

*Gradovi, klima i promet*

Zagreb, 17. i 18. 3. 2022.

# Klima i promet

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Sveučilište u Zagrebu

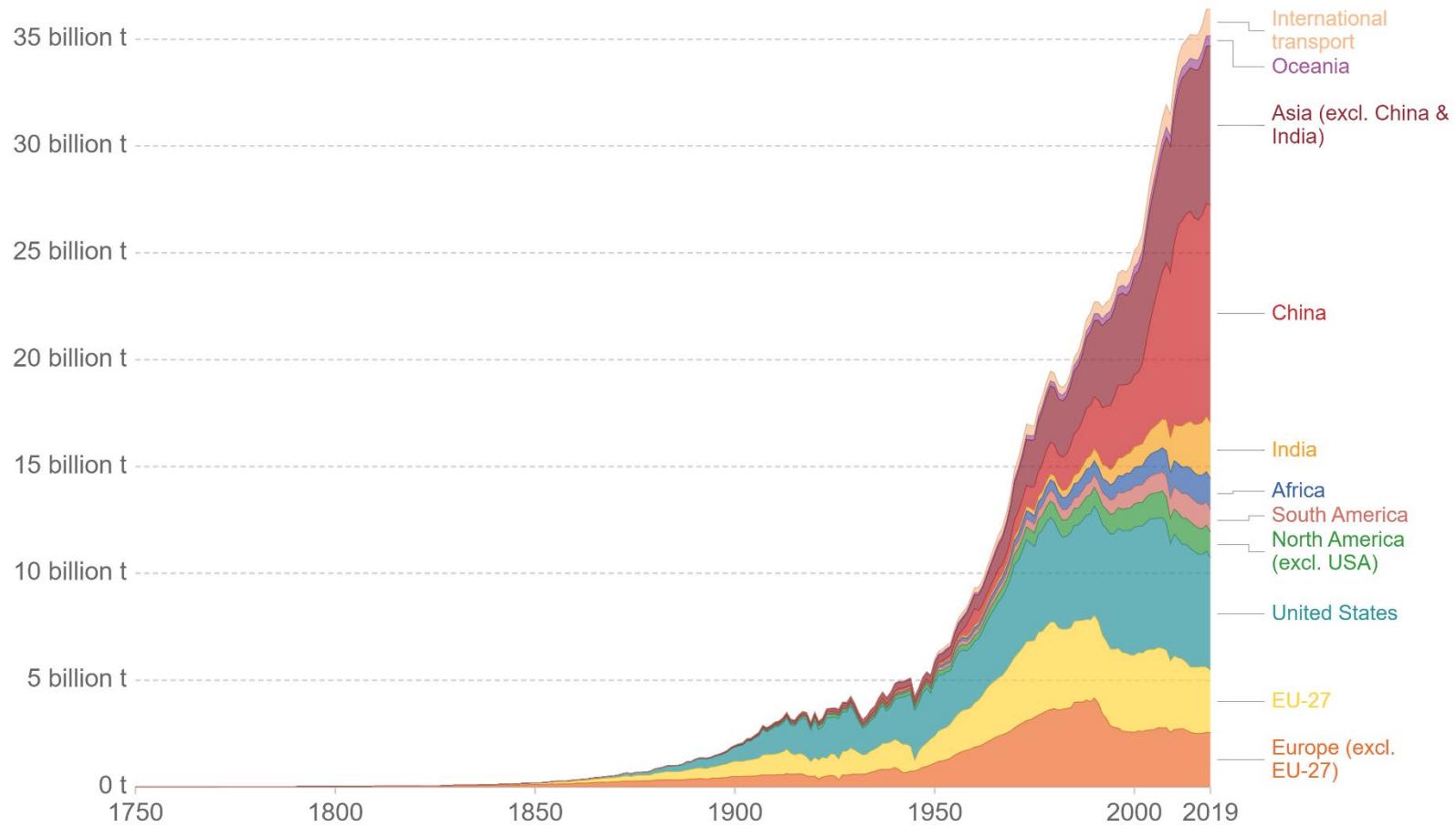


# Klima i promet – klimatske promjene

## Annual total CO<sub>2</sub> emissions, by world region

This measures CO<sub>2</sub> emissions from fossil fuels and cement production only – land use change is not included.

