Defining and Mapping soil based ecosystem services at different scales: a flexible methodological approach at multiple governance levels

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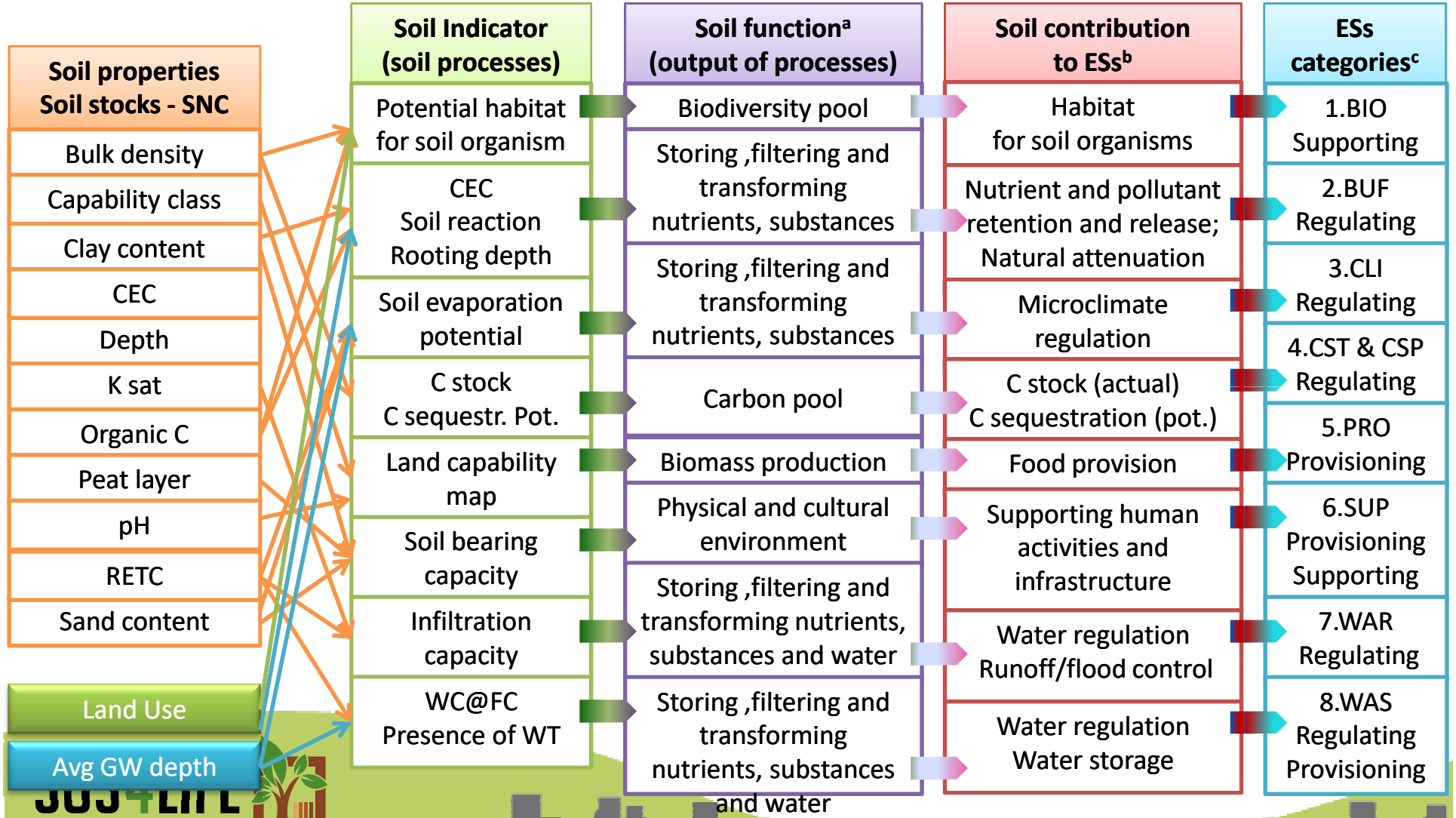
LIFE Programme 2014-2020 (Call 2015)

Title:	**Save Our Soil for LIFE**
Acronym:	**SOS4LIFE**
Sector:	**Resource Efficiency**
Start:	**01/07/2016**
End:	**31/10/2019**
Total budget :	**€ 1.788.749,00**
EU Contribution :	**€ 1.060.551,00**

