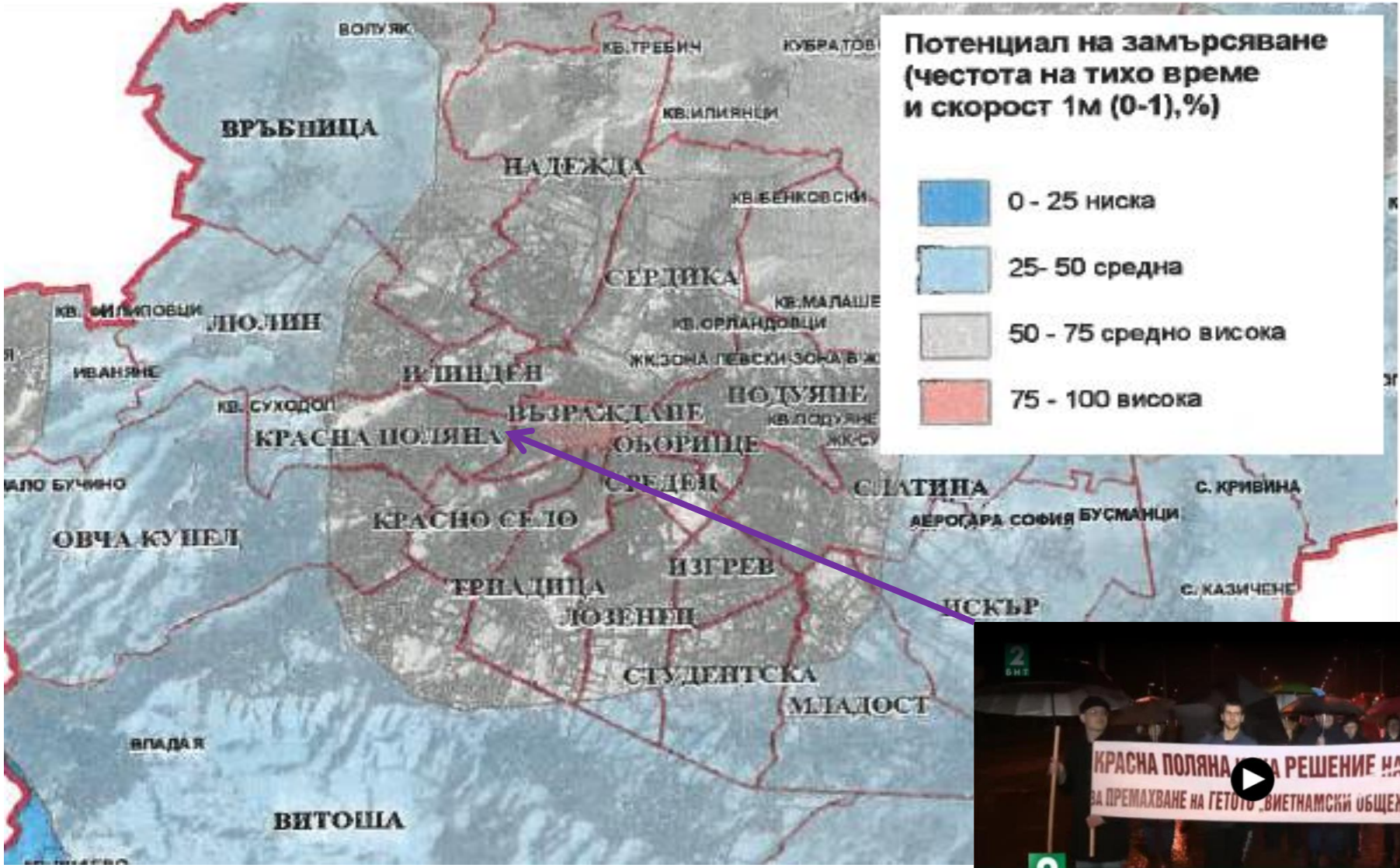
Change and quality of the air

- **Accumulation of immissions – wind pattern, temperature inversions**



Source: Troeva Konsult, 2002

Change and quality of the air



Source: Troeva Konsult, 2002; BNT2, 2018

Change and quality of the air

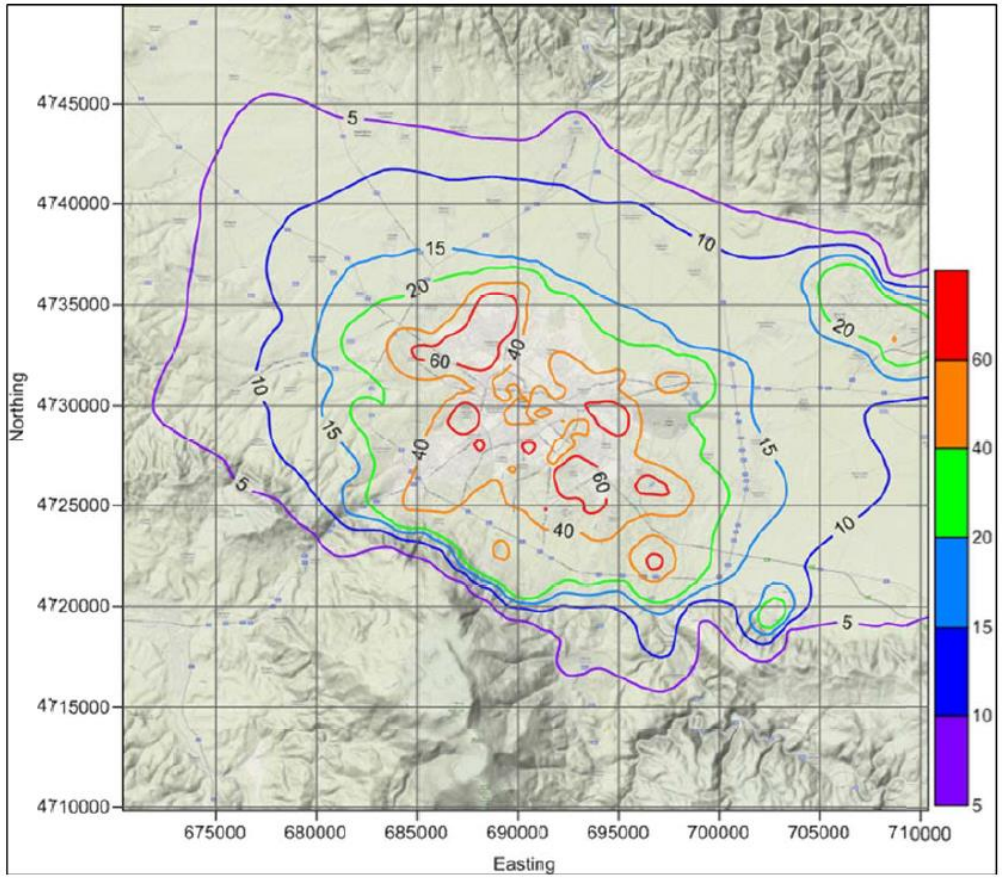
