



**S E C A P**

# **RANLIVOST IN TVEGANJA IZPOSTAVLJENOSTI KLIMATSKIM UČINKOM**

*Denis Maragno, Carlo Federico Dall'Omo, Gianfranco Pozzer, Francesco Musco*

*University Iuav of Venice  
dmaragno@iuav.it*

**"Krize so v 21. stoletju postale norma zaradi zblíževanja globalizacije, urbanizacije in podnebnih sprememb."**

# # Sprememba podnebja

# Kaj so podnebne spremembe?

---



# Kaj so podnebne spremembe?

---

Podnebne spremembe lahko opredelimo kot:

statistično pomembne razlike v povprečnem stanju podnebja ali njegovi spremenljivosti, ki trajajo dlje časa (običajno desetletja ali več).

Podnebne spremembe pomenijo spremembo statističnih lastnosti in jih ni mogoče povezati z enim samim dogodkom (poplava, snežna nevihta itd.)

# # Razsežnost podnebnih vplivov

# Kaj so podnebne spremembe? ☐ teritorialni vpliv

## Podnebne anomalije

**MailOnline**

Home News Sport TV&Showbiz Femail Health Science&Tech Money Debate

News Home World news Headlines Pictures Most read News Board

### Vancouver Olympic chiefs truck in snow to combat city's warmest winter on record while rest of globe shivers (typical, isn't it?)

By MAIL FOREIGN SERVICE  
Last updated at 3:31 PM on 4th February 2010

[Comments \(18\)](#) [Add to My Stories](#)

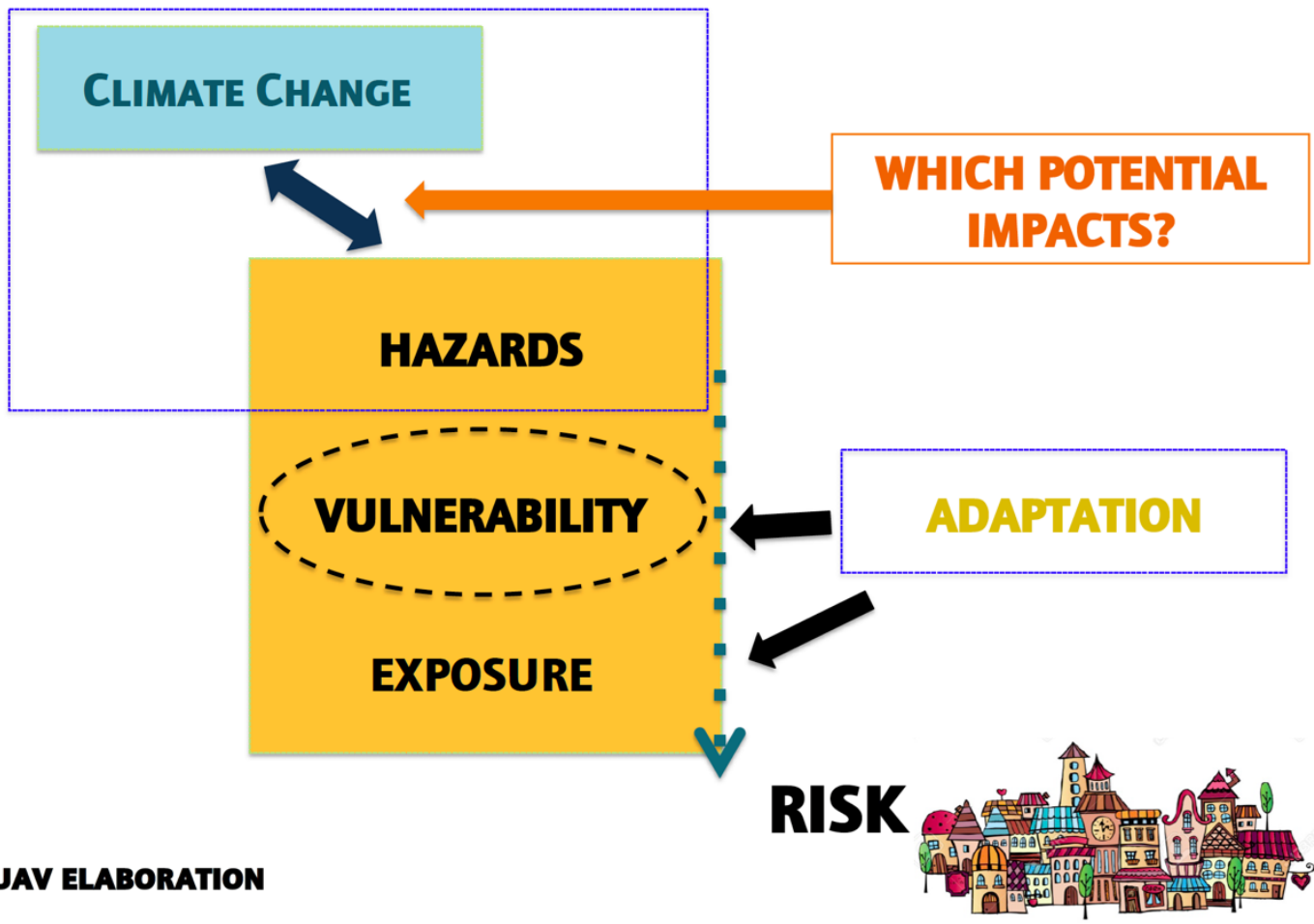
Britain may have suffered its longest cold snap in decades while parts of north Asia, Europe and the U.S. suffered record snowfalls.

But the one place in the world where icy conditions would be appreciated – the site of the Winter Olympics – has just had the warmest January on record and is unseasonably mild.

Organisers of the Vancouver Games are so worried about the lack of snow they have been forced to bring in truckloads of it in a desperate bid to save the event.