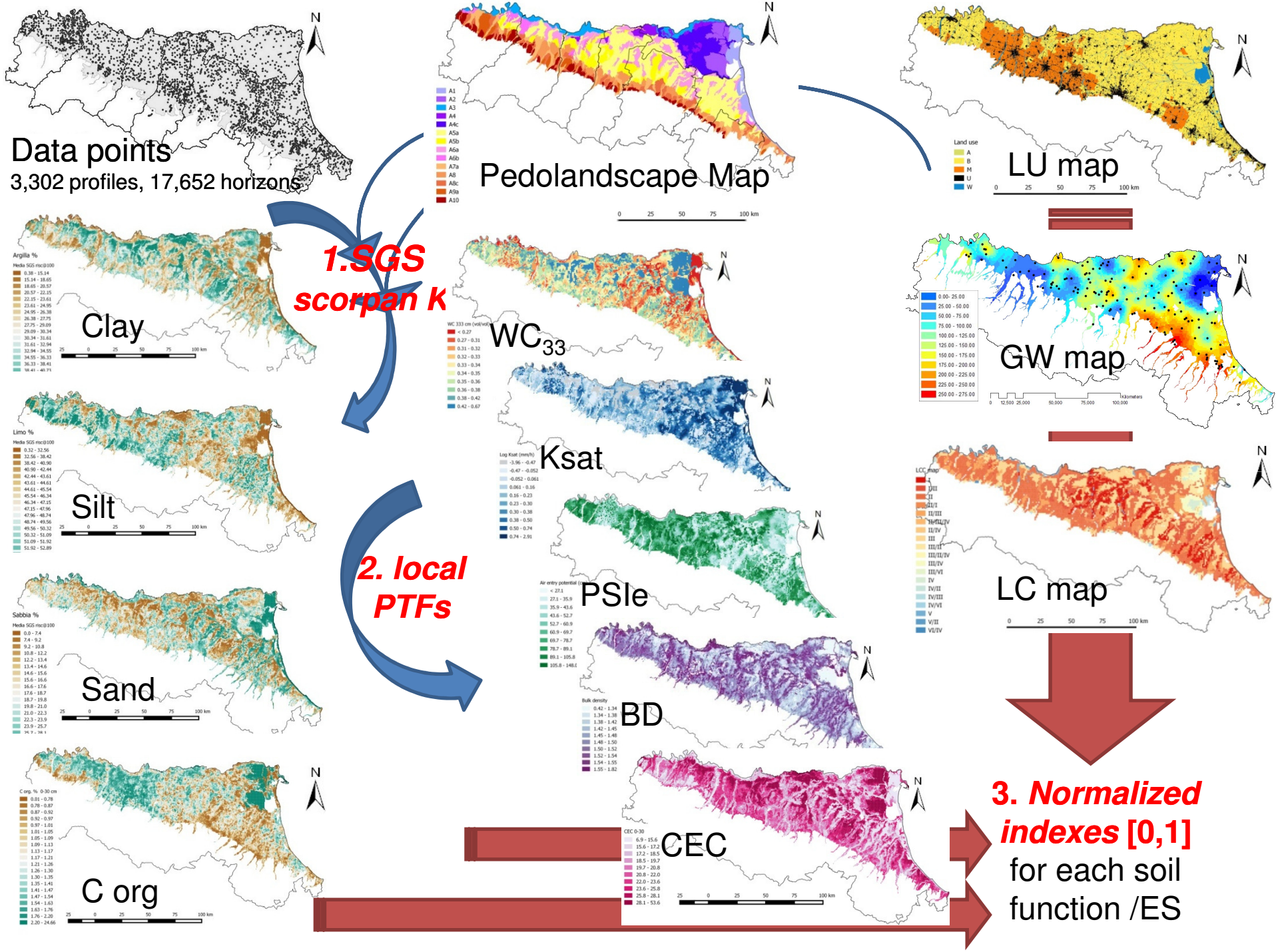
Save our Soil for Life – SOS4LIFE

- Evaluate **ecosystems services** provided by **urban and peri-urban soils** and quantify costs and impacts caused by **land take** and **soil sealing**
- Define a viable regulation framework and operational tools to achieve, at the municipal level, the **no net land take t**arget and promote **urban regeneration**
- Promote and practice **de-sealing interventions** as a way to compensate newly urbanized areas and improve the urban resilience
- Develop a **Urban and Soil Decision Support System** to be adopted by municipalities and regions for monitoring land use change, soil-sealed areas, urban regeneration processes, soil ecosystem services
- Raising **awareness** on the need **to save our soils** among decision makers, technicians, citizenship.

ESs: underpinning soil functions, indicators and data

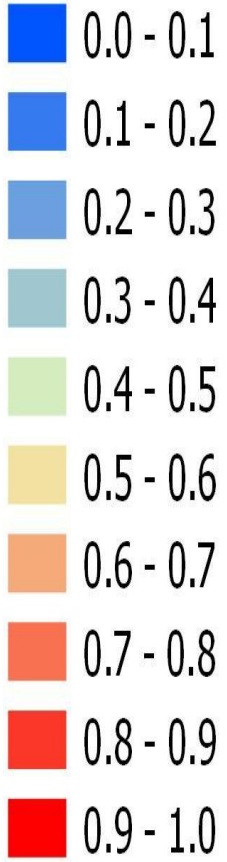


Regional scale

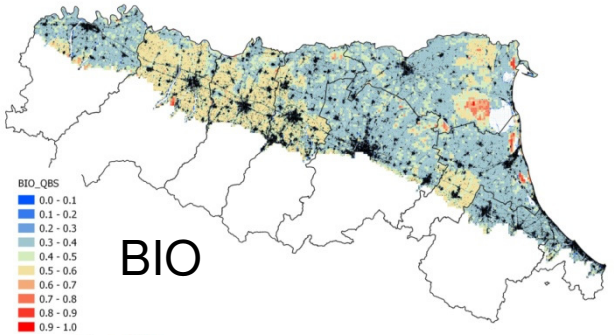

Data points
3,302 profiles, 17,652 horizons
Pedolandscape Map
LU map
1.SGS scorpan k
Clay
Silt
Sand
C org
WC33
Ksat
PSIe
BD
CEC
GW map
LC map
2. local PTFs
3. Normalized indexes [0,1] for each soil function /ES