➢ Accumulation of immissions – visual impact

Source: BNT, 2017

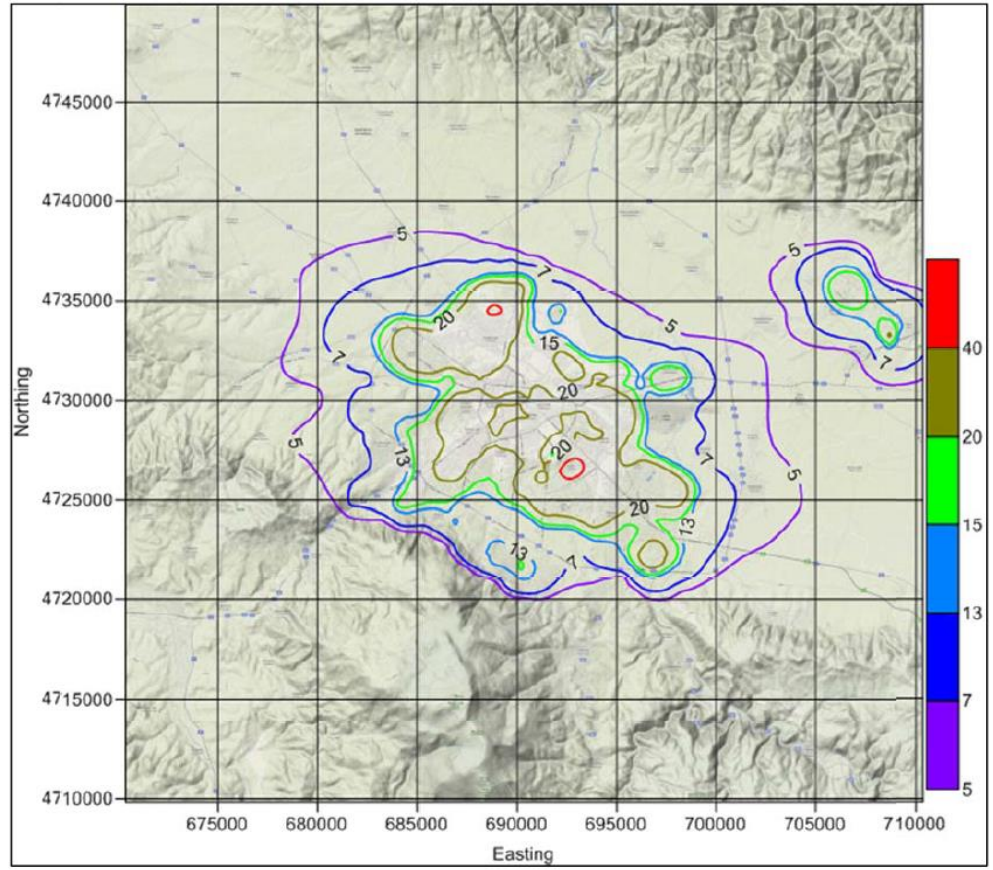
Change and quality of the air

➢ Spatial distribution

➢ PM10 and NO2 from all sources, 2010 … 2014



Фигура 6.19 Средногодишна концентрация на ФПЧ10, µg/m3, от всички източници, за 2010 г.