# IPCC 2014 APPROACH (FIFTH ASSESSMENT REPORT )



IUAV ELABORATION





**Vernazza – Cinque Terre  
2011**



Gargano 2014

FOGG



Genova – 2013



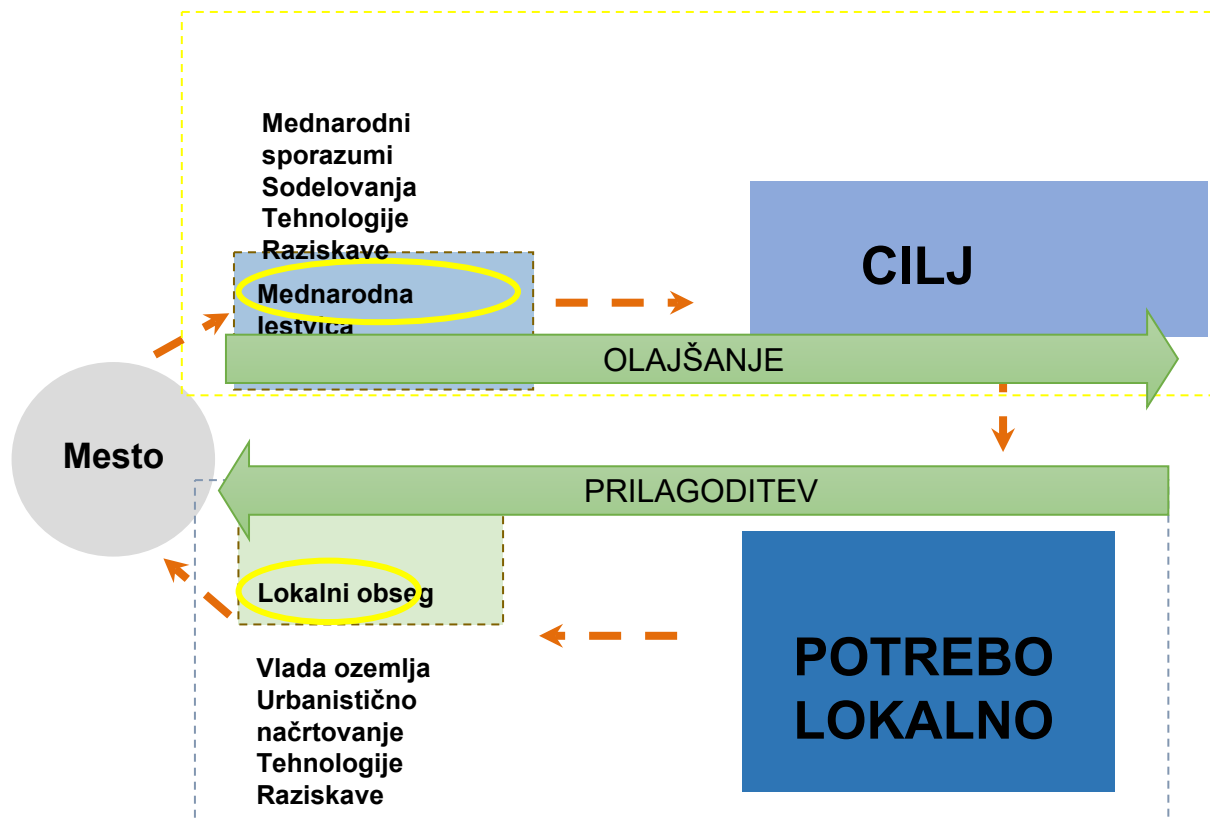
**Ancona 2016**

© Adriano Carbone 2016



**Emilia Romagna**  
**2017**

# # Načrtovanje podnebnih dokazov

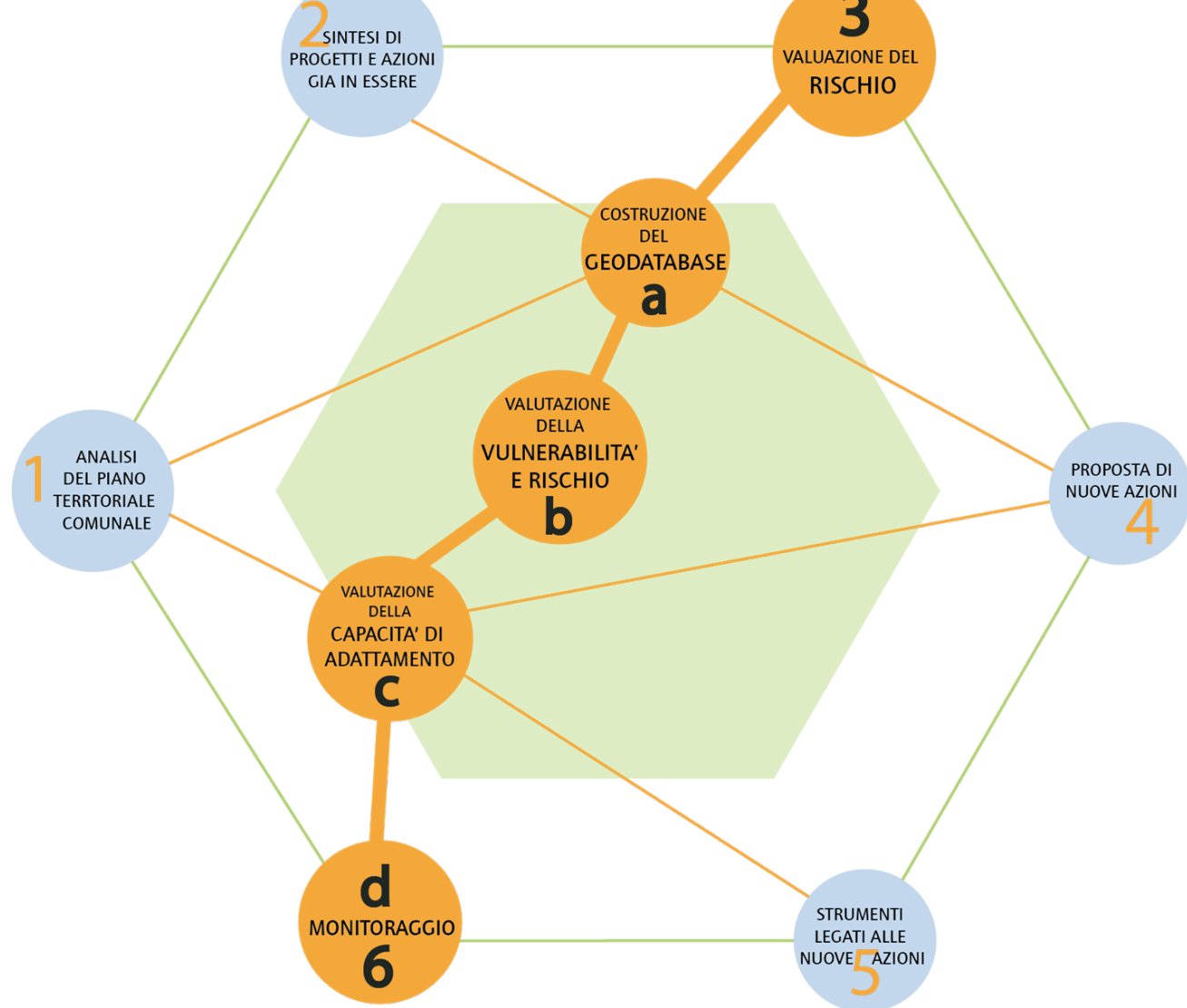


# GLOBALNO OGREVANJE PROTI KLIMATSKIM SPREMEMBAM



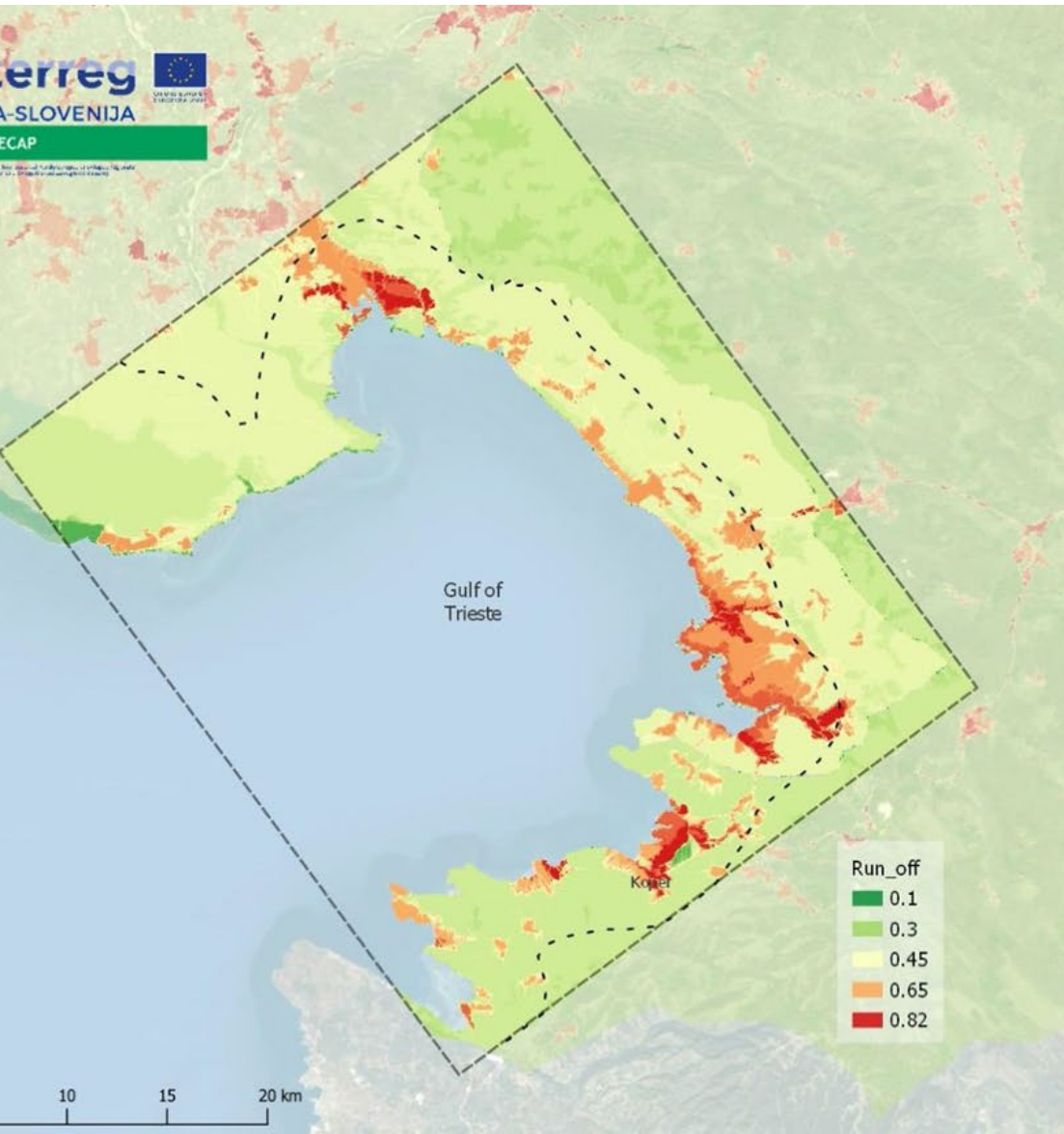


# # Pomen ranljivosti za usmerjanje prilagajanja



- a** Hazard, ICT, Open Data
- b** Sensitivity, Exposure, Index
- c** Adaptation Capacity, Adaptation Design
- d** Real Time

# EsemPrimer ranljivosti in prilagoditve

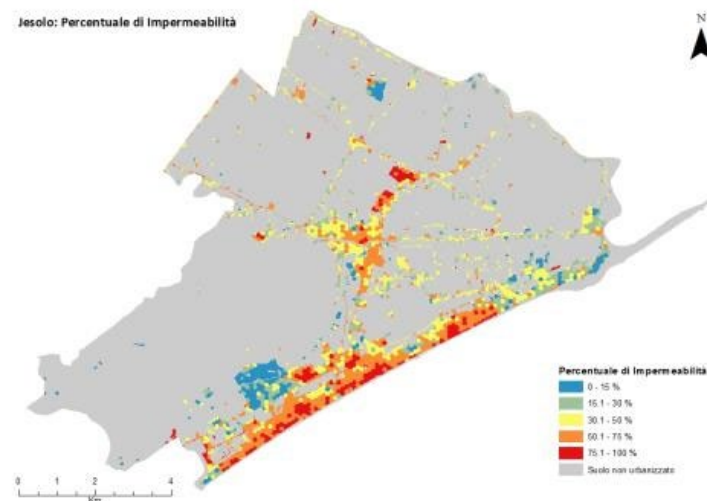
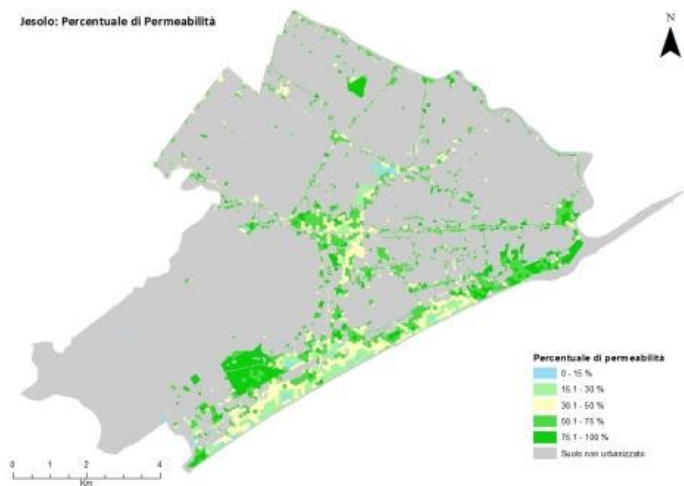


## 3. Vulnerability Maps

### Urban Run-Off Vulnerability Gulf of Trieste

Elaboration From Landsat 8 Satellite Image  
(July, 2017)

# Primer ranljivosti in prilagoditve

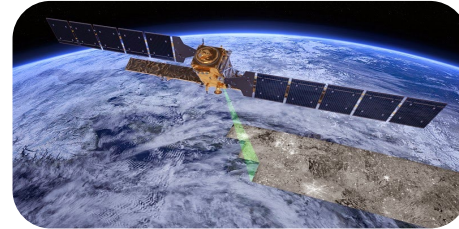


Pilotno območje za izvajanje prilagoditvenih ukrepov

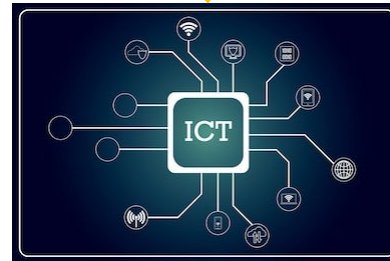
# # Pomen tehnologij za pridobivanje vesoljskih informacij



Daljinsko zaznavanje



Nove tehnologije



Obdelava podatkov



NIZKO

ZELENA



VISOKO  
ZELENA



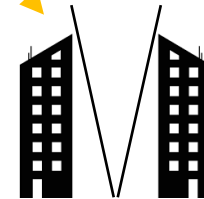
GRADBENA  
POVRŠINA



Vodotesna površina



TEMPERATURE



FAKTOR SKY VIEW

Kazalniki

# URBANO POPLAVJE



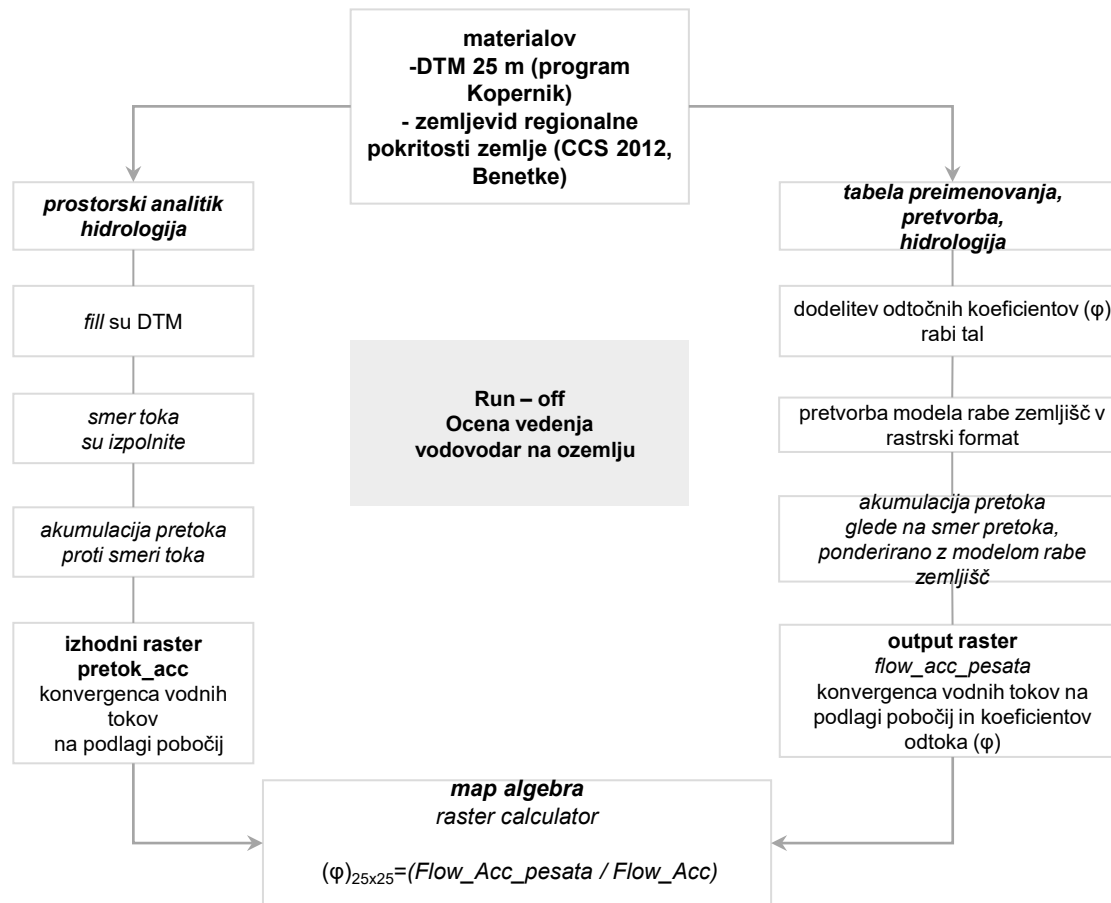
# URBANO POPLAVJE





# URBANO POPLAVJE– Flow Chart

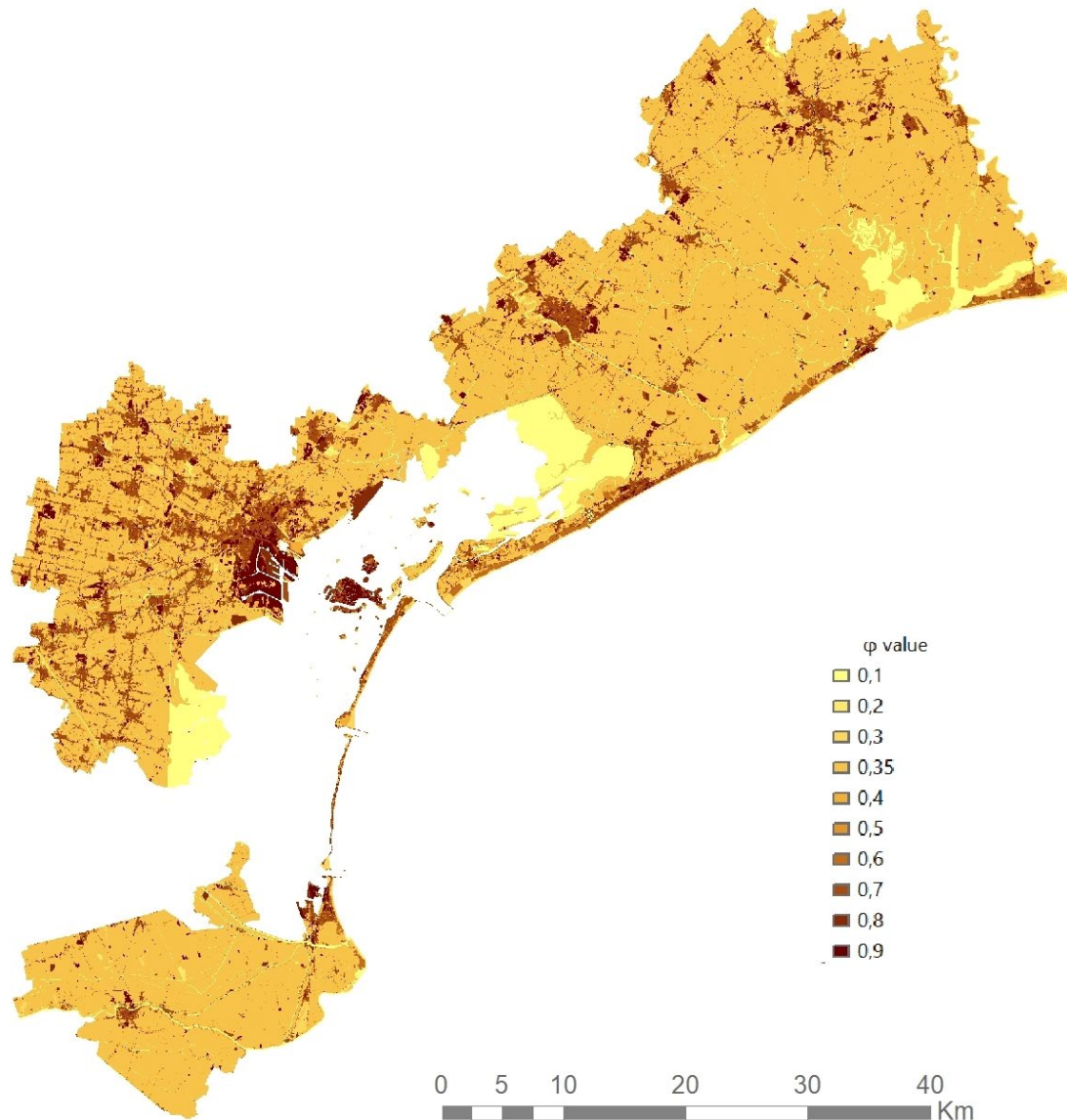
Prostorski algoritem za izračun odtekanja