Our World  
in Data

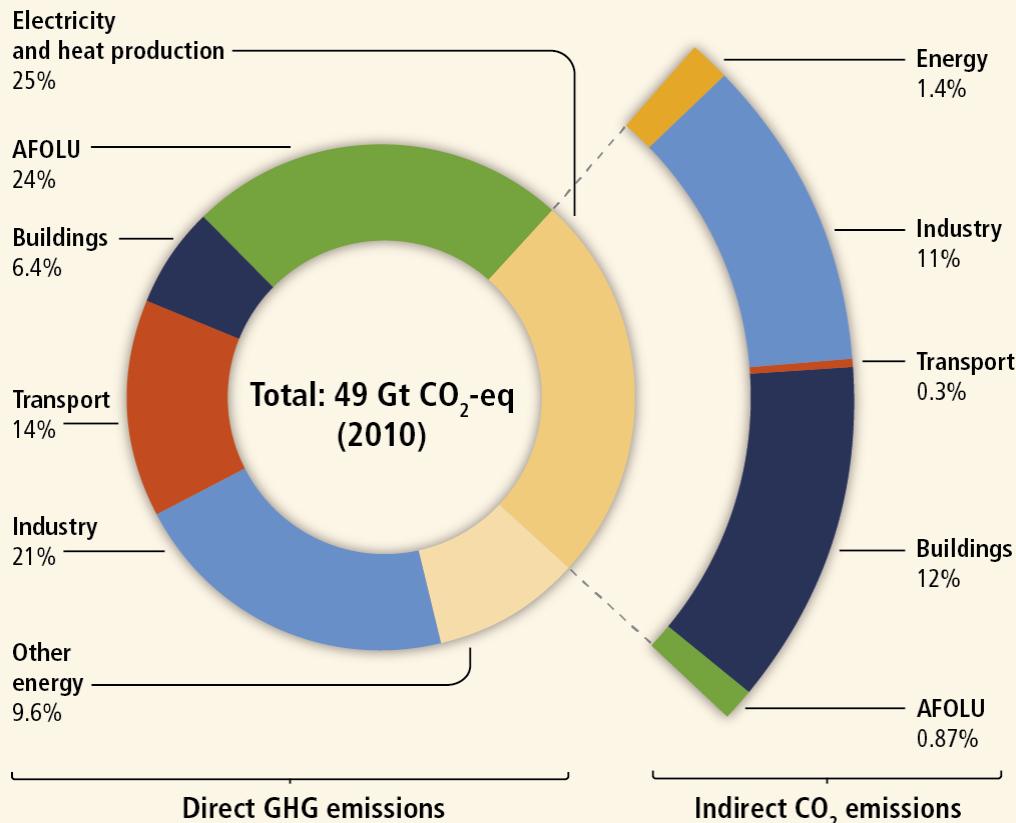


Source: Our World in Data based on the Global Carbon Project  
Note: 'Statistical differences' included in the GCP dataset is not included here.

[OurWorldInData.org/co2-and-other-greenhouse-gas-emissions](https://OurWorldInData.org/co2-and-other-greenhouse-gas-emissions) • CC BY

# Klima i promet – klimatske promjene

Greenhouse gas emissions by economic sectors



Emisija stakleničkih plinova u svijetu nastala ljudskom djelatnošću 2010. godine  
(izvor: IPCC)

U gradovima nastaje 70 % antropogene emisije stakleničkih plinova;  
trećina te emisije porijeklom je od prometa.

(izvor: <https://www.c40.org/networks/mass-transit>)

# Klima i promet – klimatske promjene



(izvor: <https://www.jutarnji.hr/autoklub/aktualno/sto-ceka-hrvatska-slovenci-uveli-sofisticirane-elektronske-vinjete-dostupne-na-mobitelu-15133018>)

# Klima i promet - onečišćenje atmosfere

- izvori onečišćenja u gradu
  - industrija
  - promet
  - kućna ložista



Los Angeles – sekundarni onečišćivači

(izvor: <http://www.localpin.com/los-angeles/>)

PORAZNI REZULTATI

# Zagreb je ovaj tjedan predzadnji u EU po kvaliteti zraka. Istražili smo što se događa

Među najzagađenijima smo u svijetu, a i prošle je godine Hrvatska po zagađenosti zraka na svijetu bila na 51. mjestu

Piše: Željka Godeč Objavljeno: 24. prosinac 2020. 13:11

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Goran Mehkek /cropix

LOŠE ZA ZDRAVLJE

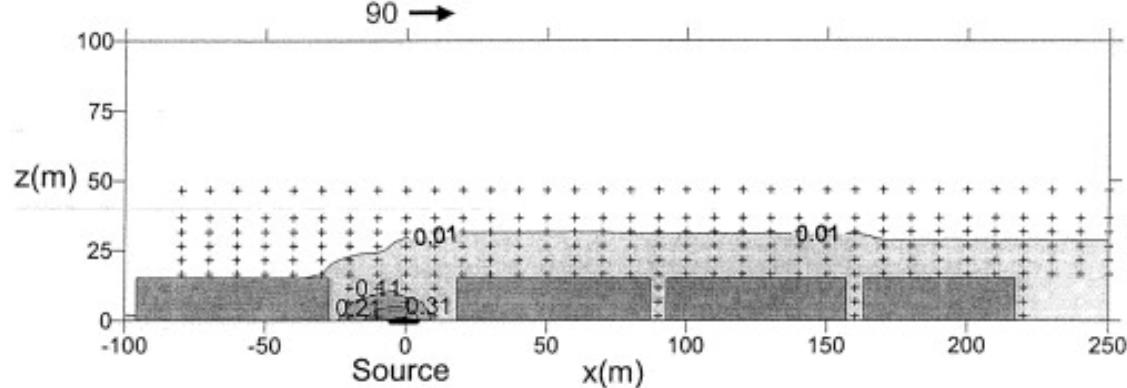
## Alarmantni podaci: Zrak u Zagrebu danas bio drugi najzagađeniji na svijetu, oglasila se stručnjakinja

Vidić naglašava i da sve dok traje sezona grijanja, u ovakvim situacijama će koncentracije lebdećih čestica, ali i drugih spojeva biti visoke.