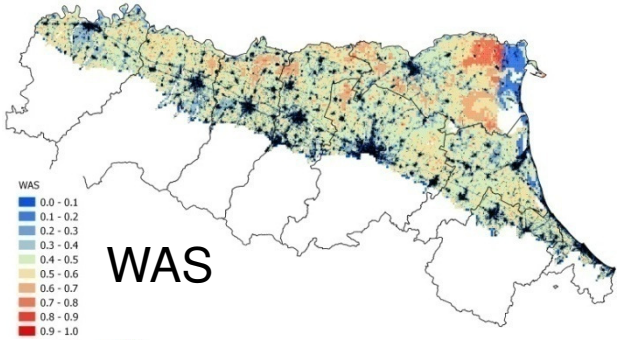
NORMALISED INDEXES FOR EACH SOIL FUNCTION

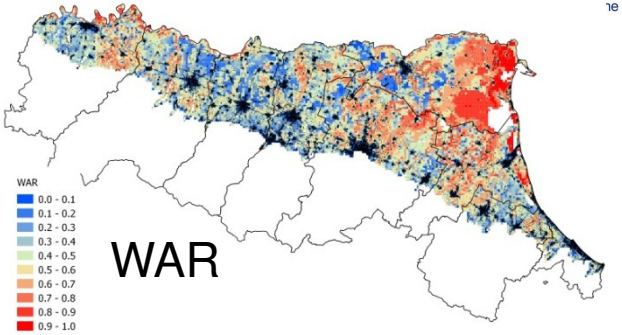
- Provision
  - ***Biomass production*** *(PRO)*
- Regulation
  - ***Soil buffer capacity*** *(BUF),*
  - ***Microclimate regulation*** *(CLI)*
  - ***Water storage*** *(WAS),*
  - ***Water infiltration*** *(WAR),*
  - ***Carbon sink actual and potential*** *(CST, CSP),*
- Support
  - ***Suport to infrastructures (SUP)***
  - ***Support to biodiversity (BIO)***
- Based on existing **data** and **maps**, definition of **indicators**
- Calculation, normalisation (**0-1**) and **mapping** (value 0 indicates the relative minimum for each indicator)

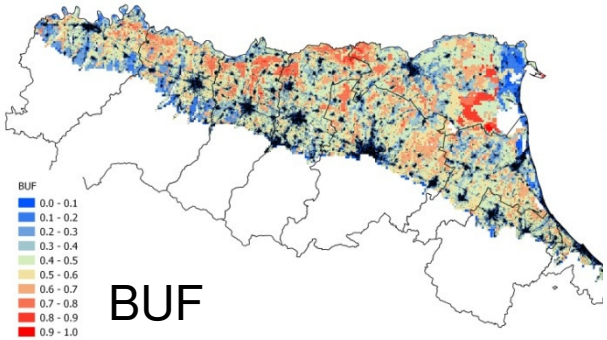


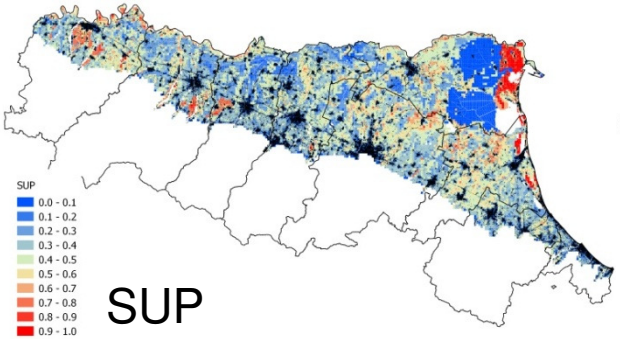
Mapping the potential contribution of soils to ES at regional scale

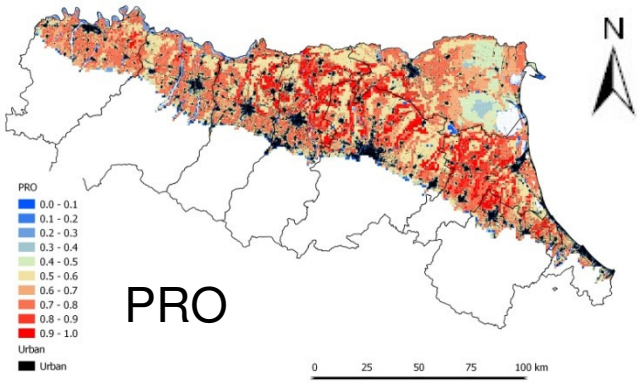


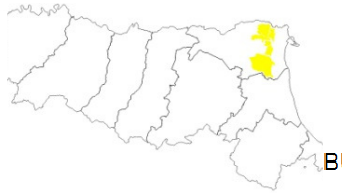




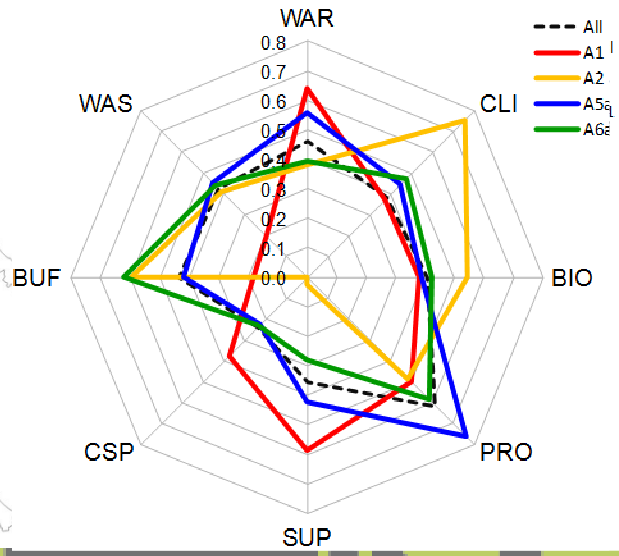


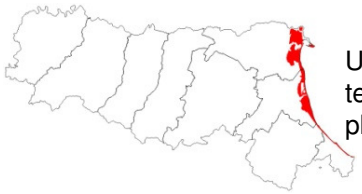






Unit A2 - Fine textured soils, with organic layers and peat of recently reclaimed area of Po river delta plain