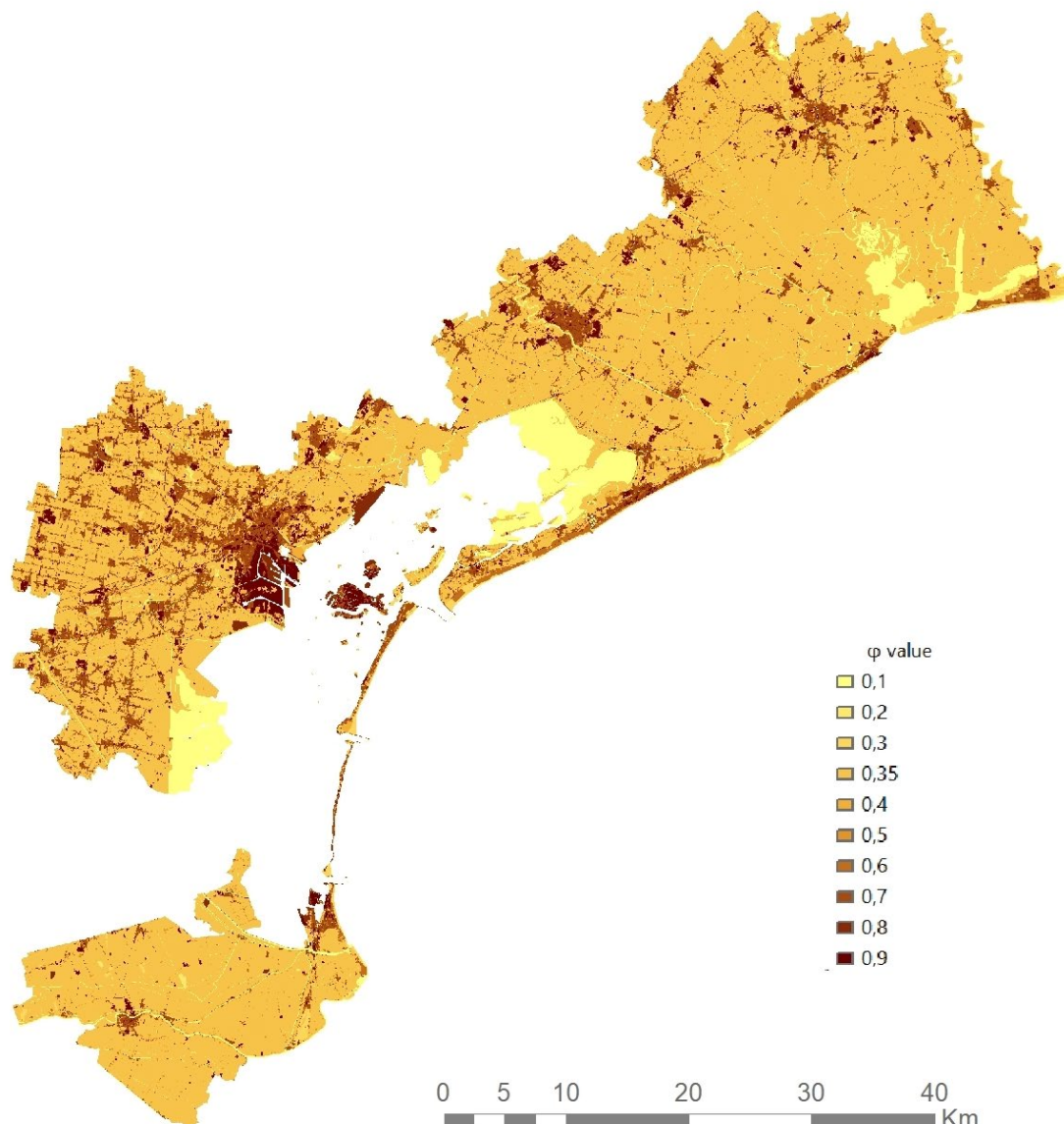
Razmerje vam omogoča, da koeficientom pretoka dodelite akumulacijo pretoka Flow\_Acc in vrnete "hidravlične vplive"  $\phi$  (ali  $\phi_{25 \times 25}$ ). Ta korelacija je izražena kot % padavin, ki se spremenijo v površinski odtok (v območju od 0,2 do 0,9). Il procedimento, calibrato a scala di bacino, è cumulativo.

**NAPOTILO:** Rezultati odtekanja so parametri, ki jih je mogoče določiti v sprejemnem intervalu na podlagi poglobljenih analiz tudi geološke narave.

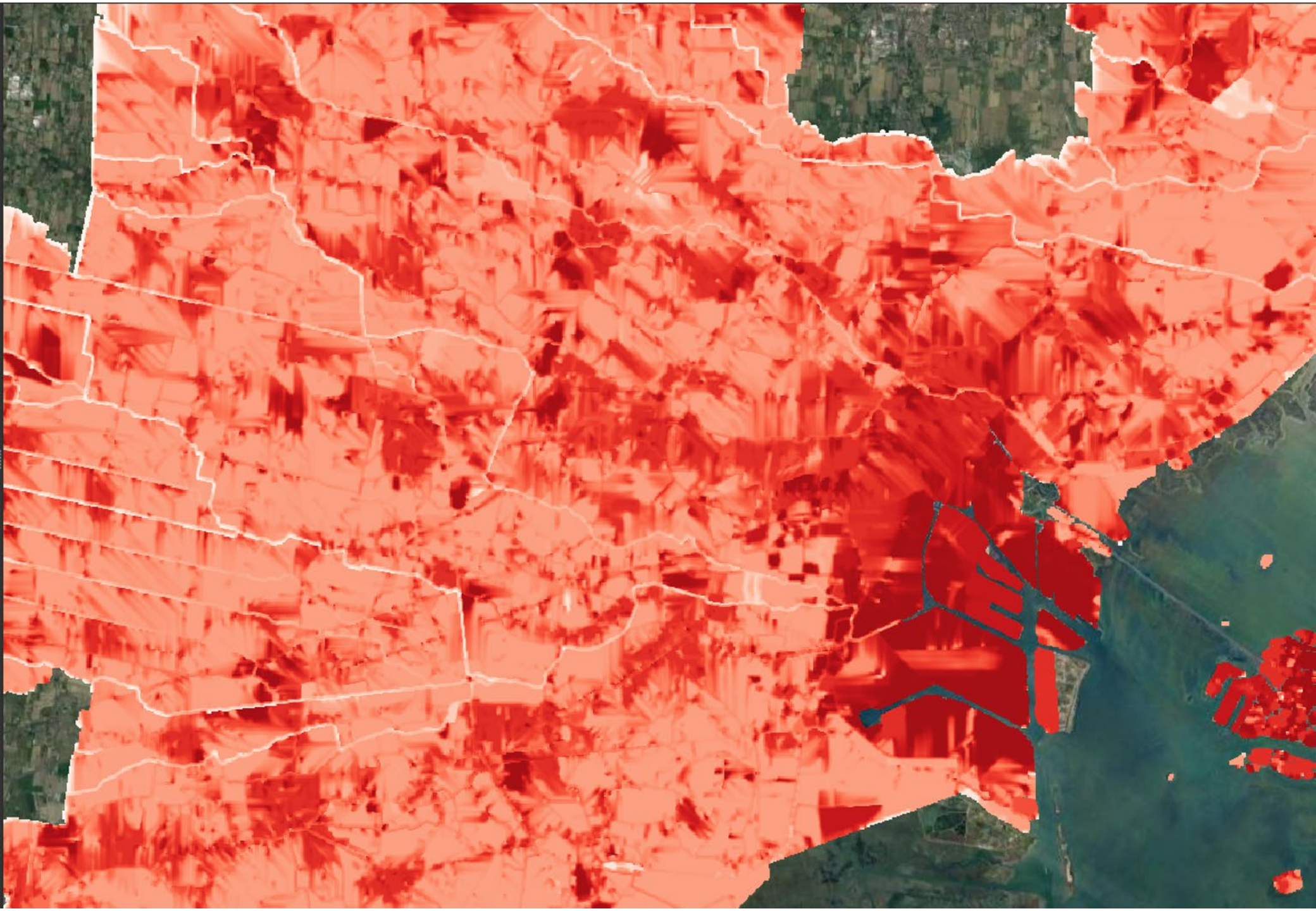
# URBANO POPLAVJE– Koeficienti odtoka

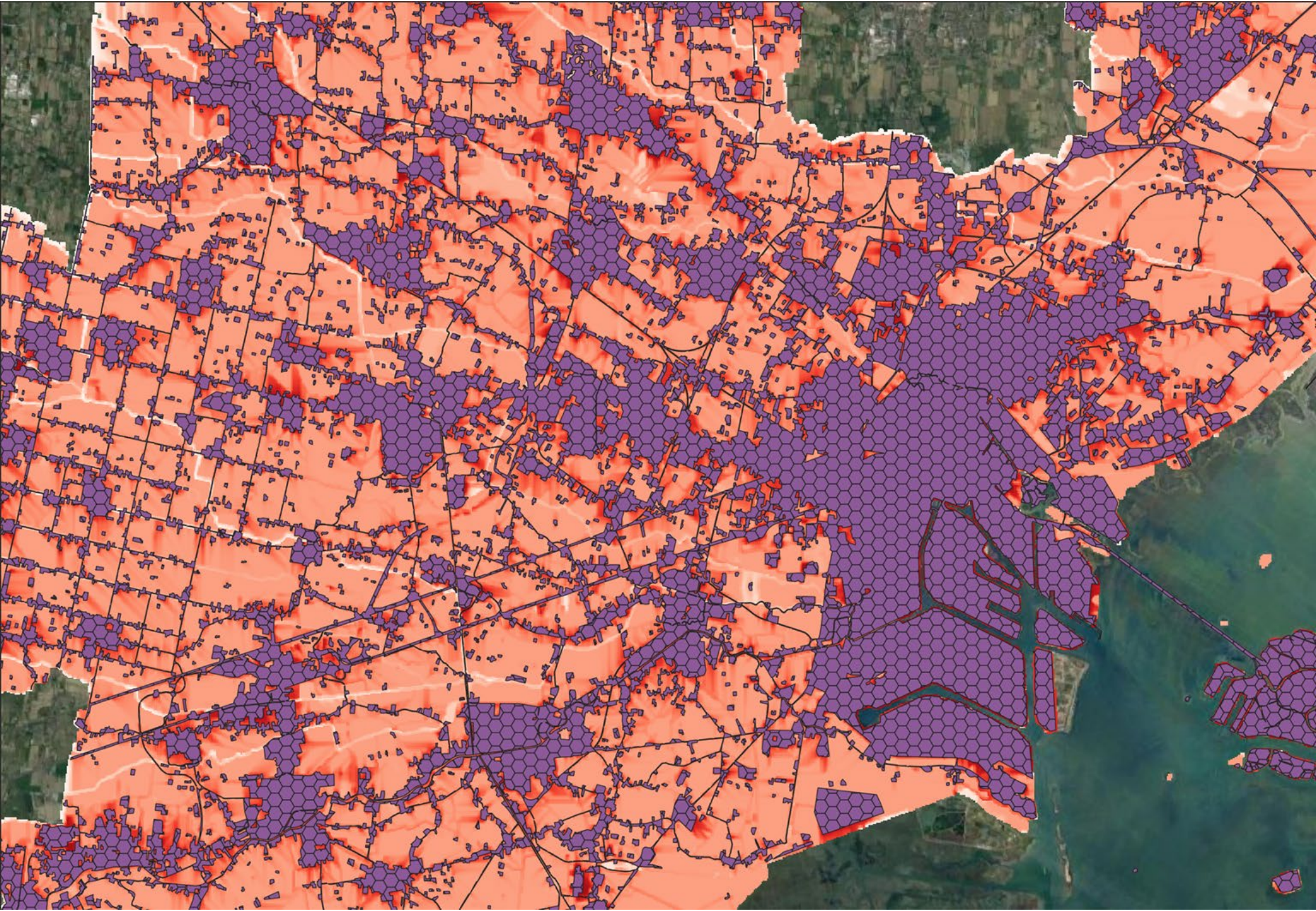


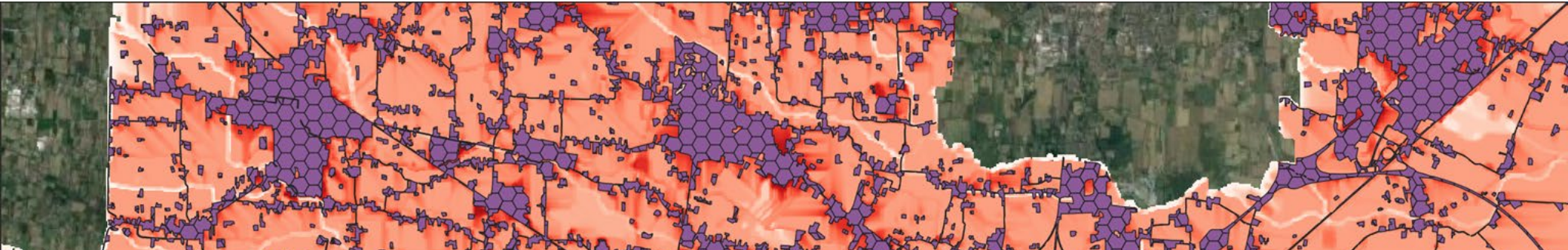
# URBANO POPLAVJE– Ranljivost











cmve\_t\_hexgrid150m\_20200121 :: Totale degli elementi: 21763, Filtrati: 21763, Selezionati: 0



j_exten	vuln1	vuln11	vuln111	expo1	expo11	expo111	risk1	risk11	risk111	_floodmean	_floodmin	_floodmax
1	1 0,361470991...	NULL	NULL	0,004366126...	NULL	NULL	0,001578227...	NULL	NULL	0,403976266...	0,384444445...	0,429263114...
2	1 0,354380399...	NULL	NULL	0,004106788...	NULL	NULL	0,001455365...	NULL	NULL	0,401001443...	0,384629637...	0,424426943...
3	1 0,200942734...	NULL	NULL	0,000115665...	NULL	NULL	2,324218368...	NULL	NULL	0,380952549...	0,380784273...	0,381450921...
4	1 0,365571442...	NULL	NULL	9,382025643...	NULL	NULL	3,42980064...	NULL	NULL	0,314721864...	0,277491480...	0,368659704...
5	11 0,183639487...	0,184871683...	NULL	0,000167161...	0,000167161...	NULL	3,069750798...	3,09034840...	NULL	0,100812403...	0,100713446...	0,100927397...
6	11 0,2010910119...	0,202491430...	NULL	6,266858876...	6,266858876...	NULL	1,260208993...	1,268985220...	NULL	0,385144206...	0,384444445...	0,398222208...
7	11 0,203493179...	0,204791451...	NULL	5,497582809...	5,497582809...	NULL	1,1187206037...	1,125857963...	NULL	0,602146606...	0,601728439...	0,60659998...
8	1 0,361796341...	NULL	NULL	0,001850200...	NULL	NULL	0,00066939...	NULL	NULL	0,533185184...	0,459851861...	0,606518507...
9	1 0,358802380...	NULL	NULL	0,007097761...	NULL	NULL	0,002546693...	NULL	NULL	0,472047742...	0,390408158...	0,529909968...
10	1 0,198736120...	NULL	NULL	0,000120394...	NULL	NULL	2,39266566...	NULL	NULL	0,1114908087...	0,110476896...	0,111696206...
11	111 0,557440679...	0,557987885...	0,555614819...	0,093841653...	0,093841653...	0,103836905...	0,0523111550...	0,052362505...	0,057693323...	0,804657115...	0,713333308...	0,819999933...
12	1 0,316708964...	NULL	NULL	0,005174269...	NULL	NULL	0,001638737...	NULL	NULL	0,447051651...	0,390899479...	0,490490674...
13	1 0,360899450...	NULL	NULL	0,000152593...	NULL	NULL	5,507086751...	NULL	NULL	0,448937333...	0,430000007...	0,449599981...