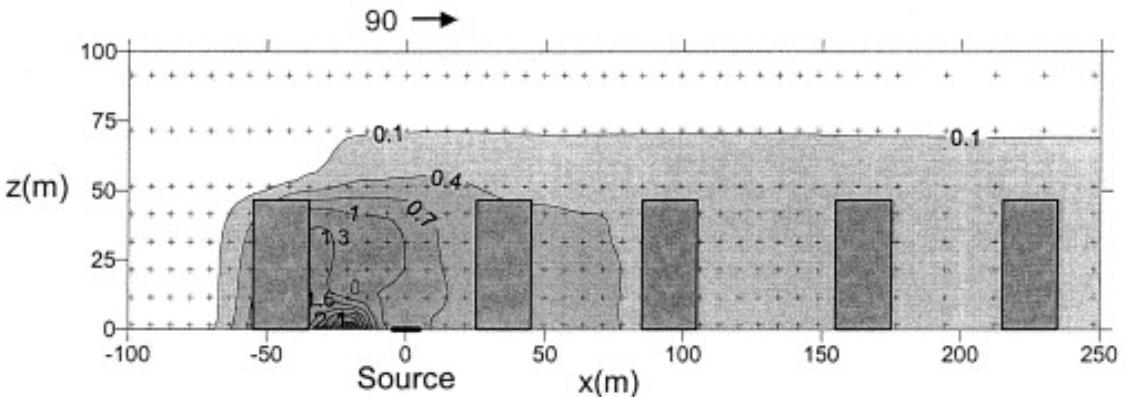
26. VELJAČE 2021. U 15:21 | 36 KOMENTARA | 20199 PRIKAZA | Sviđa mi se



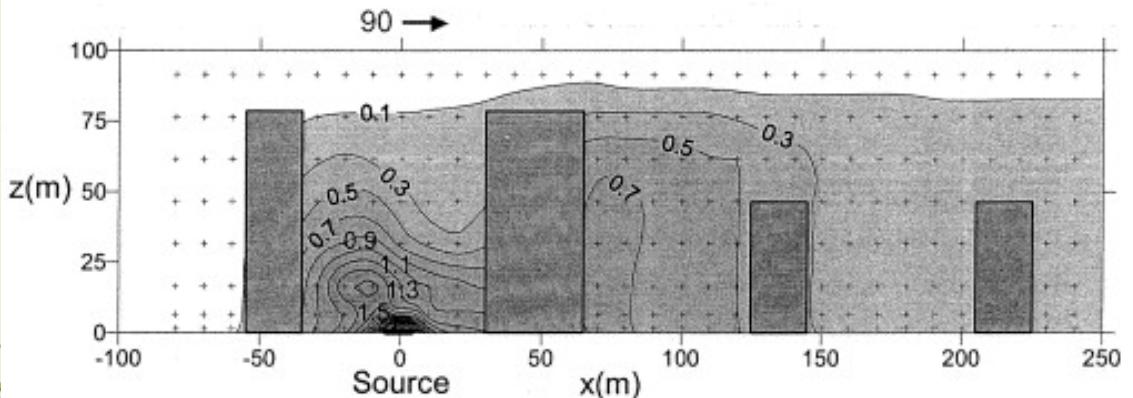
## Utjecaj veličine i oblika zgrada na kvalitetu zraka u gradu