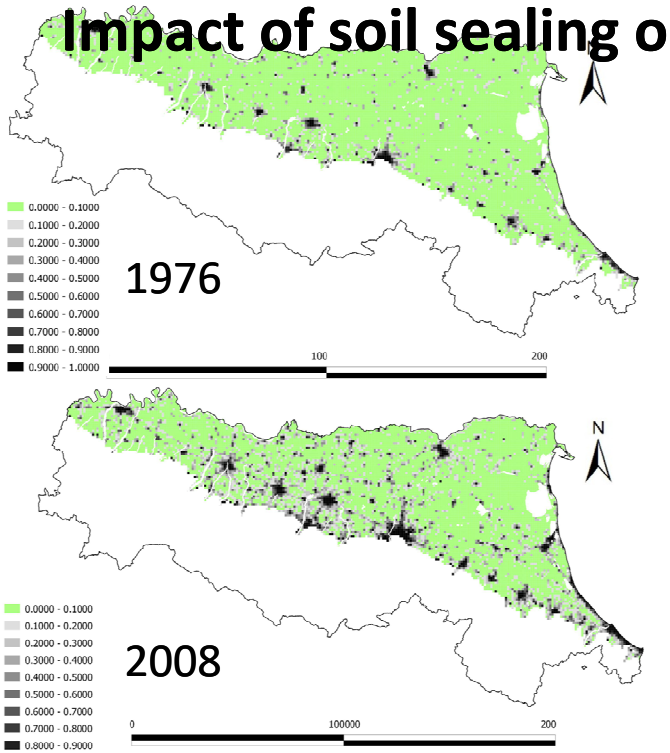


Unit A1 - Coarse textured soils of coastal plain

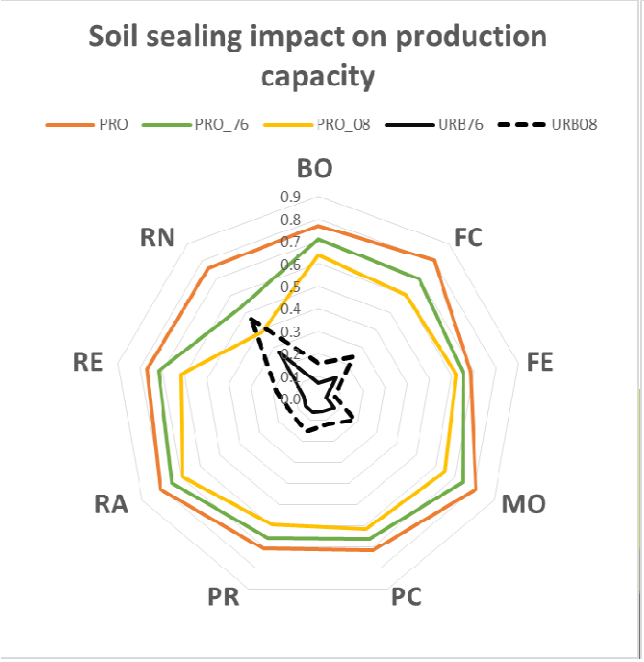
Unit A6a - Fine textured soils of the depressions of the Apennines recent alluvial plain

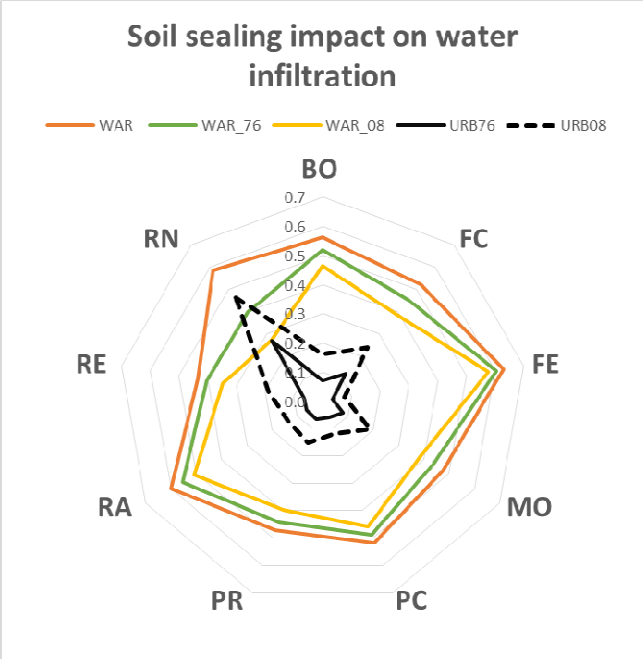
Unit A5a - Loamy textured soils of the levee areas of the Apennines recent alluvial plain