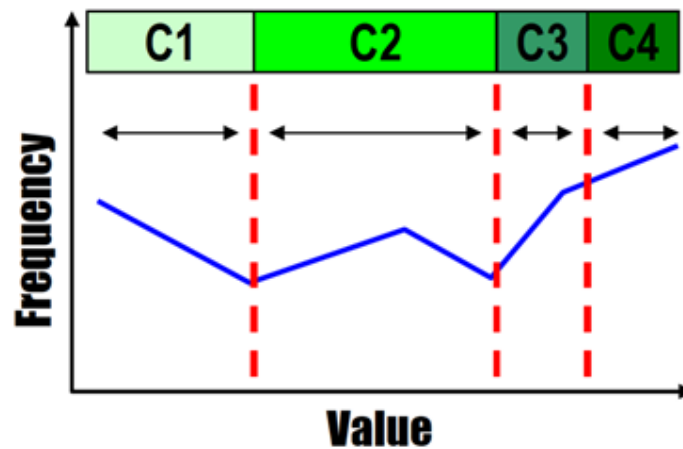
Mostra Tutti gli Elementi



# URBANO POPLAVJE– Ranljivost

## OPOMBE: kako razvrstiti številska polja

3 za količino ----- intervali - naravni prelomi

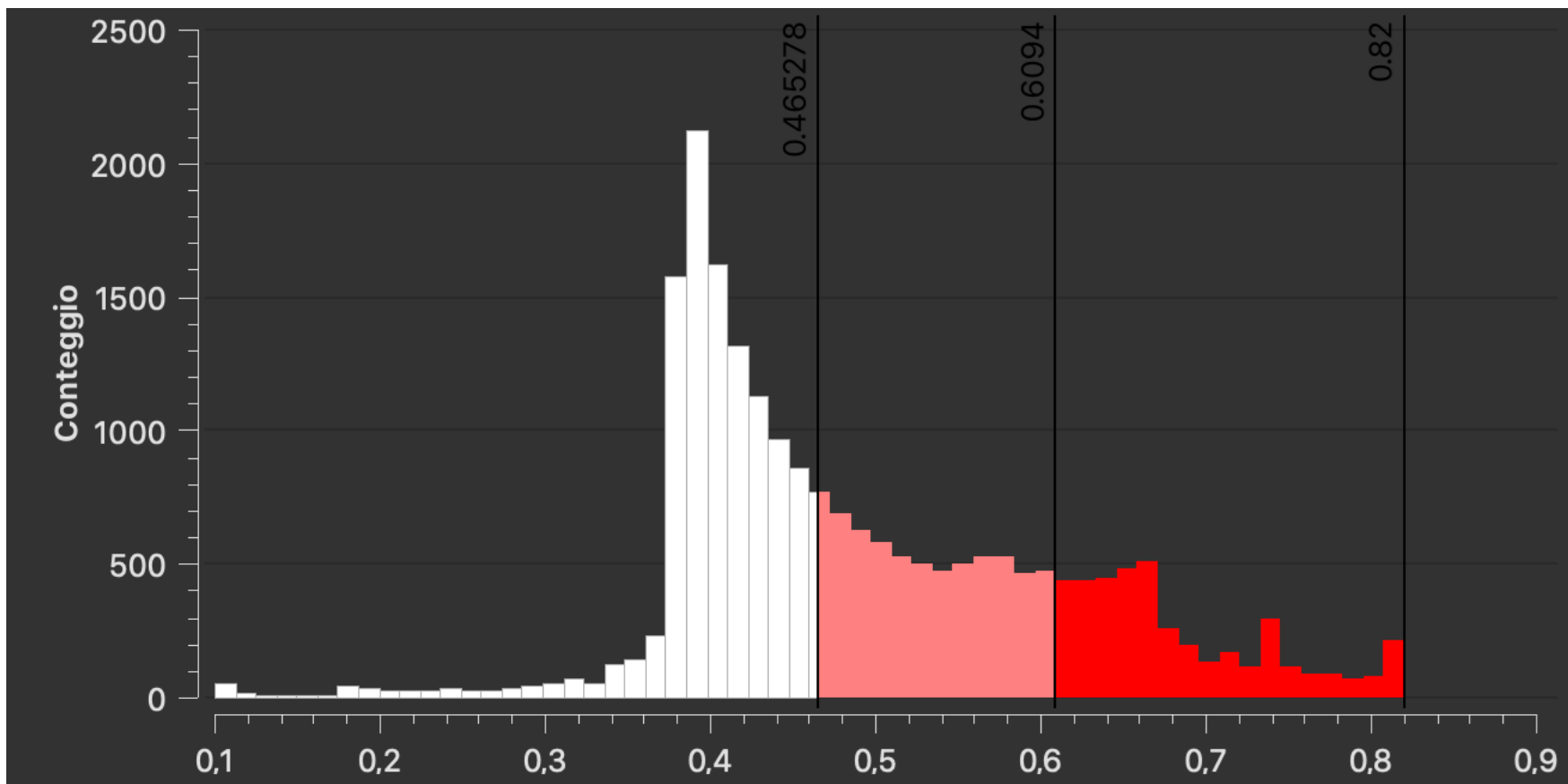


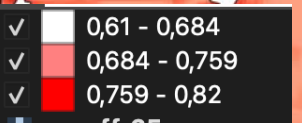
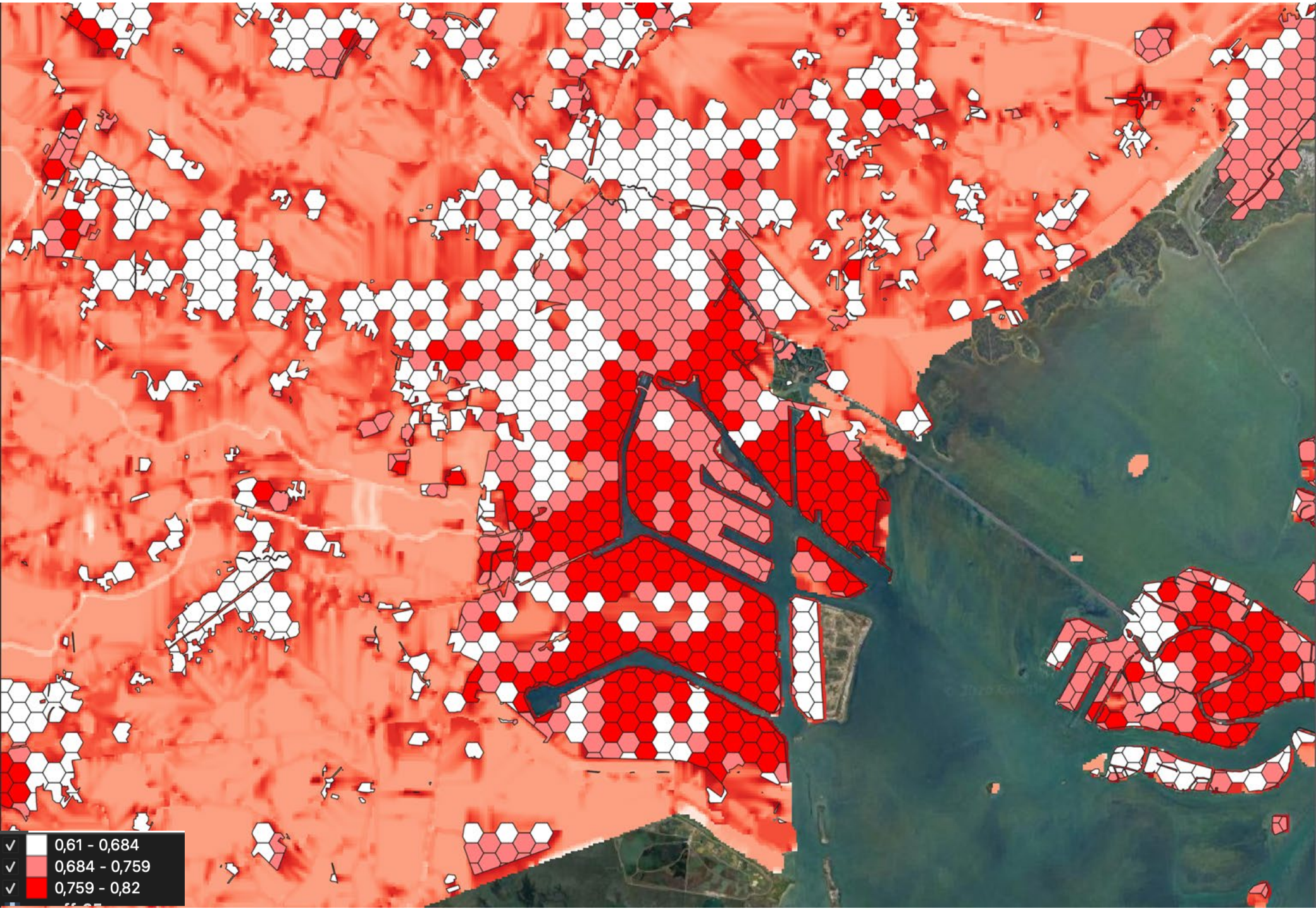
Intervali so opredeljeni, kadar pride do velikih prekinitev ali preskokov pri porazdelitvi vrednosti atributov.