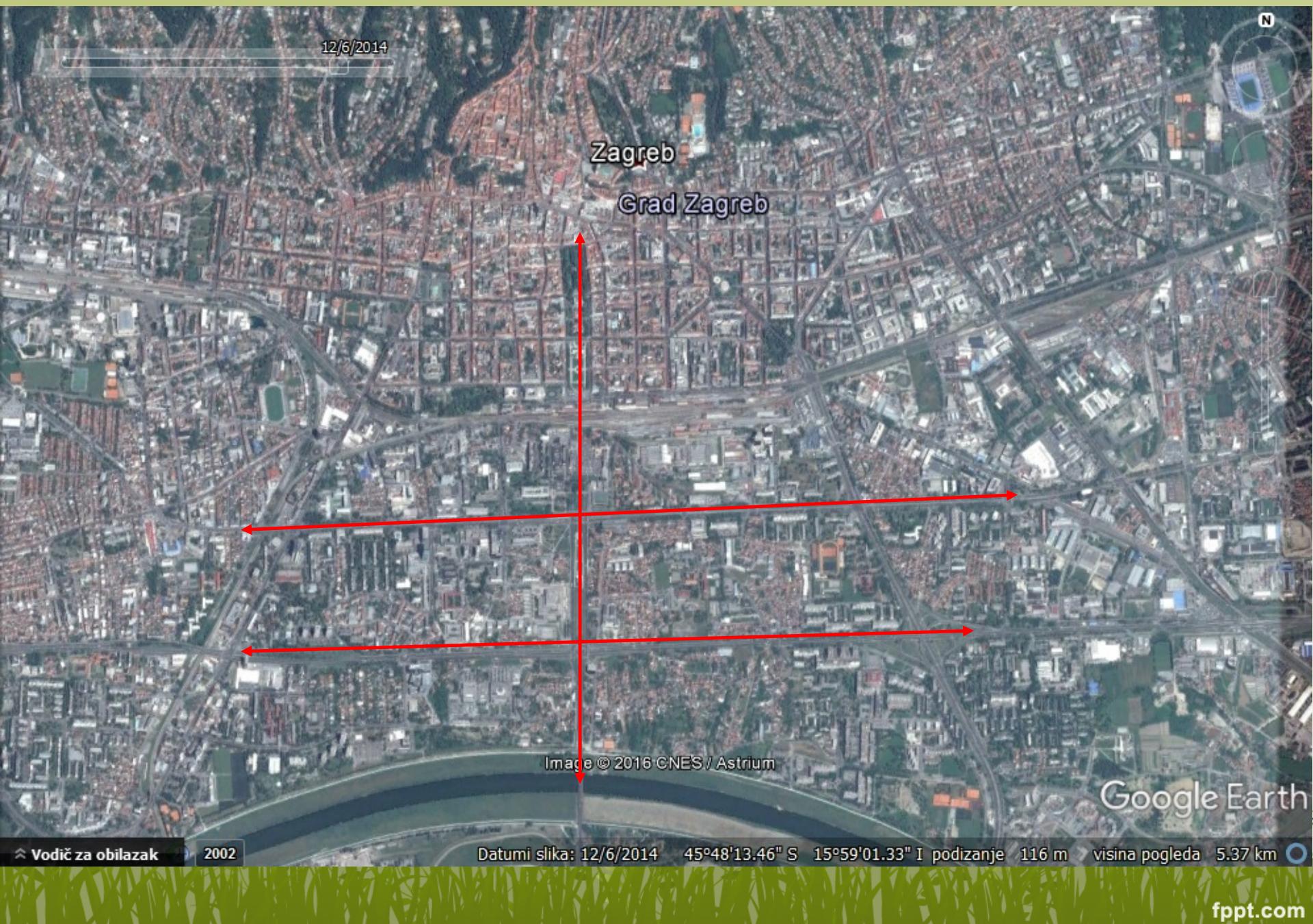
(a) Wide canyon ( $W/H=2.38$ )



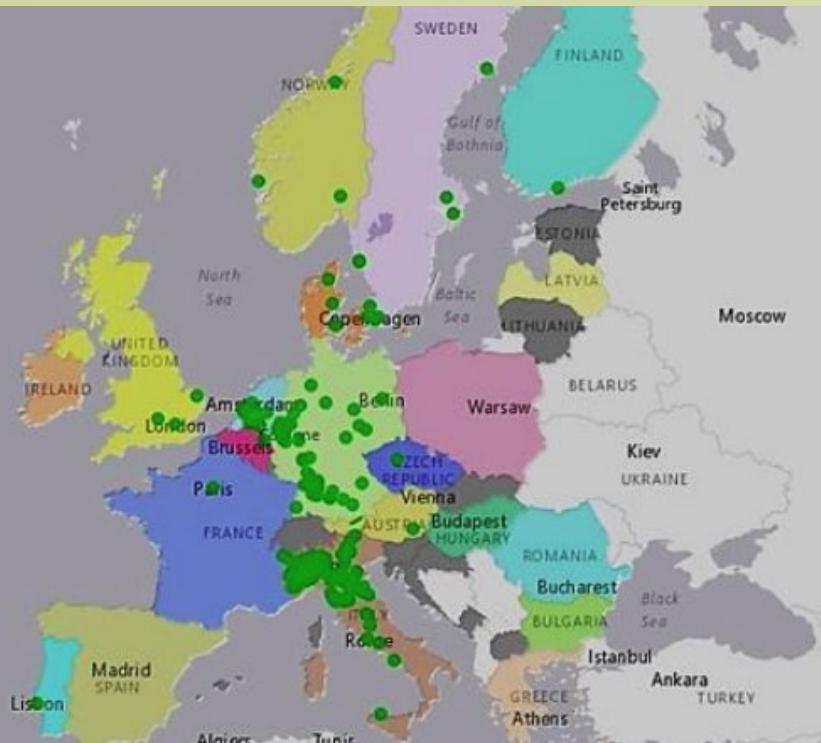
(b) Regular canyon ( $W/H=1.39$ )



(c) Deep canyon ( $W/H=0.64$ )



# Klima i promet – onečišćenje atmosfere



Low emission zone – zone u kojima je ograničen pristup vozilima koja onečišćuju atmosferu

(izvori: <https://euobserver.com/regions/135941> ;  
Fuc, P., et al 2018 IOP Conf. Ser.: Mater. Sci. Eng. 421 042020)

# Toplinski otok grada – važnost izgrađenih površina

## Urban Heat Island Effect

Urban cores retain heat for a variety of reasons, creating a heat island effect. Canadian researchers illustrated the differences between rural areas, leafy neighborhoods and downtown areas with the following summer example.