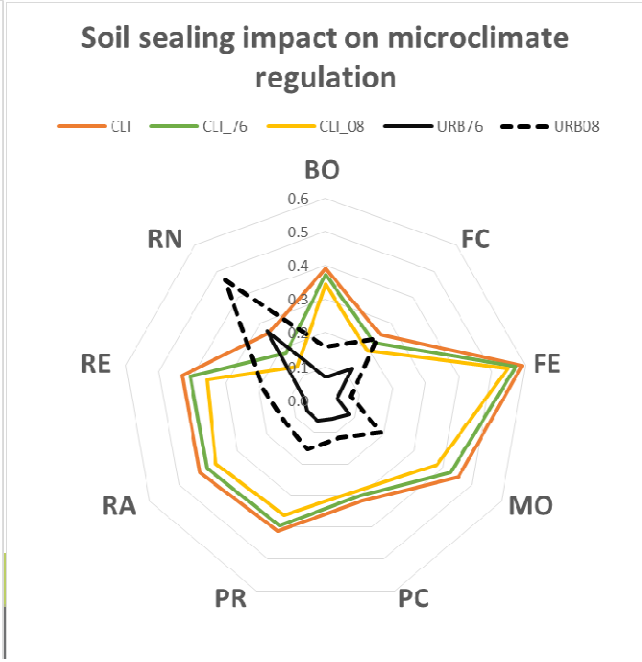
Impact of soil sealing on Ess at regional scale



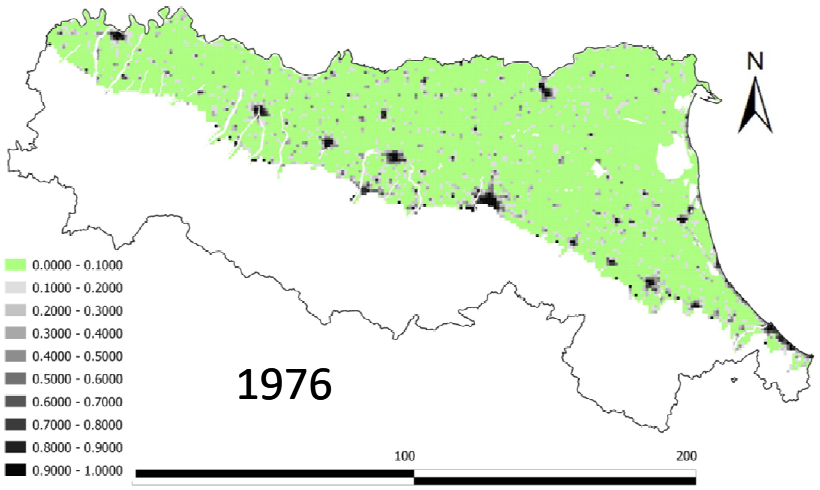
	1976	2008	diff.
PRO	0.693	0.628	-9.4%
BUF	0.515	0.435	-15.5%
WAS	0.425	0.388	-8.6%
WAR	0.504	0.459	-9.1%
CSP	0.306	0.277	-9.5%
SUP	0.389	0.36	-8.1%
CLI	0.414	0.383	-7.6%
URB	0.067	0.149	122.4%