Dobro za podatke, ki niso enakomerno porazdeljeni

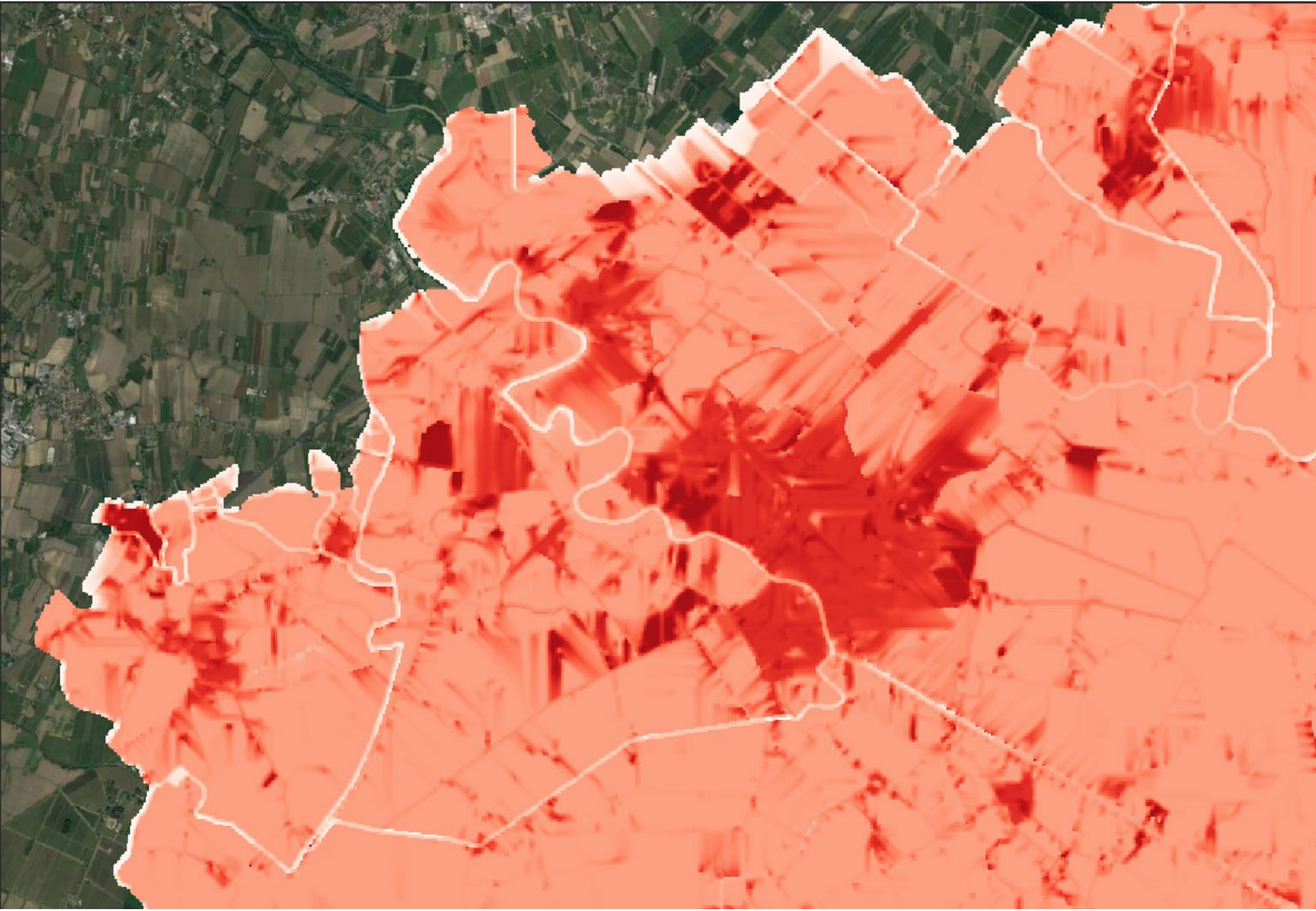


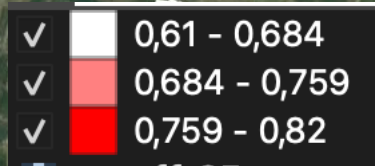
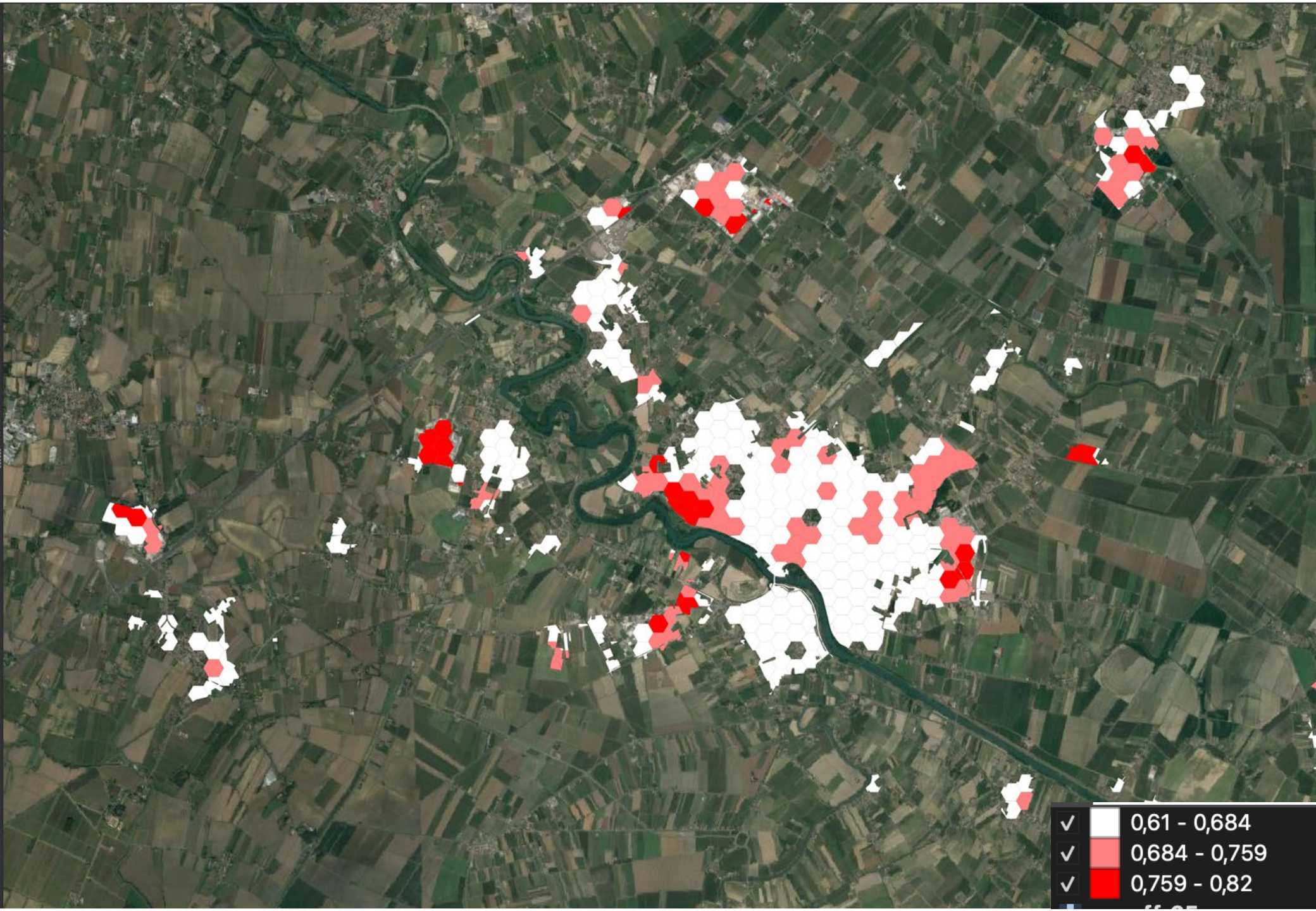
# URBANO POPLAVJE– Ranljivost