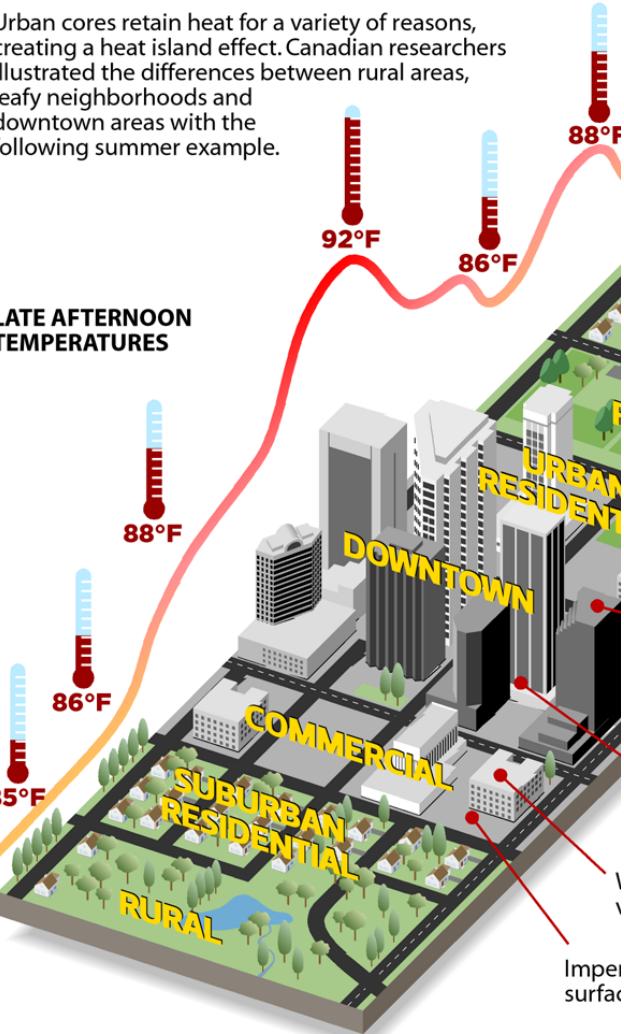
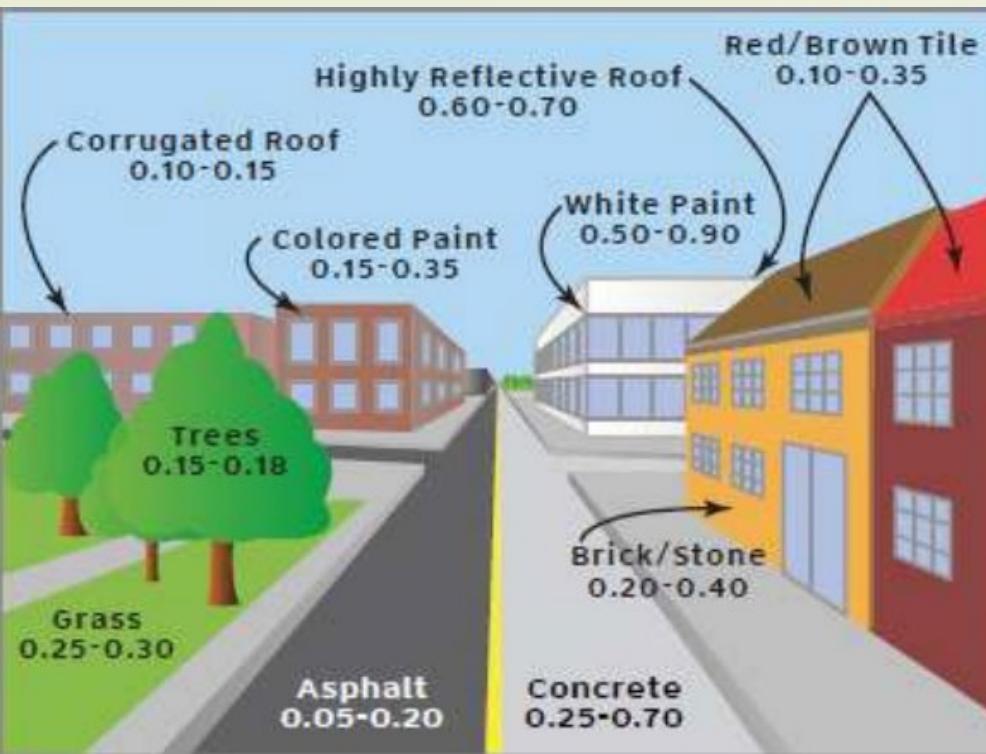


Table 1. Classification of “urban” and “rural” field sites by local climate zones.