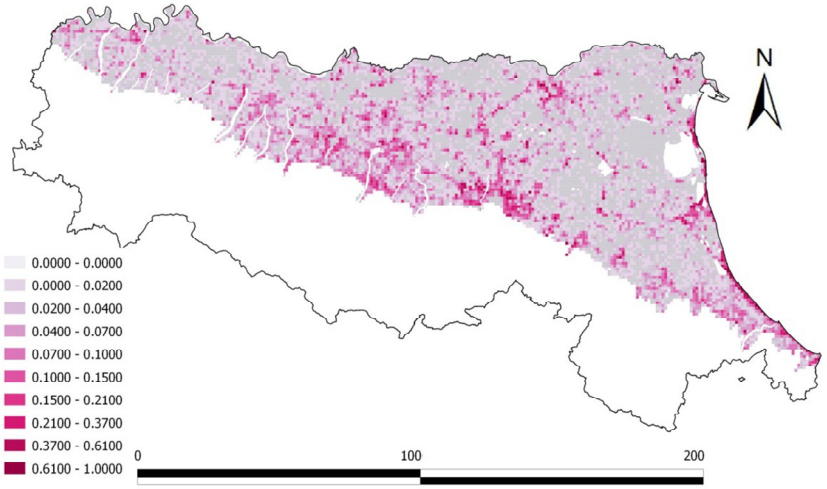


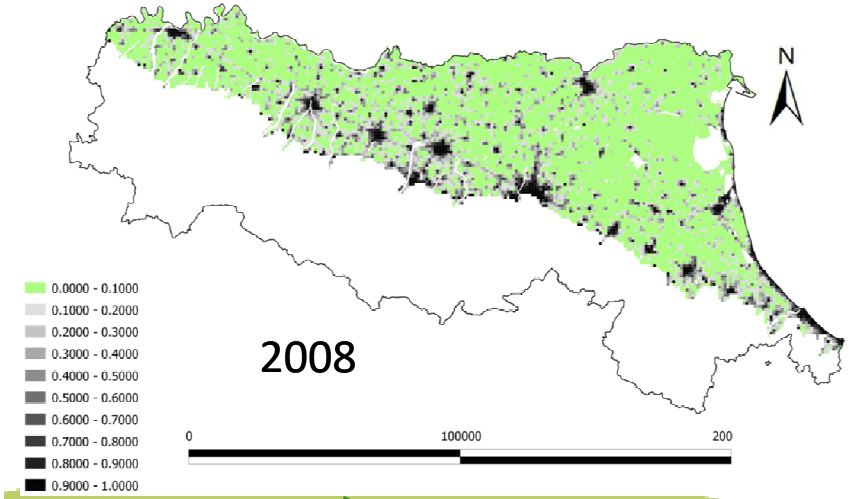




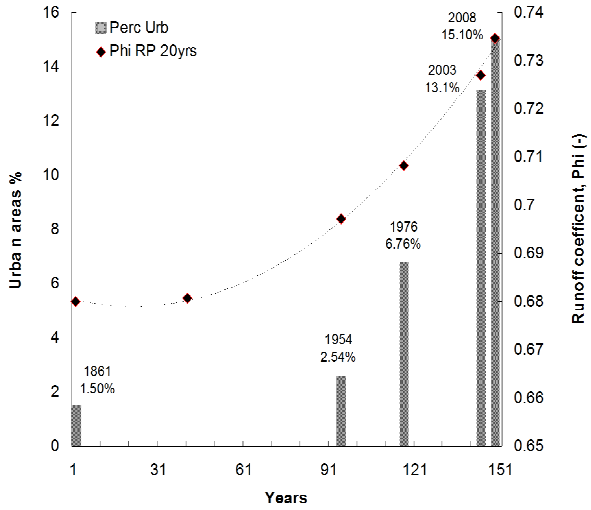
Impact of soil sealing on runoff







Difference between the Phi values at 1976 and 2008 (20-years RP)

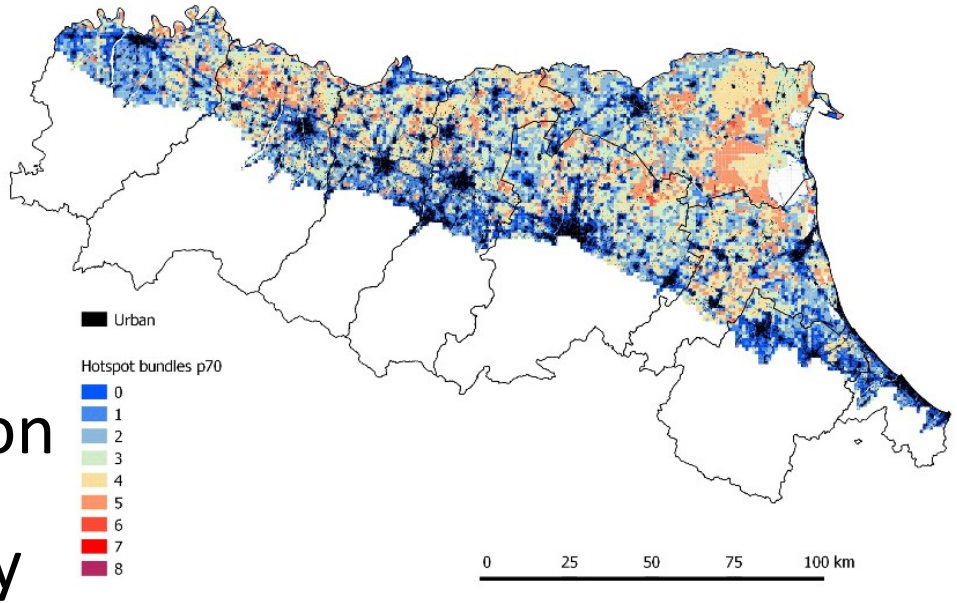


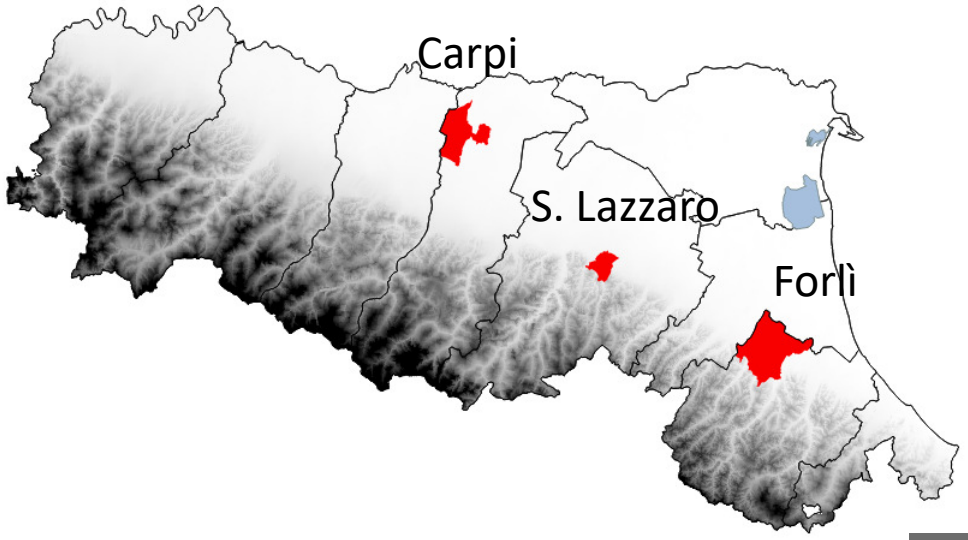
Phi values (RP 20 yrs) and urban areas % between 1861 and 2008