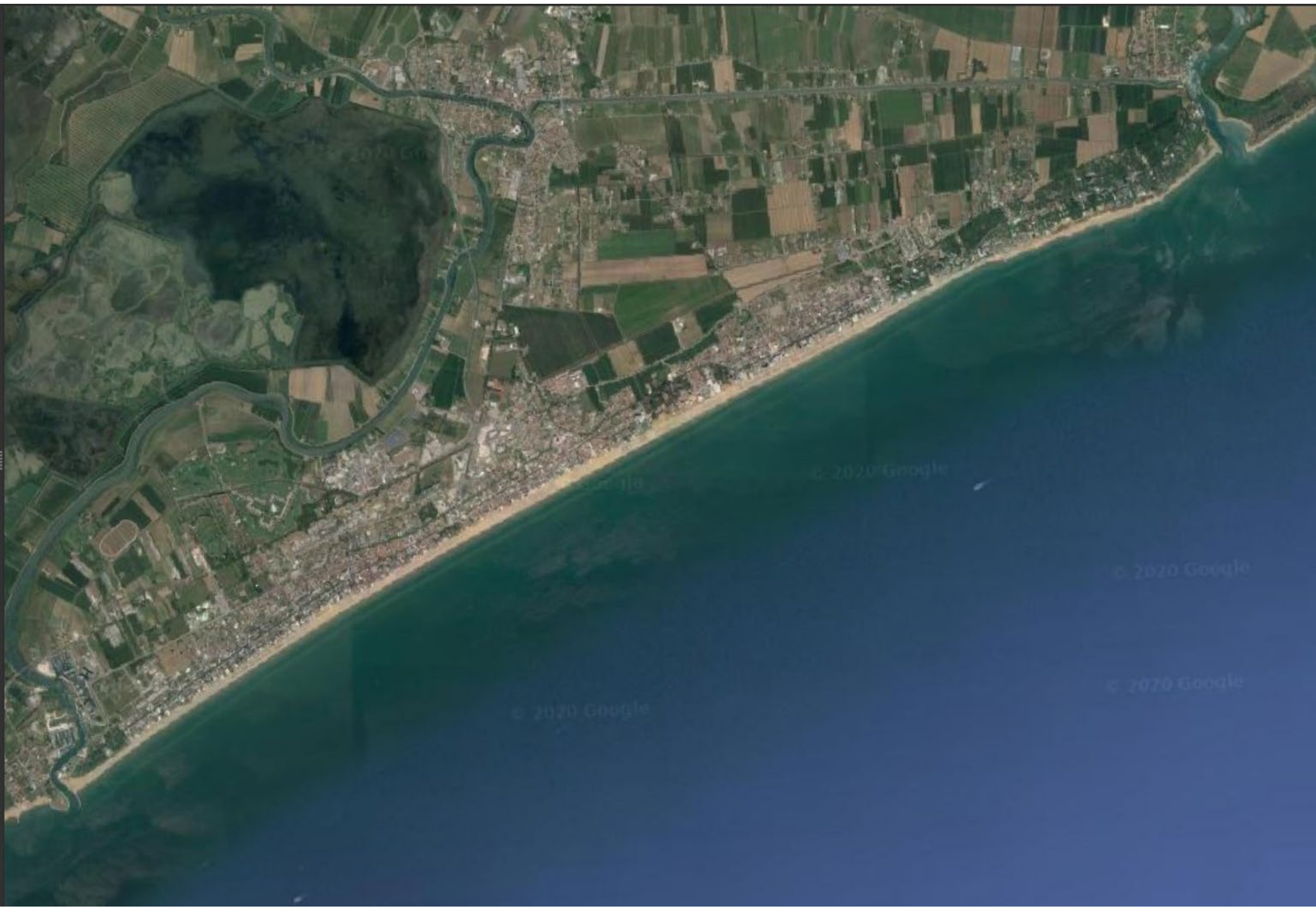


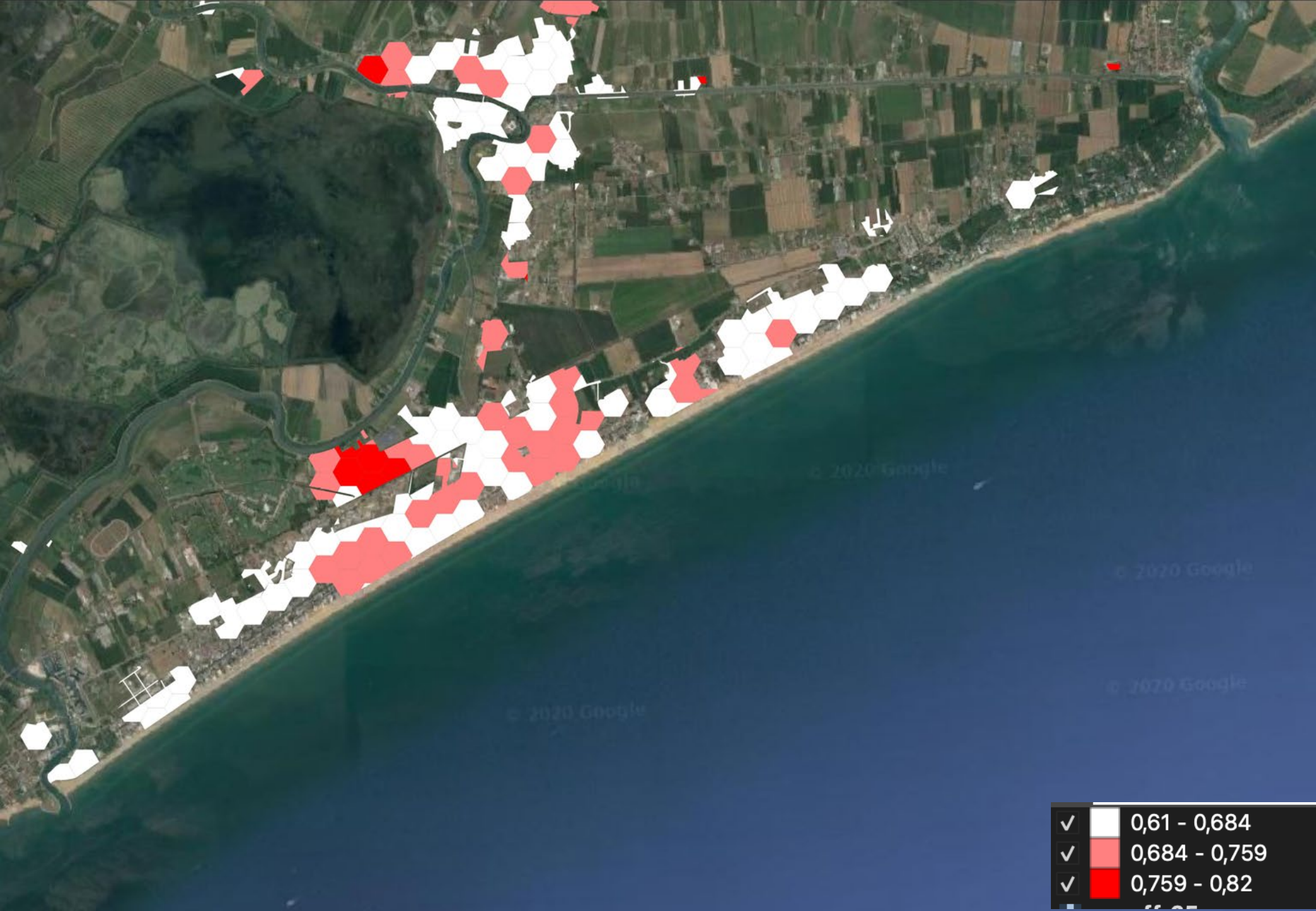












© 2020 Google

© 2020 Google

© 2020 Google

© 2020 Google



# Ocene ranljivosti

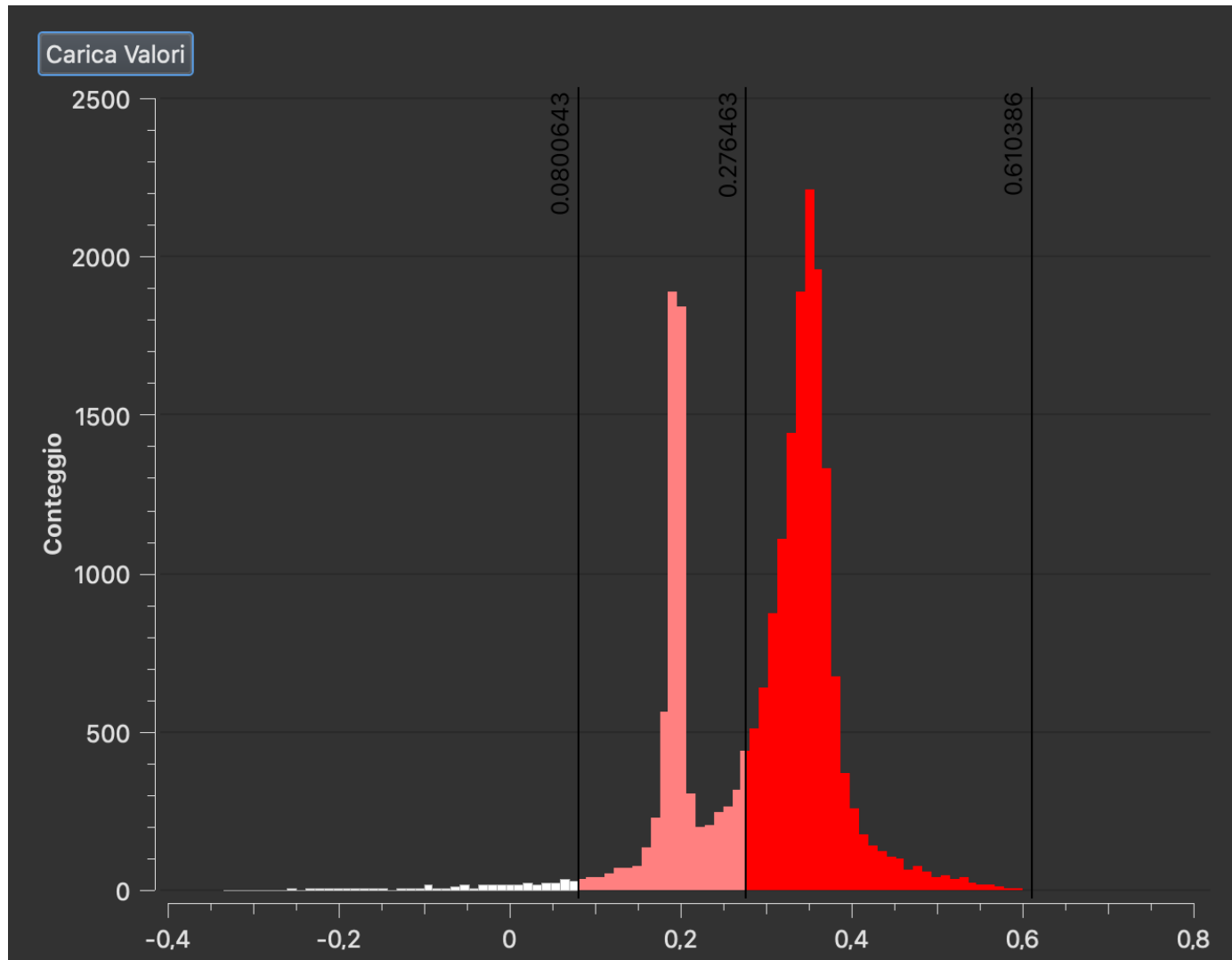
# TOPLOTNI VALOVI

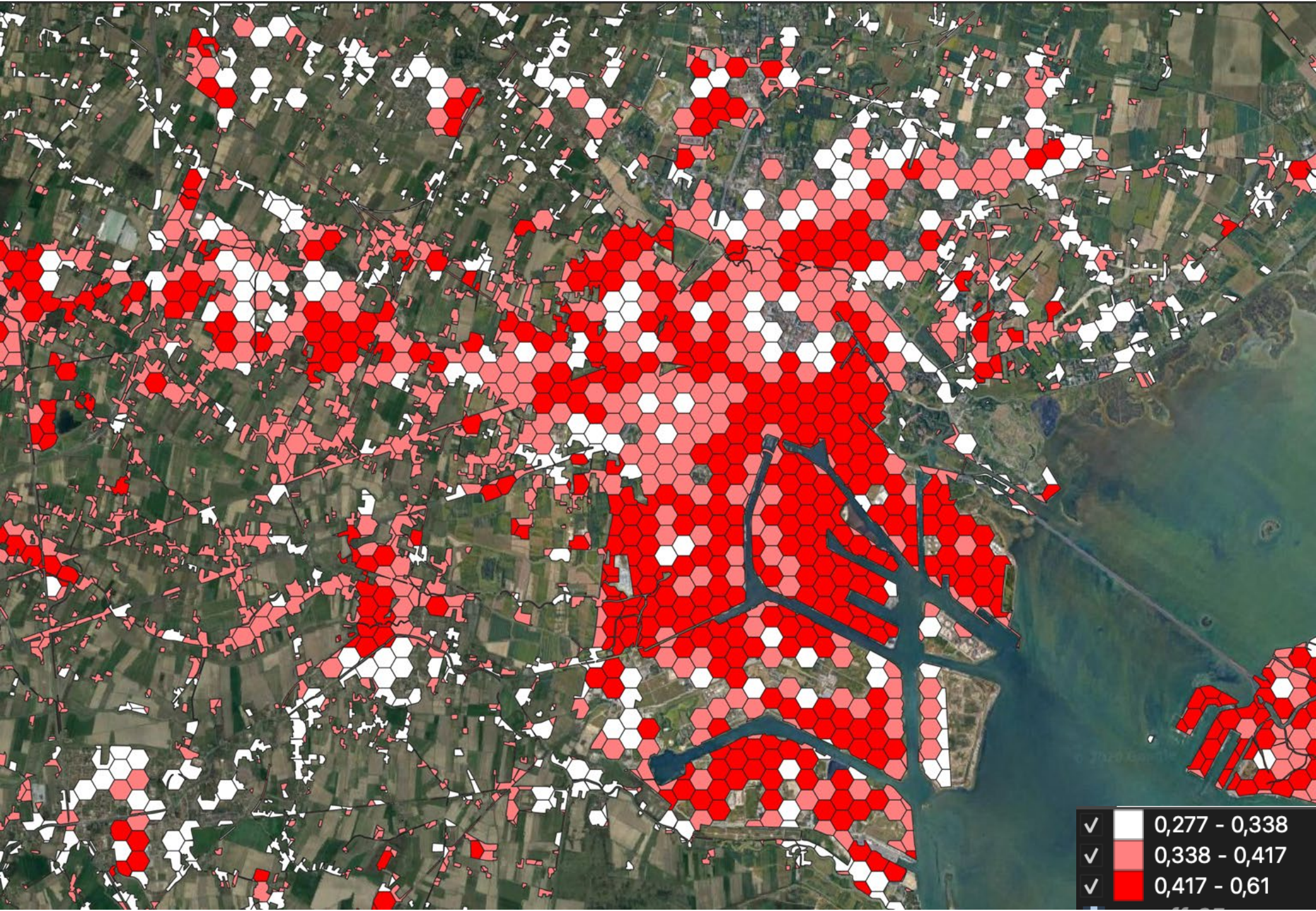


# URBAN FLOODING – Vulnerabilità

✓	□	-0,33 - 0,1
✓	□	0,1 - 0,28
✓	□	0,28 - 0,61

# UHI - ranljivost

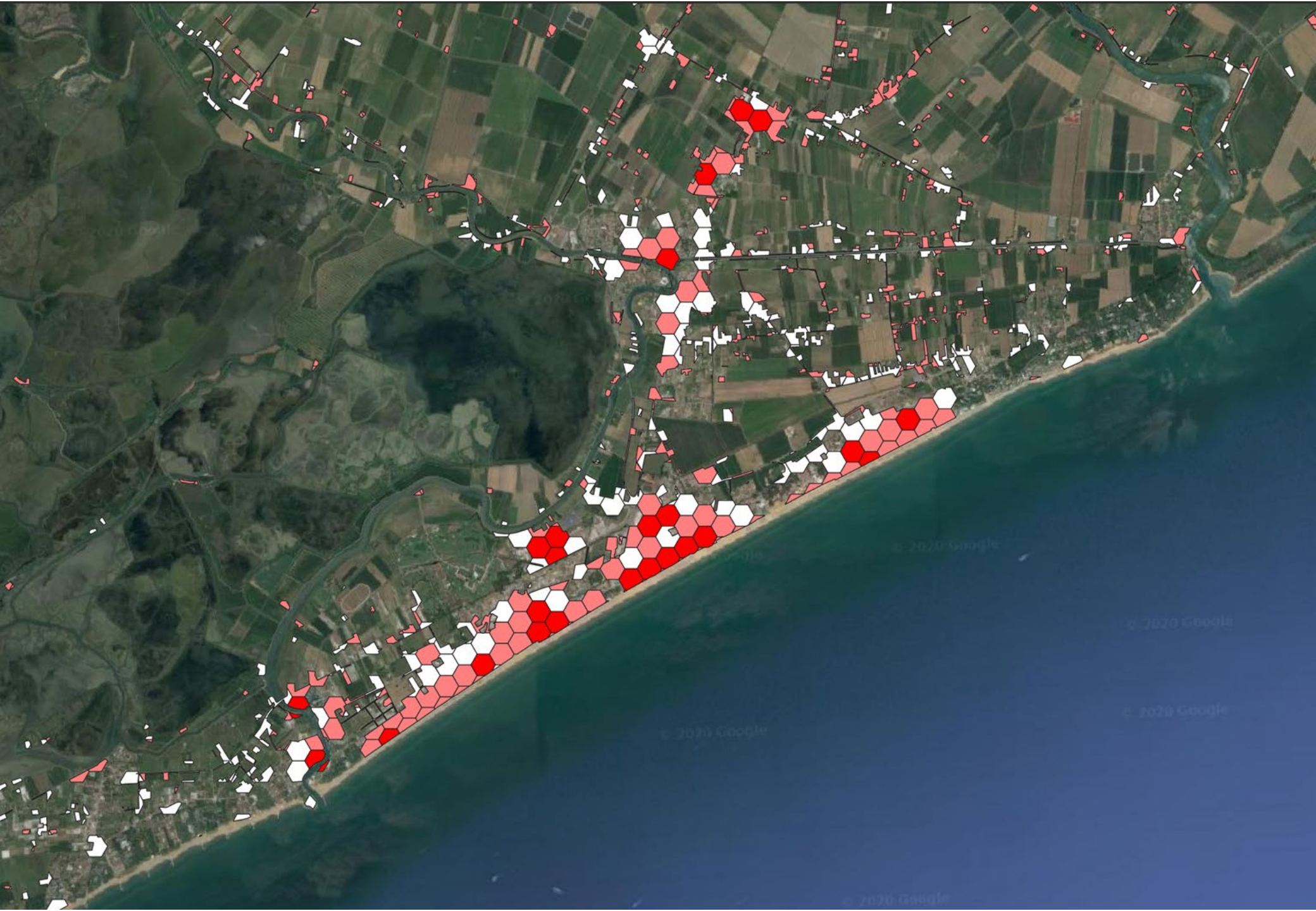




✓	□	0,277 - 0,338
✓	■	0,338 - 0,417
✓	■	0,417 - 0,61



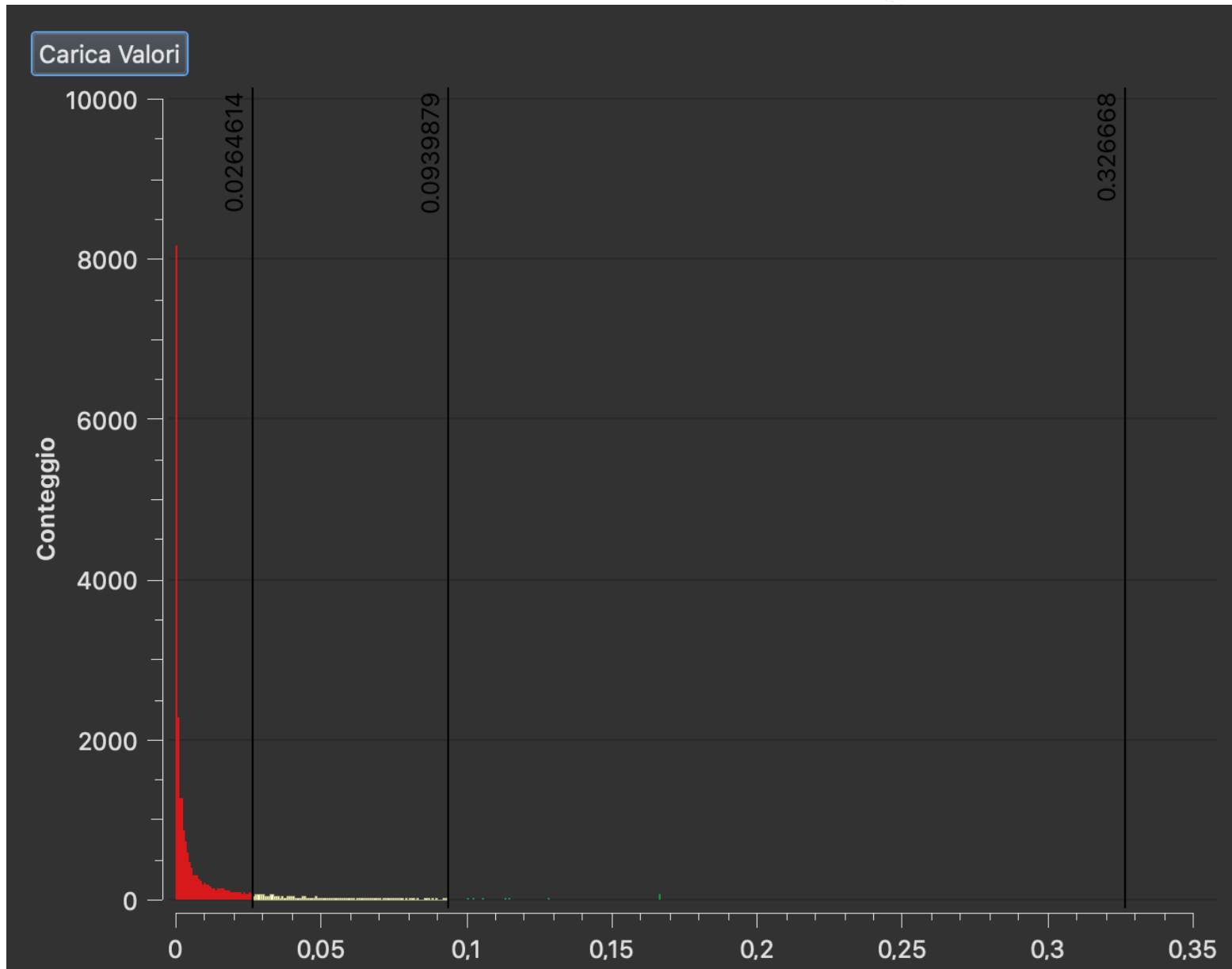




**Ocene tveganja**

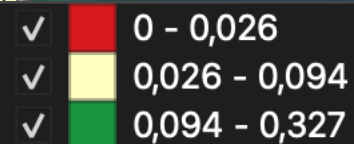
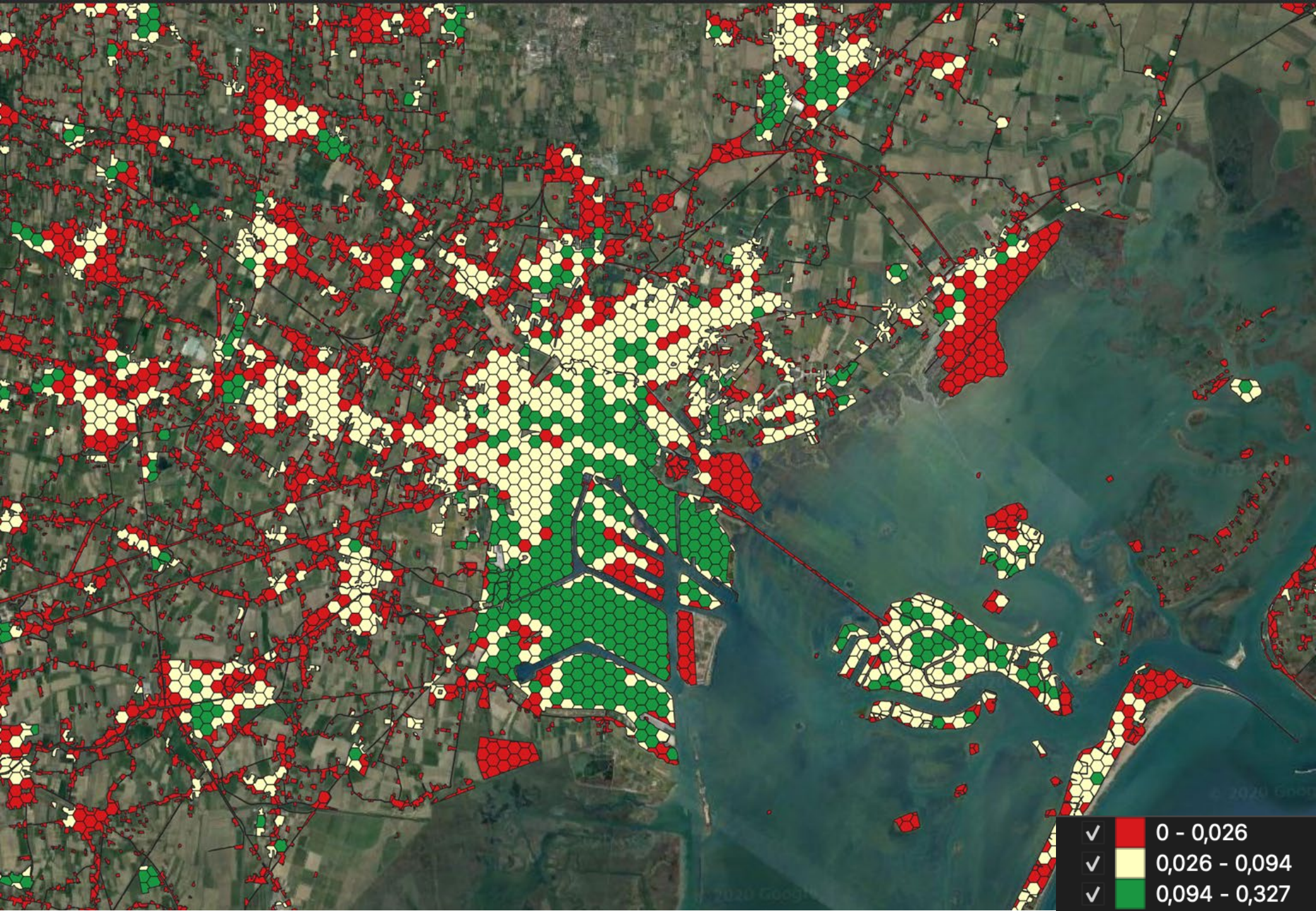
**TOPLOTNI VALOVI**