Site Photographs Eye Level	Site Photographs High Angle*	Traditional Classification & Site Metadata	Local Climate Zone Classification
		<b>Urban</b> Weather observatory in central Tokyo, next to busy roads, expressways, and close-set concrete buildings 10–20 stories tall. SVF~0.65. Vegetation scarce. Built fraction ~90 %. Heavy traffic flow.	<u>COMPACT HIGHRISE</u> 
		<b>Urban</b> Narrow street canyon in central Goteborg. Compact brick buildings 5–8 stories tall. SVF=0.5 H/W=1.4 Z <sub>H</sub> =20 m. Few trees or green surfaces. Built fraction ~75 %. Moderate traffic flow.	<u>COMPACT MIDRISE</u> 
		<b>Urban</b> Housing estate on the outskirts of Szeged. Concrete towers 5–11 stories tall, widely set, uniform in design and layout. Z <sub>H</sub> =19 m. SVF=0.85. Abundant vegetation and open space. Built fraction 54 %. Low-moderate traffic flow.	<u>OPEN-SET MIDRISE</u> 
		<b>Rural</b> Residential site 60 km NW of Tokyo. Detached, open-set homes 1–2 stories tall, separated by green spaces and small trees. SVF~0.75. Built fraction ~70 %. Low traffic flow.	<u>OPEN-SET LOWRISE</u> 
		<b>Rural</b> Cultivated fields 4.5 km west of Szeged. Fields uniformly cropped. No trees. Dry soils. Crop canopy 1 m agl. SVF=1. Built fraction < 1 %. Traffic flow nil.	<u>LOW PLANT COVER</u> 

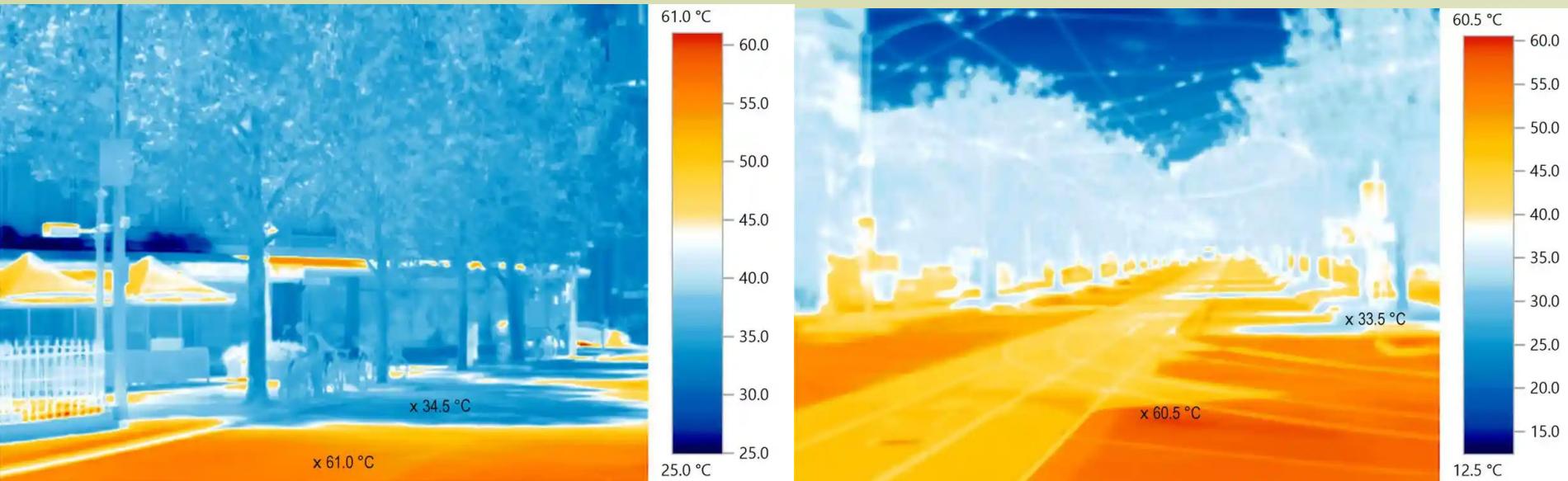
# Toplinski otok grada – važnost izgrađenih površina

- albedo
  - koeficijent refleksije Sunčevog zračenja od podloge
  - velika uloga u zagrijavanju gradova



(izvor:  
[http://www.ghcc.msfc.nasa.gov/urban/urban\\_heat\\_island.html](http://www.ghcc.msfc.nasa.gov/urban/urban_heat_island.html))