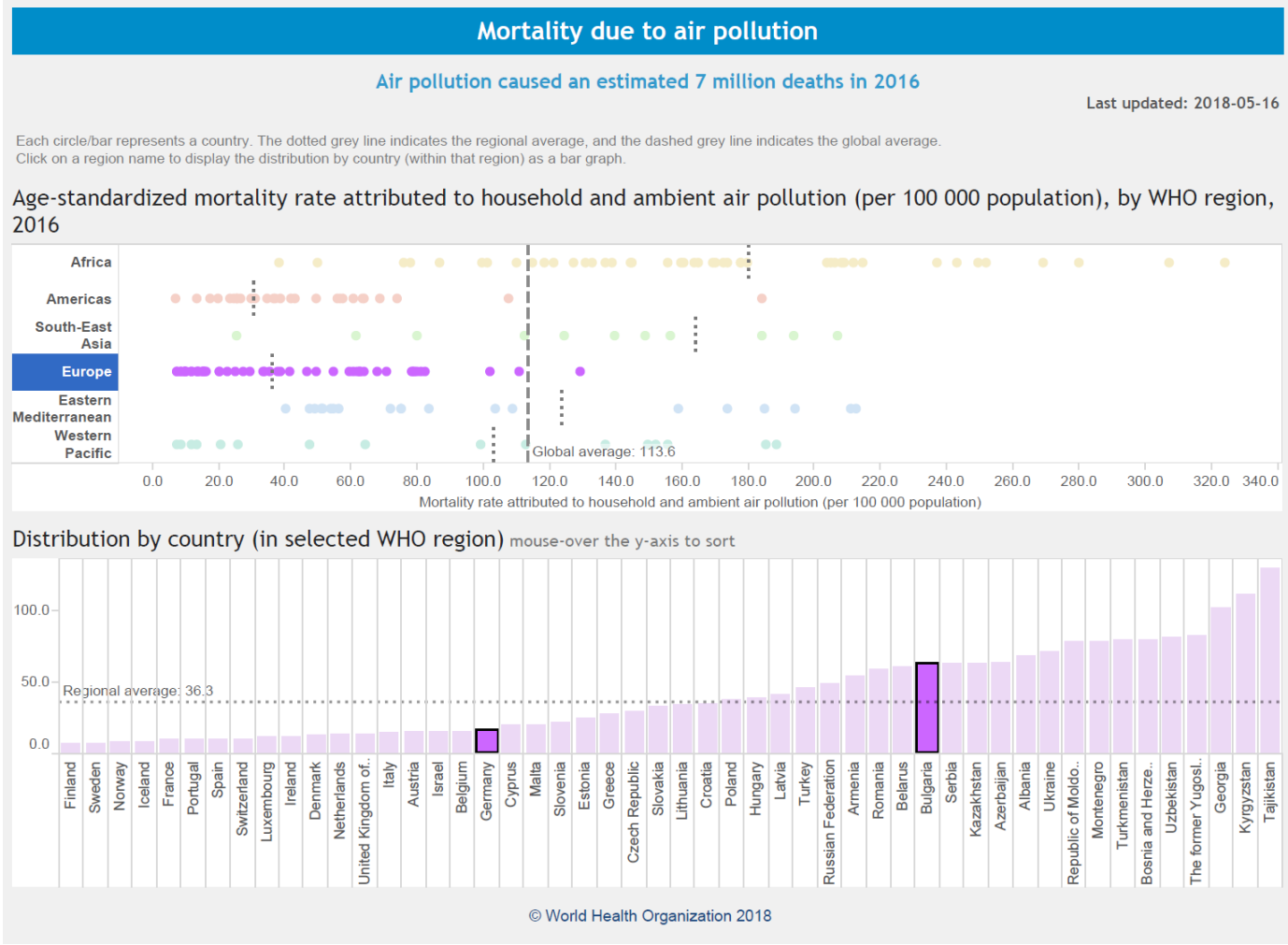


Фигура 6.40 Средногодишна концентрация на NO2, $\mu g/m^3$, от всички източници, за 2010 г.