# UHI - IZPOSTAVLJENOST

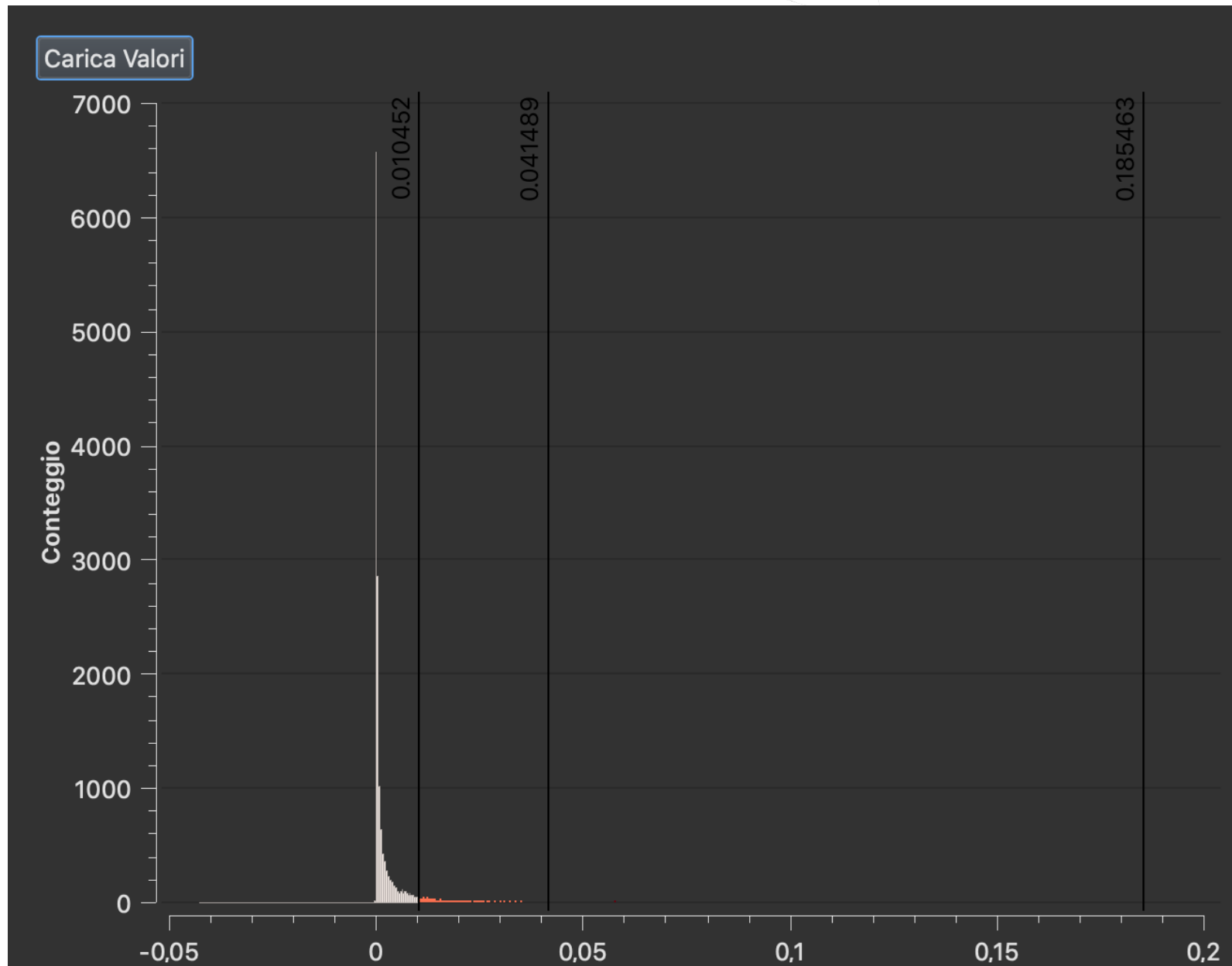


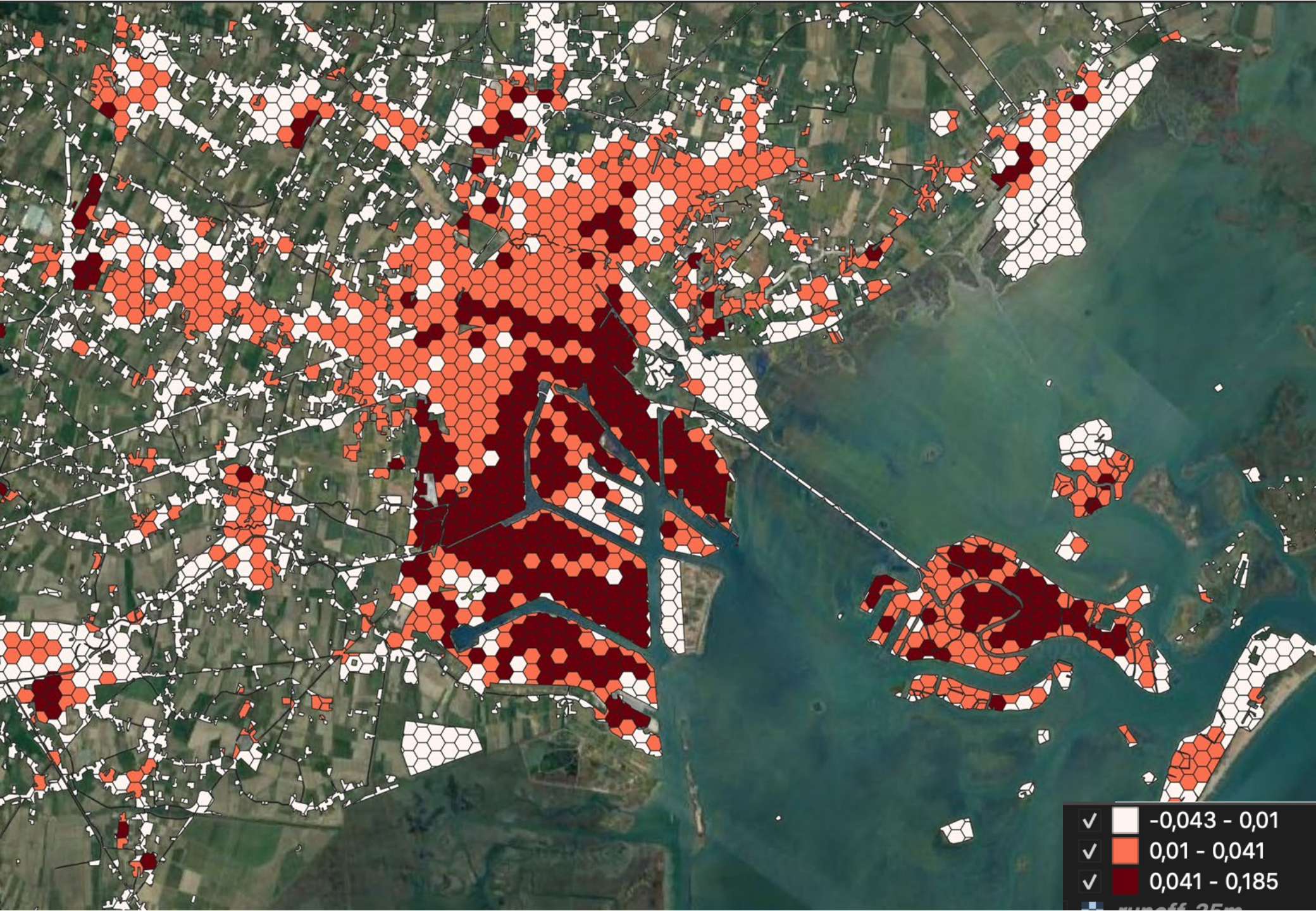


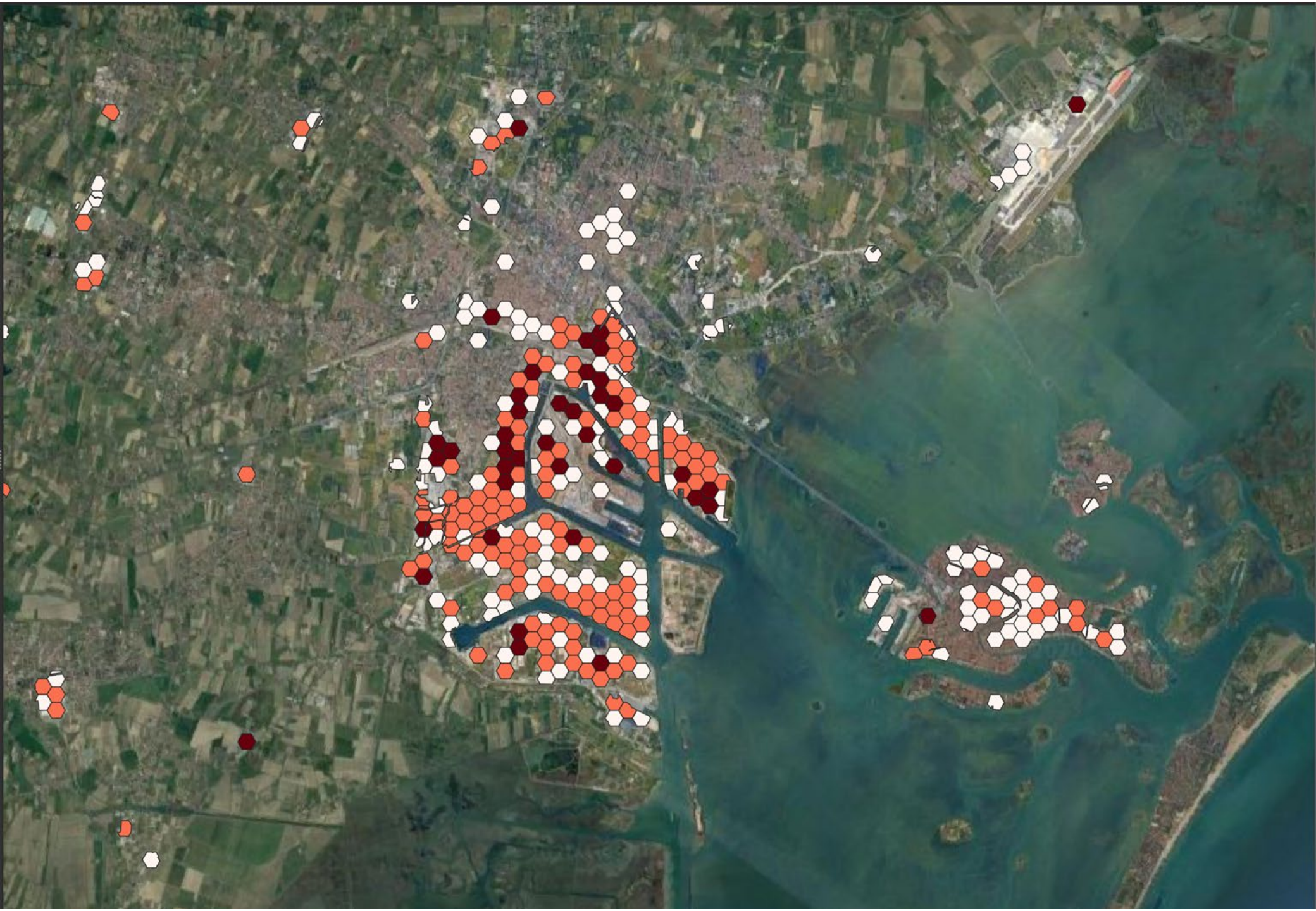




# UHI - TVEGANJE

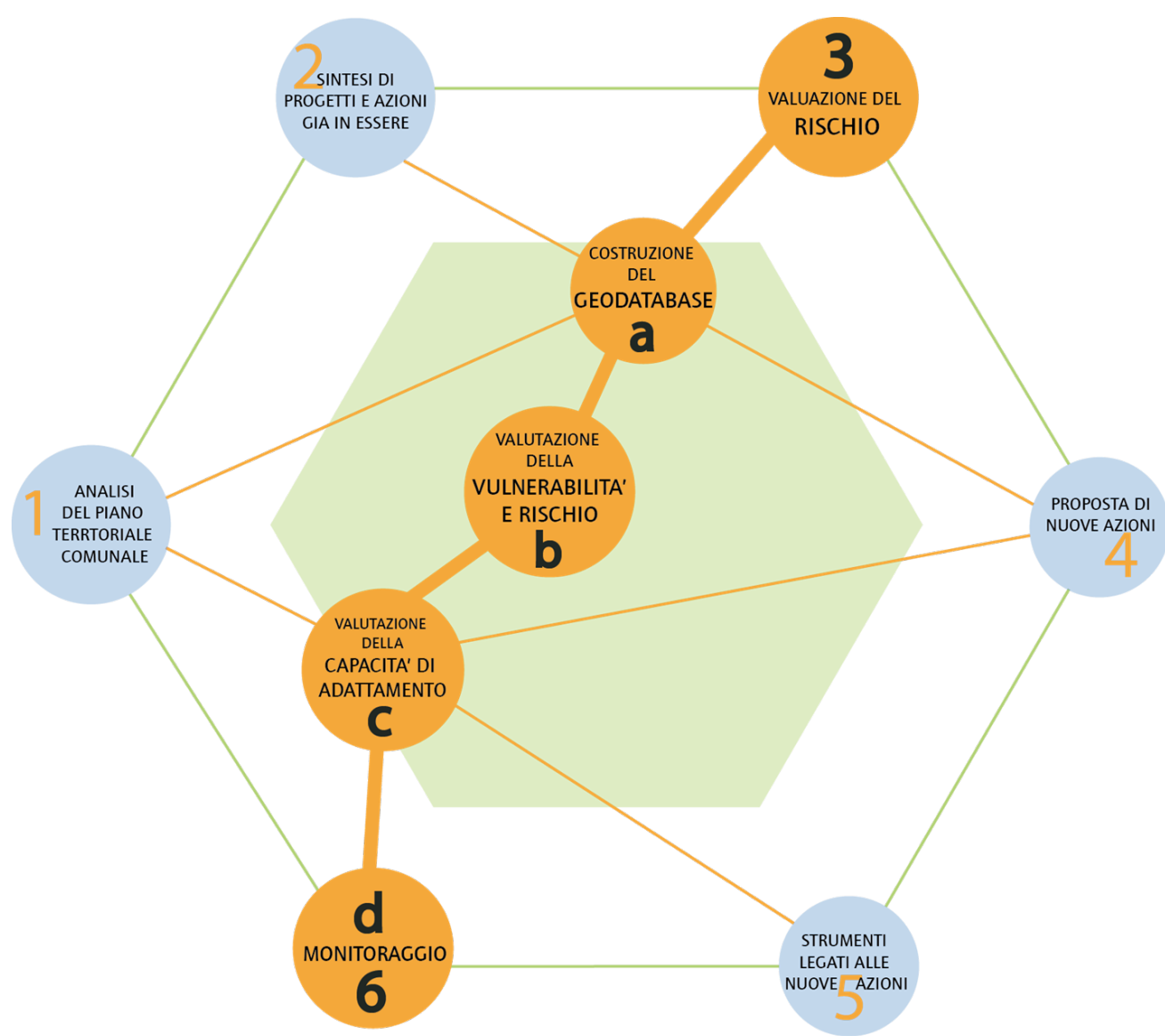












- a** Hazard, ICT, Open Data
- b** Sensitivity, Exposure, Index
- c** Adaptation Capacity, Adaptation Design
- d** Real Time