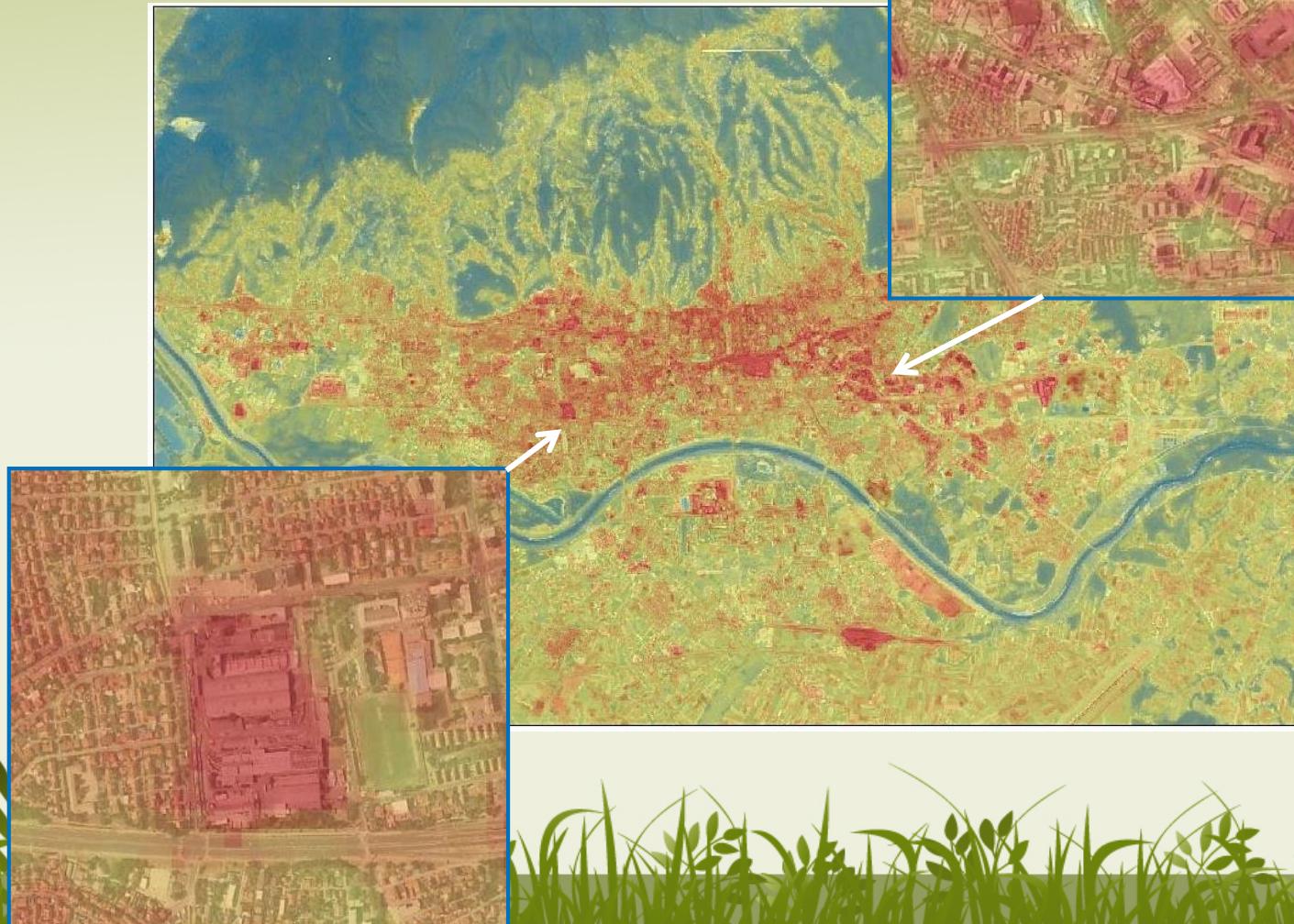
# Toplinski otok grada – prirodne vs. izgrađene površine