Source: SRS-UCTM, 2017

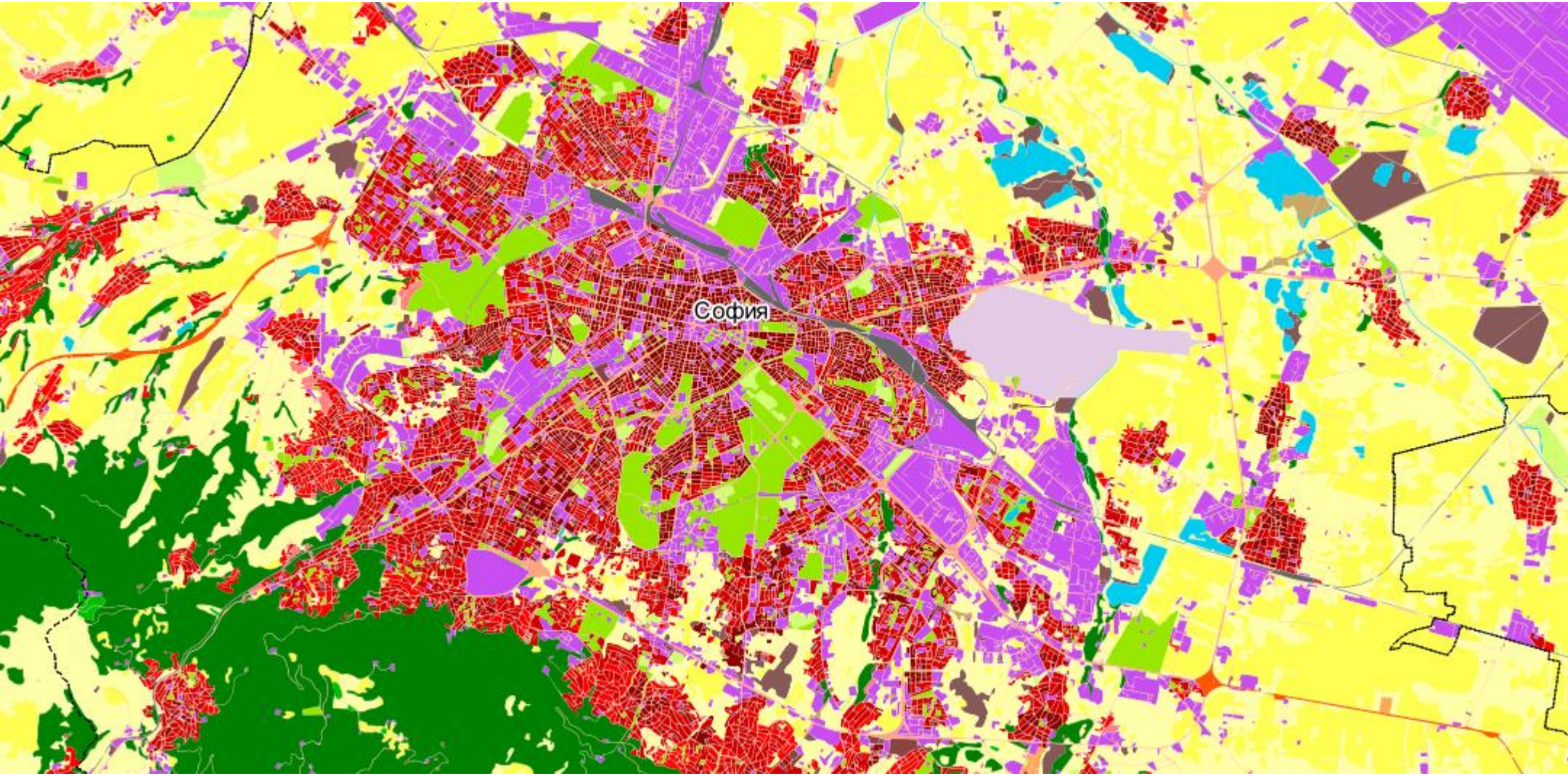
Change and quality of the air

- **Current WHO estimates for Bulgaria – 18 000 deaths**
- **EU estimates – 13 620 deaths**