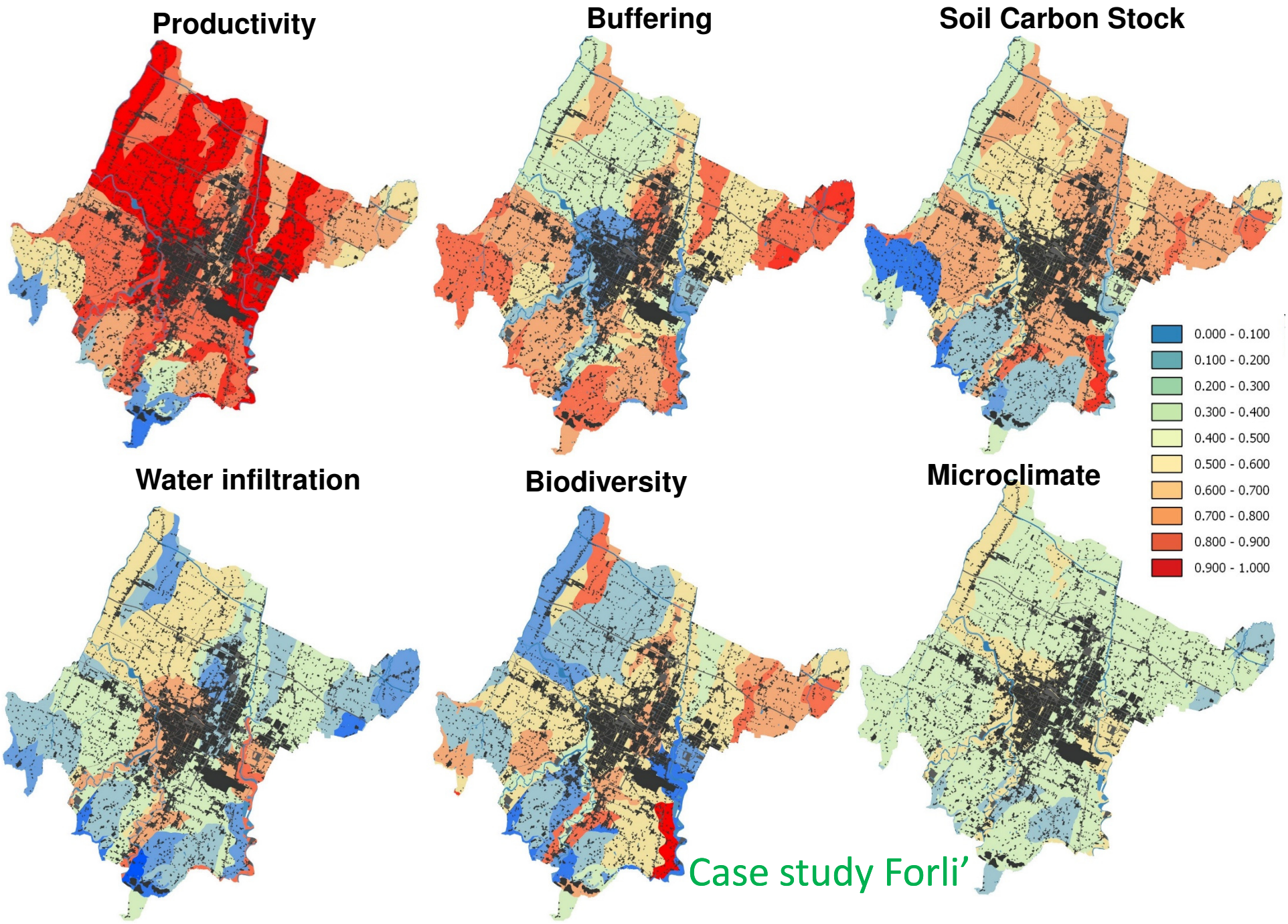
Municipal scale

Ecosystem Services at municipal scale and soil sealing impacts

- Potential productivity
- Water regulation
- Microclimate regulation
- Support to biodiversity
- Soil Carbon Stock
- Buffering