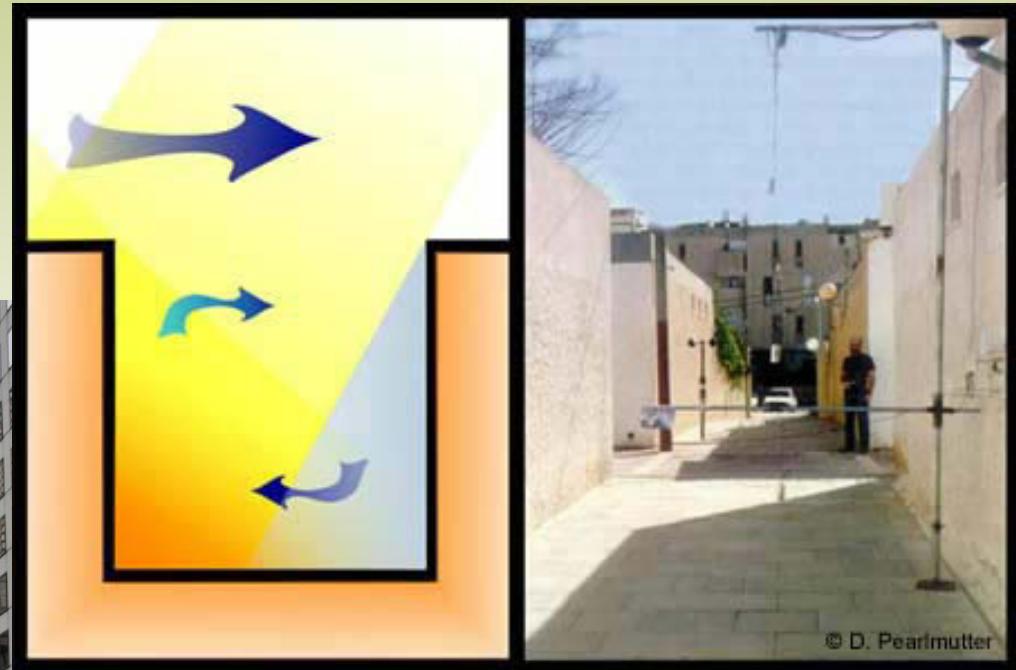
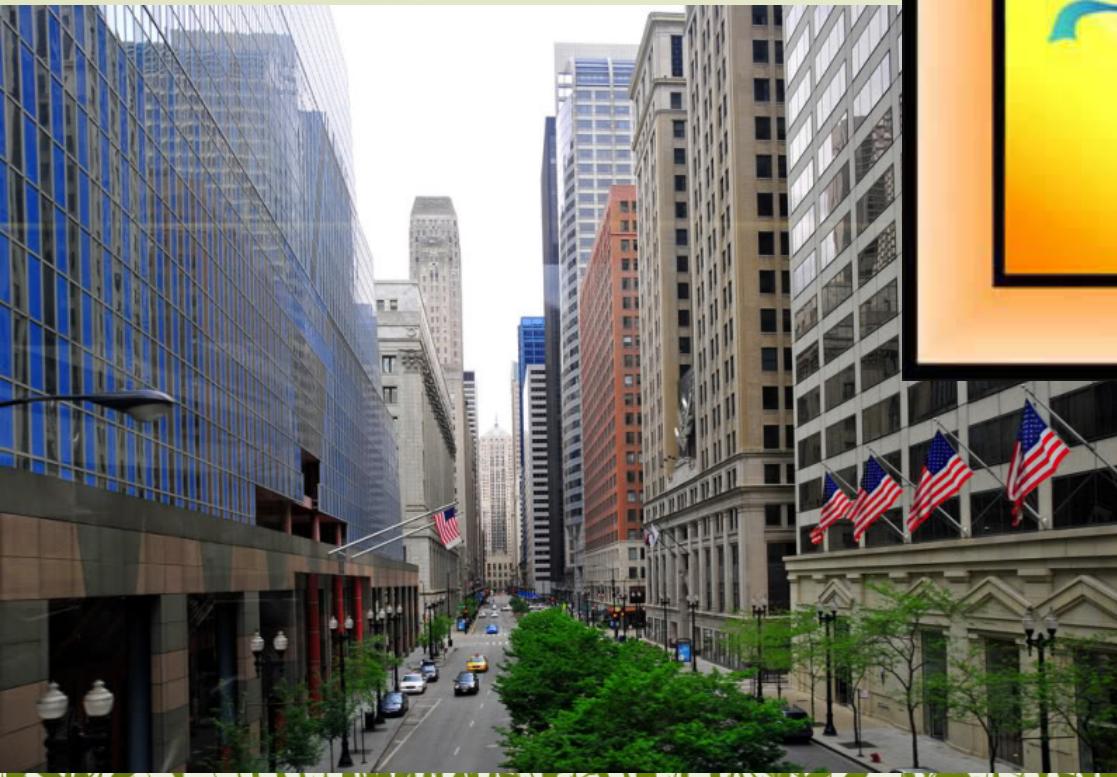
Snimke toplinskog zračenja odabranih dijelova Melbournea za vrijeme  
toplinskog vala, siječanj 2017. godine

(izvor: <https://www.theguardian.com/sustainable-business/2017/feb/21/urban-heat-islands-cooling-things-down-with-trees-green-roads-and-fewer-cars>)

# Toplinski otok – Zagreb



# Toplinski otok grada – ulični kanjoni



(izvor: <http://ag.arizona.edu/oals/ALN/aln47/pm2.html>)

(izvor: <http://www.city-data.com/forum/city-vs-city/838157-photos-your-citys-urban-canyons.html>)

# Utjecaj prometnica na ohlađujući učinak Botaničkog vrta



Odstupanja ljetne/srpanjske temperature u 14 sat od temperature meteorološke postaje Zagreb–Grič za razdoblje 1. 5. 2018. – 30. 4. 2019.

# Rješenja?



(izvor: <https://www.smartcitiesdive.com/ex/sustainablecitiescollective/greening-our-streets/1079821/>)



# Rješenja?



## Projekt ozelenjavanja ulice u Melbourneu

(izvor: <https://medium.com/dark-matter-and-trojan-horses/daylighting-melbourne-how-we-can-transform-our-cities-street-by-street-2345410741>)

Zahvaljujem na  
slušanju!