Source: WHO, 2018

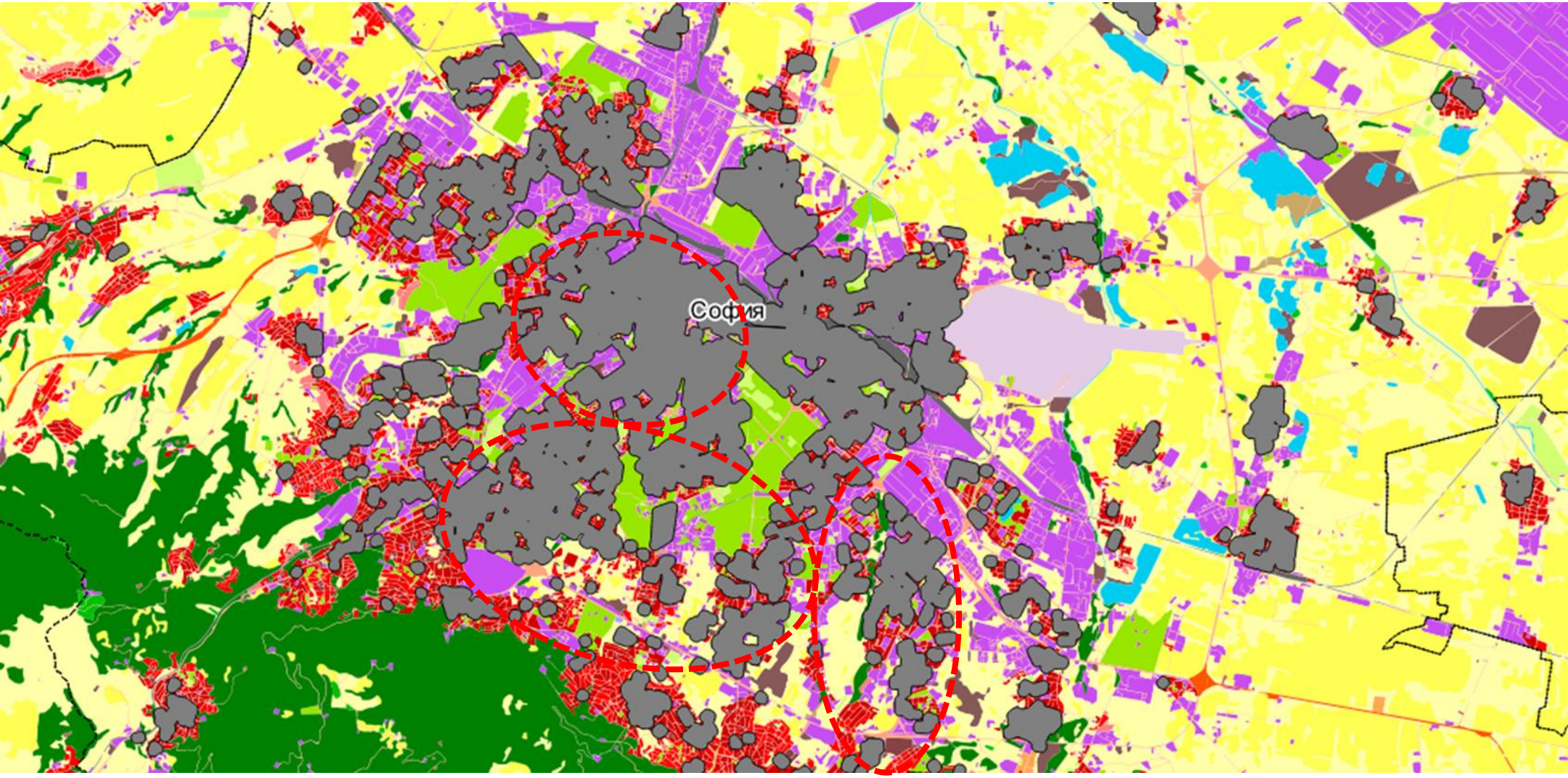
Change and quality of the air



- **Sofia – the Urban Atlas land cover classification**

Source: EC, 2018a

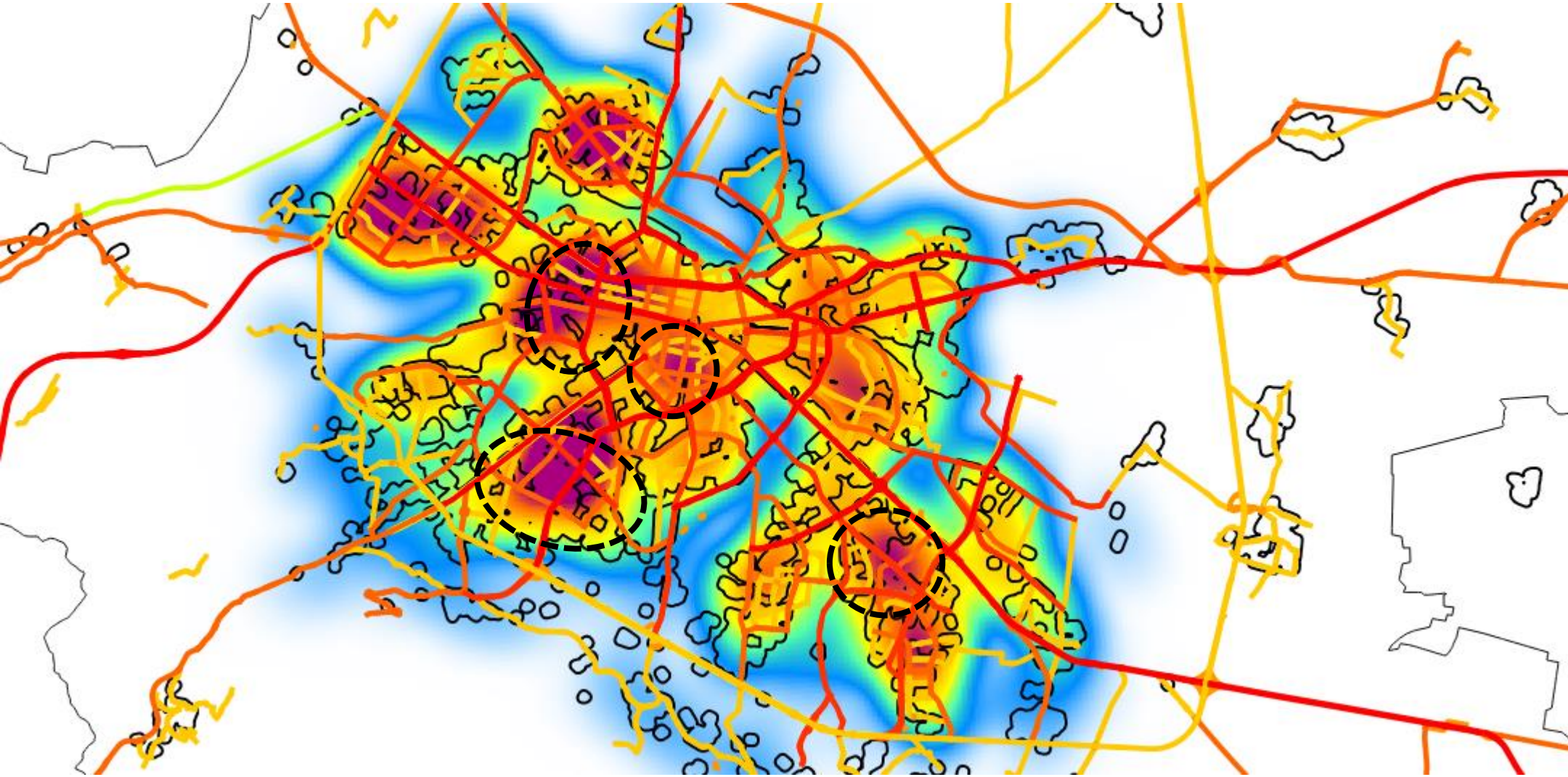
Change and quality of the air



- **Sofia – Continuously built up land buffers**

Source: EC, 2018a

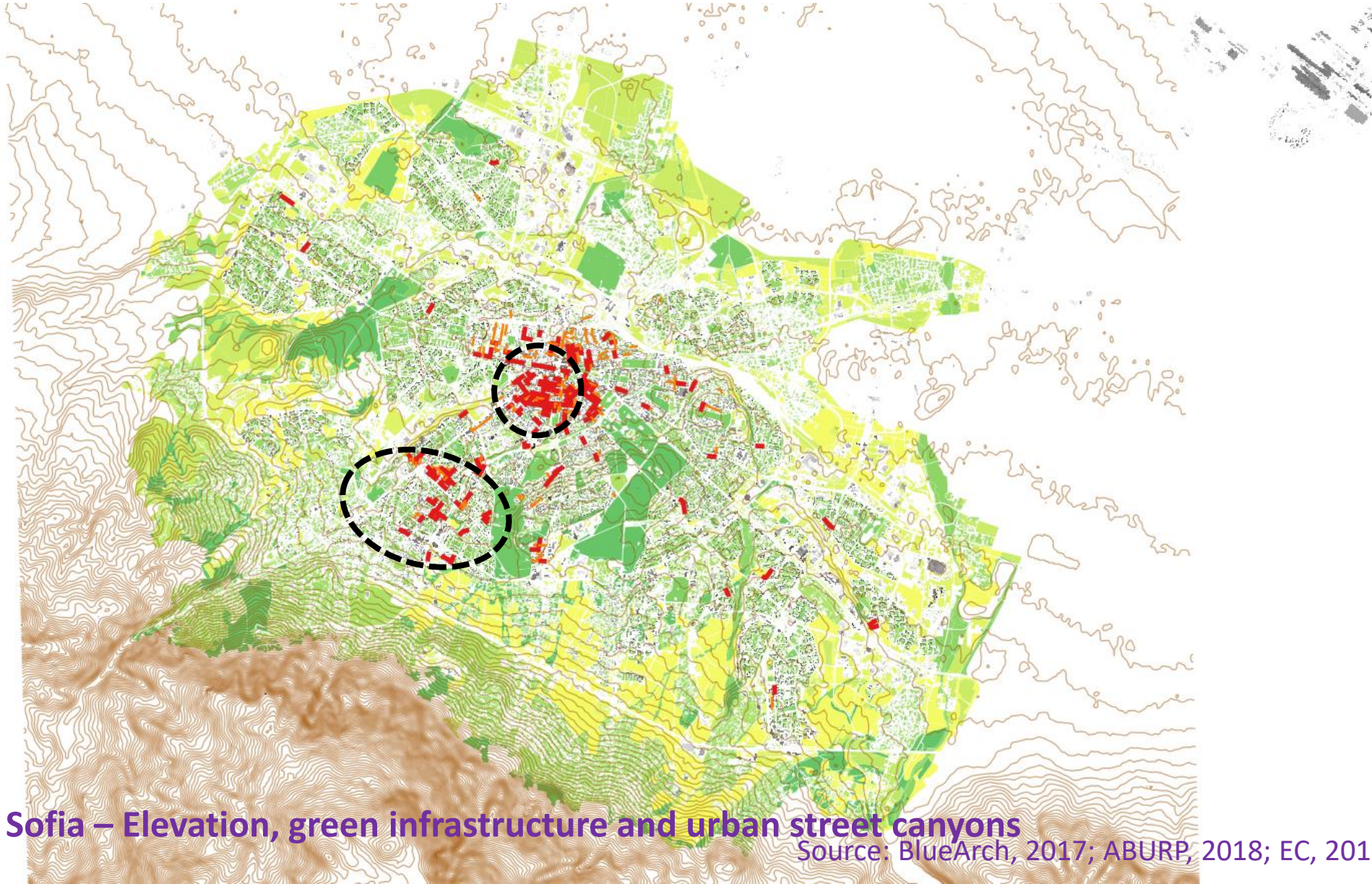
Change and quality of the air



➢ **Sofia – Population heat islands and major transport arteries**

Source: EC, 2018a; GIS Sofia, 2017

Change and quality of the air



- **Sofia – Elevation, green infrastructure and urban street canyons**

Source: BlueArch, 2017; ABURP, 2018; EC, 2018b

Change and livability

- ‘Ecology’ of the streets and nodes
  - Air
  - Noise
  - Safety
  - Physical barriers
  - Occupation of space