Delovna pot

Študije o LCZ

Nove tehnologije

Primer Padove

- proces združevanje v skupine
- pridobljeni rezultat
- podrobna območja
- zbirni zemljevidi
- Razmerje med kazalniki (regresijska analiza)

Prilagoditveni posegi

Abakus intervencij  
- Podatkovni list

Potencial dela

## Podatkovni list



INTERVENTI GRIGI	Cool roofs	●
	Cool pavements	●
	Trattamenti alle pareti vetrate	●
	Depermeabilizzazione	● ● ●
	Colorazioni chiare per i materiali da costruzione	● ● ●
	Strade raffreddate ad acqua	● ● ●
	Strade con colorazioni chiare	● ● ●
	Spostamento aree di sosta	● ●
INTERVENTI VERDI	Green roofs	●
	Pareti verticali verdi	●
	Viali alberati	● ● ●
	Rain Garden	● ● ●
SMART SOLUTIONS	Piani di sensibilizzazione	●
	Allarmi informativi	●
	Partecipazione per gli allarmi	●
	Piani di soccorso mirati	●
	Installazione di sensori e ICT	●



### NAČRTI LEGENDE

- Piano del Traffico - Piano Urbano della Mobilità Sostenibile
- Piano Regolatore Generale
- Piano del Verde
- Piano Comunale della Protezione Civile
- Piano degli Interventi
- Piano per Insediamenti Produttivi
- Regolamento Edilizio

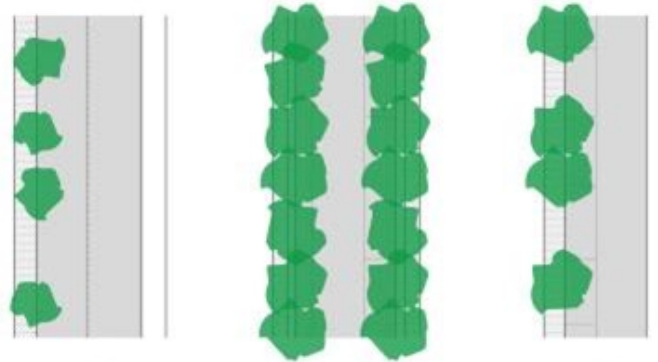
# DEL II - Prestrežanje običajnega



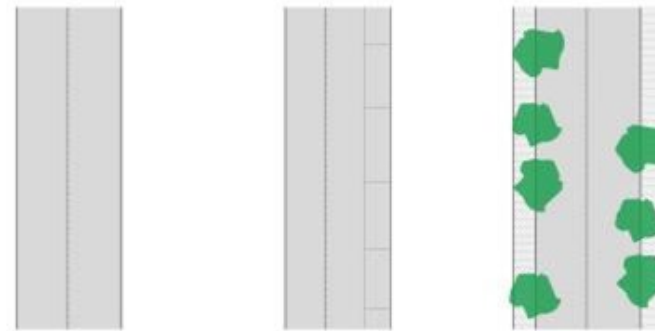
Javne zelene površine



Naklon streh

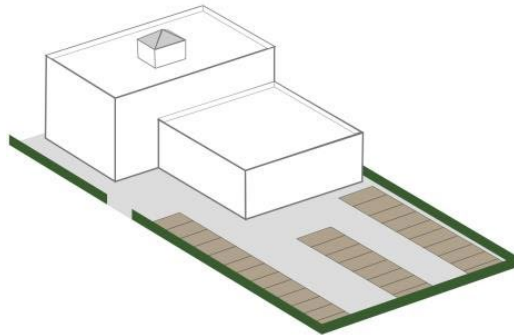


Večja cestna infrastruktura

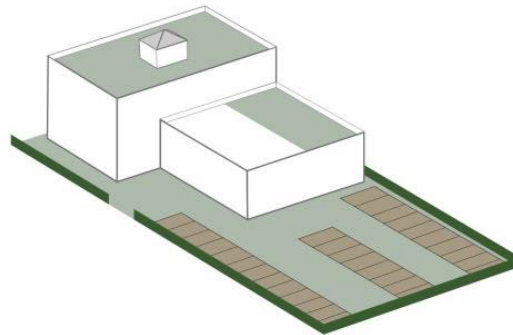


Sekundarna infrastruktura

# DEL II - Prestrežanje običajnega



2015

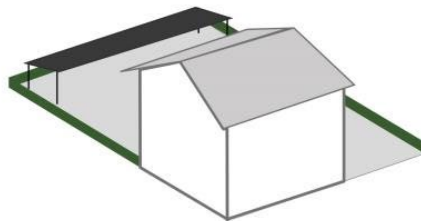


2020

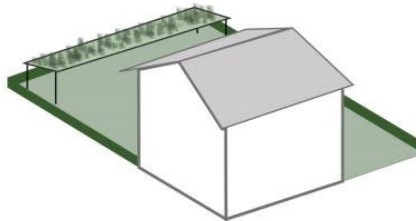


Hotel z neuporabljenimi  
ravnimi strehami

Hotel z zelenimi  
strehami



2015



2020

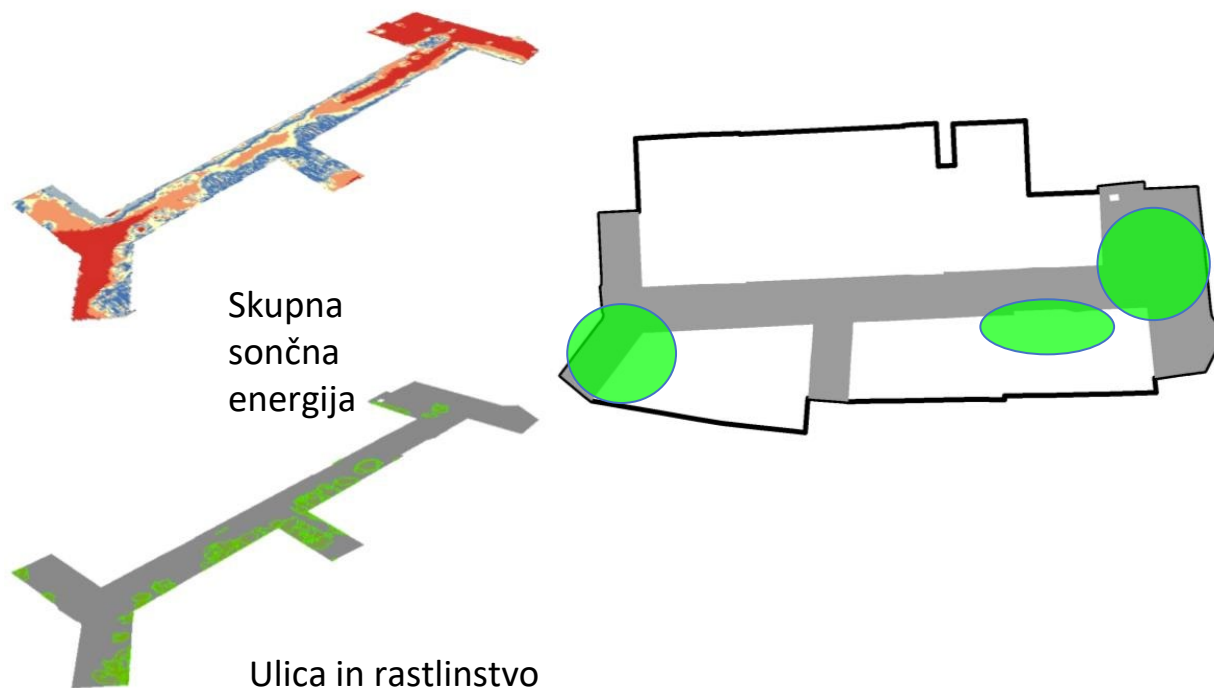
Parkirišče v zasebni  
hiši vodoodporen

Predelava v prepustno parkirišče



# Primer ranljivosti in prilagoditve

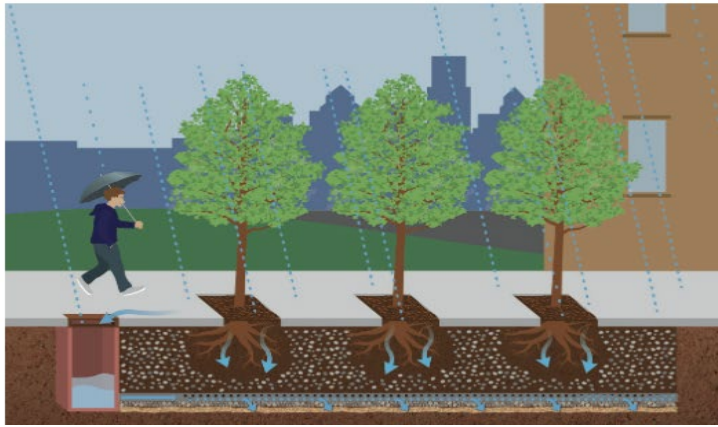
Potreba po lokalnem delu na območjih, kjer je večja ranljivos

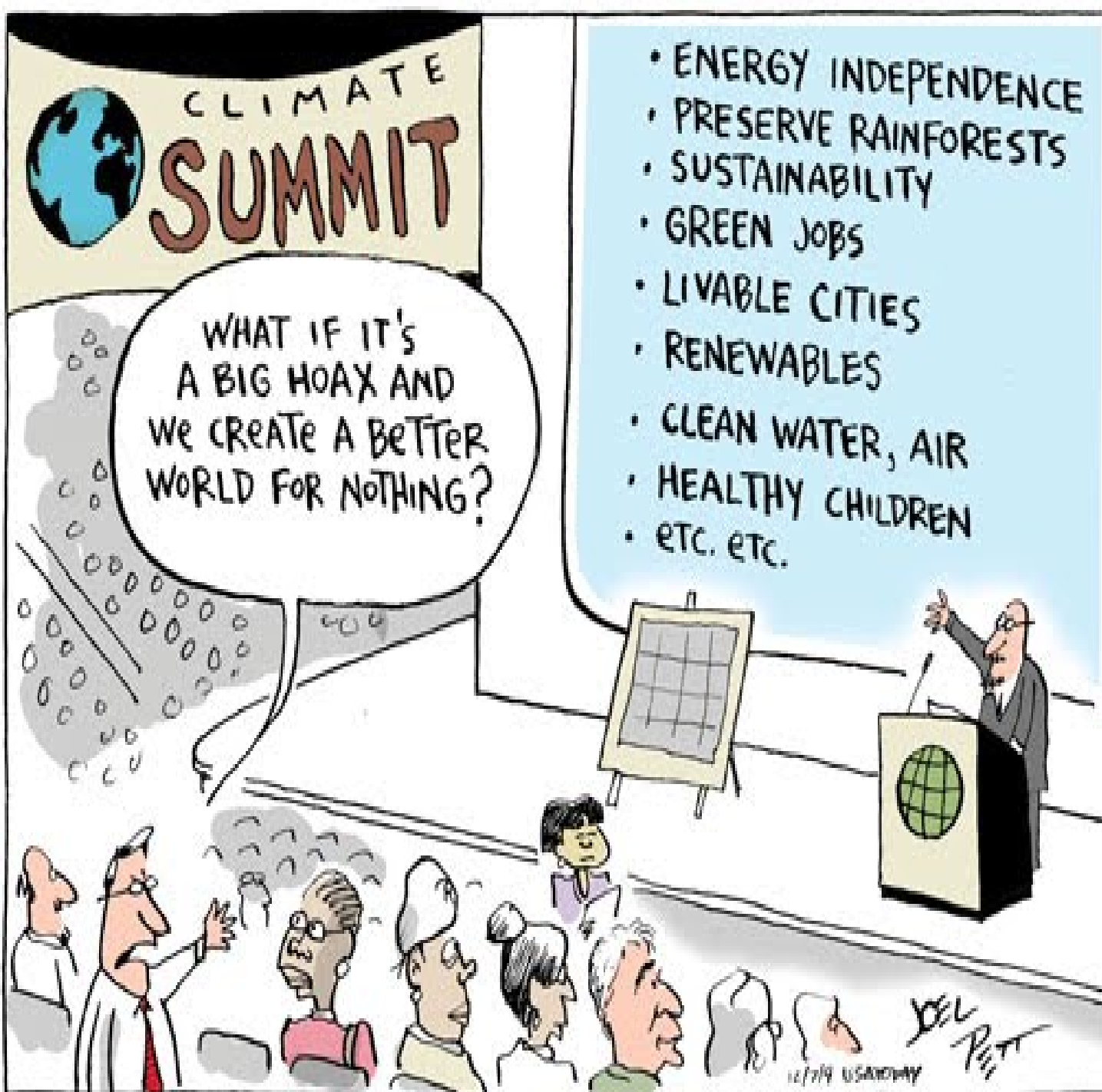


# SISTEMI PRILAGODITVE Z ZELO INFRASTRUKTURO



# SISTEMI PRILAGODITVE Z ZELO INFRASTRUKTURO





**HVALA**  
**POZOR**  
[dmaragno@iuav.it](mailto:dmaragno@iuav.it)