Source: WhATA, 2018

Source: GIS Sofia, 2009

Source: Dir.bg, 2018

Source: Justine, 2009

Source: Yanchev, 2016

Change and recreation

- **Weekend access to outdoor recreation – intra, peri, extra**

Source: offnews, 2018

Source: detstvoto.net, 2018

Source: opoznai.bg, 2018

Source: news.bg, 2018

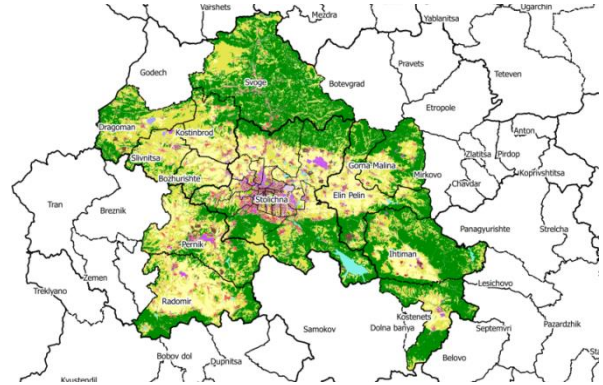
Source: bTV, 2018

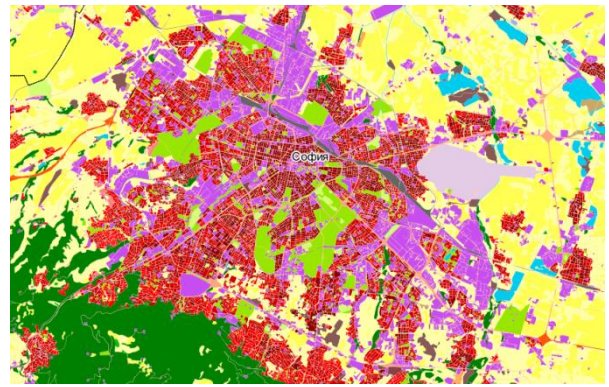
Source: Dnevnik, 2018

Concept and discussion

➢ Overall – short term mitigation, long term change in lifestyles and energy transition

Levels / Issues	Wise and smart approach	Prevention of air pollution and other nuisances	Livability and safety	Recreation and play
Regional / FUA / Municipal	Studies and Integrated macro model; ITS for transit and commuters & regional smart grid	Equitable and efficient access and mobility coverage, incl. taxation	By passes and park-ride … rail, bus and car pooling	E-mobility infrastructure, flexible mini, e-car pooling and sharing, e-bike
City / District	Transport-land use-air meso models; ITS for commuters, dwellers & city smart grid	Low emission zones … right mix and balance between mass, group and individual options	Dynamic traffic re-routing and kiss-ride … Reconsidered fixed mass and flexible mini, e-car pooling and sharing, e-bike, healthy green corridors	
Neighborhood / Street	Transport-air pollution micro models; ITS advisors & quarter micro smart grids	Pedestrian, bike and light vehicle friendly design and public works, incl. non-motorized routing, greening, ventilating and absorbing		

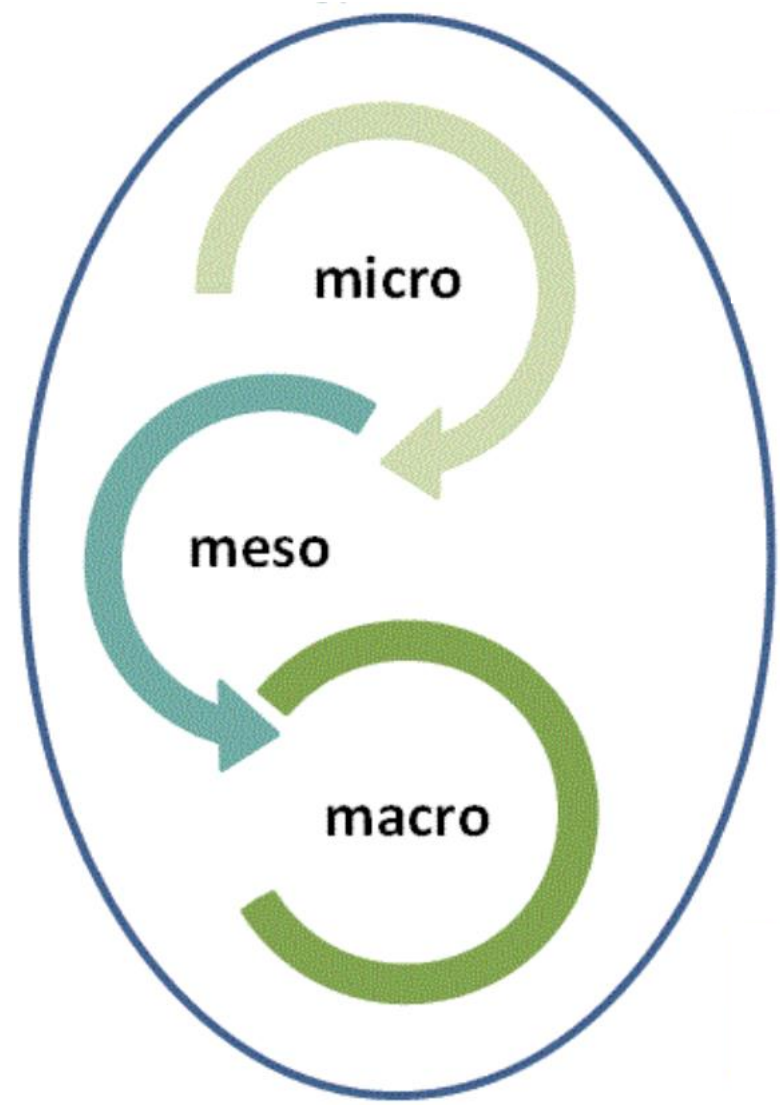




Concept and discussion

➢ Decision making (ECHOES, 2018b)

Decision-making units	Electric mobility
Individual	Building trust and acceptance; Car sharing initiatives; Joint decision making for charging infrastructure to motivate shift to EVs; Increase consumer awareness and knowledge ... confidence
Collective	Influencing national, regional and local stakeholders in adopting electric mobility and building charging stations; Association guidelines (charging, range, user experiences); Communicate to car industry on consumer demands, needs and experiences
Formal	Funding transport decarbonisation projects; Setting strict vehicle standards; Electric mobility specific support schemes; Predictable support scheme phase-out; Requiring low-carbon technology in PP (buses, ferries, municipal vehicle-fleets); Incentives for charging infrastructure (especially in rural areas); Integrated regulations (across sectors)



Source: ECHOES, 2018a

Conclusions for the sustainable mobility in Sofia's FUA?

- **Evaluating mobility patterns in transition, challenges between the environment, society and economy (D-data, I-information, K-knowledge, W-wisdom):**
  - **Where, when and who bears the load from the changing (spatial / transport) development model? D … I … K … W**
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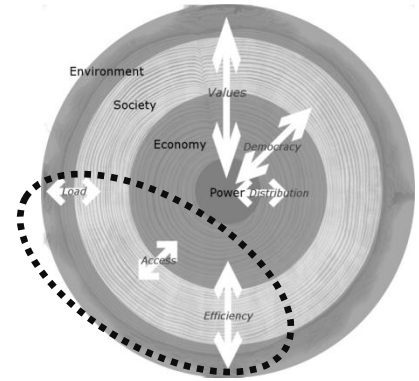

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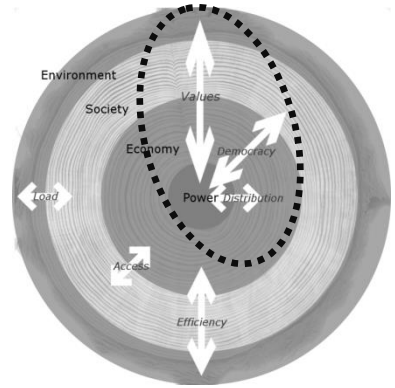

THANK YOU FOR THE ATTENTION!

SOURCES

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