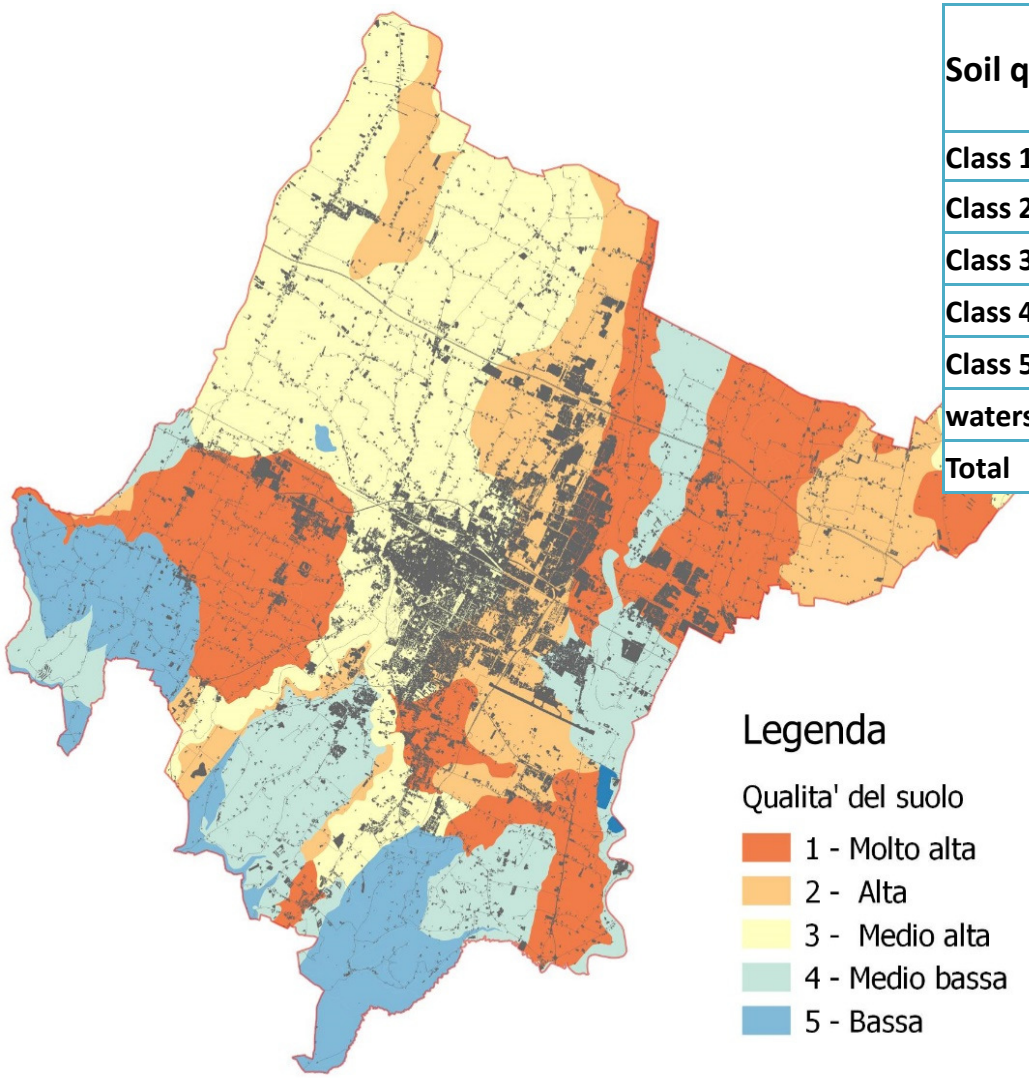





Productivity
Buffering
Soil Carbon Stock
Water infiltration
Biodiversity
Microclimate
0.000 - 0.100
0.100 - 0.200
0.200 - 0.300
0.300 - 0.400
0.400 - 0.500
0.500 - 0.600
0.600 - 0.700
0.700 - 0.800
0.800 - 0.900
0.900 - 1.000
Case study Forli'

Soil quality assessment to support compensation

Overall soil quality can be then assessed as the sum of indicator values, then scaled 1-0. Soil quality classes are defined based on centiles of the distribution.



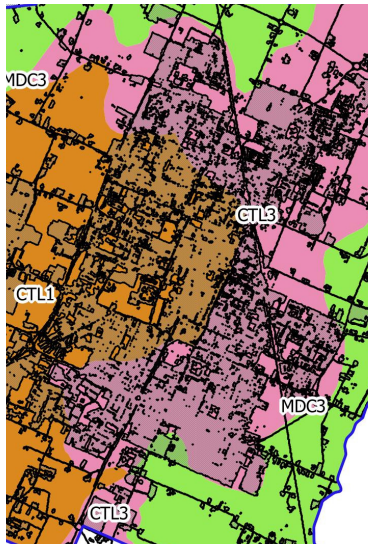
Soil quality class	Area tot (ha)	%	Sealed area (ha) ISPRA	% lost
Class 1 , > 80ile	5659.71	25%	937.51	**17%**
Class 2 <80 e > 60ile	4307.44	19%	690.95	**16%**
Class 3 <60 e > 40ile	7217.64	32%	1094.20	**15%**
Class 4 <40 e > 20ile	3368.61	15%	279.52	**8%**
Class 5 <20ile	2247.44	10%	159.83	**7%**
waters	35.10	0%	0.12	**0%**
Total	22835.94		3162.13	**14%**

This can support decisions in land and urban planning and compensation policies

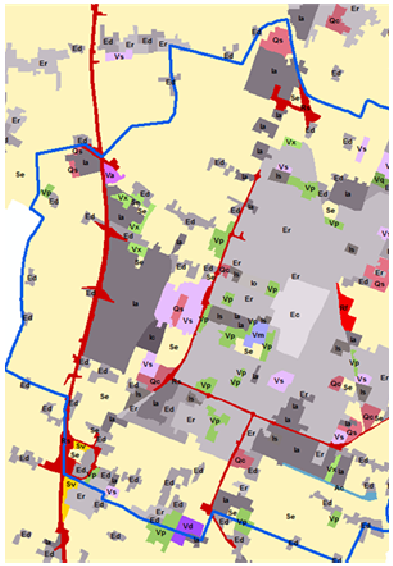
Urban scale

Soil ESs assessment at urban level: Carpi case study

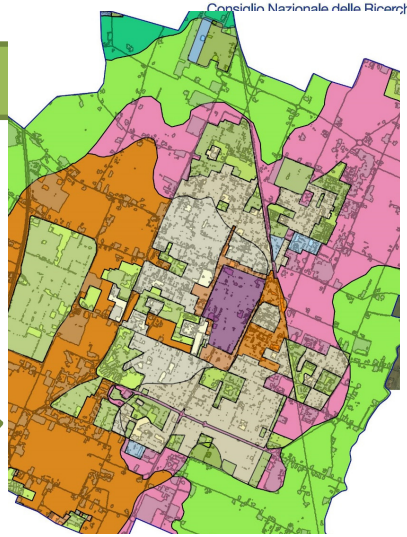
1. Urban typology



2. Soil map



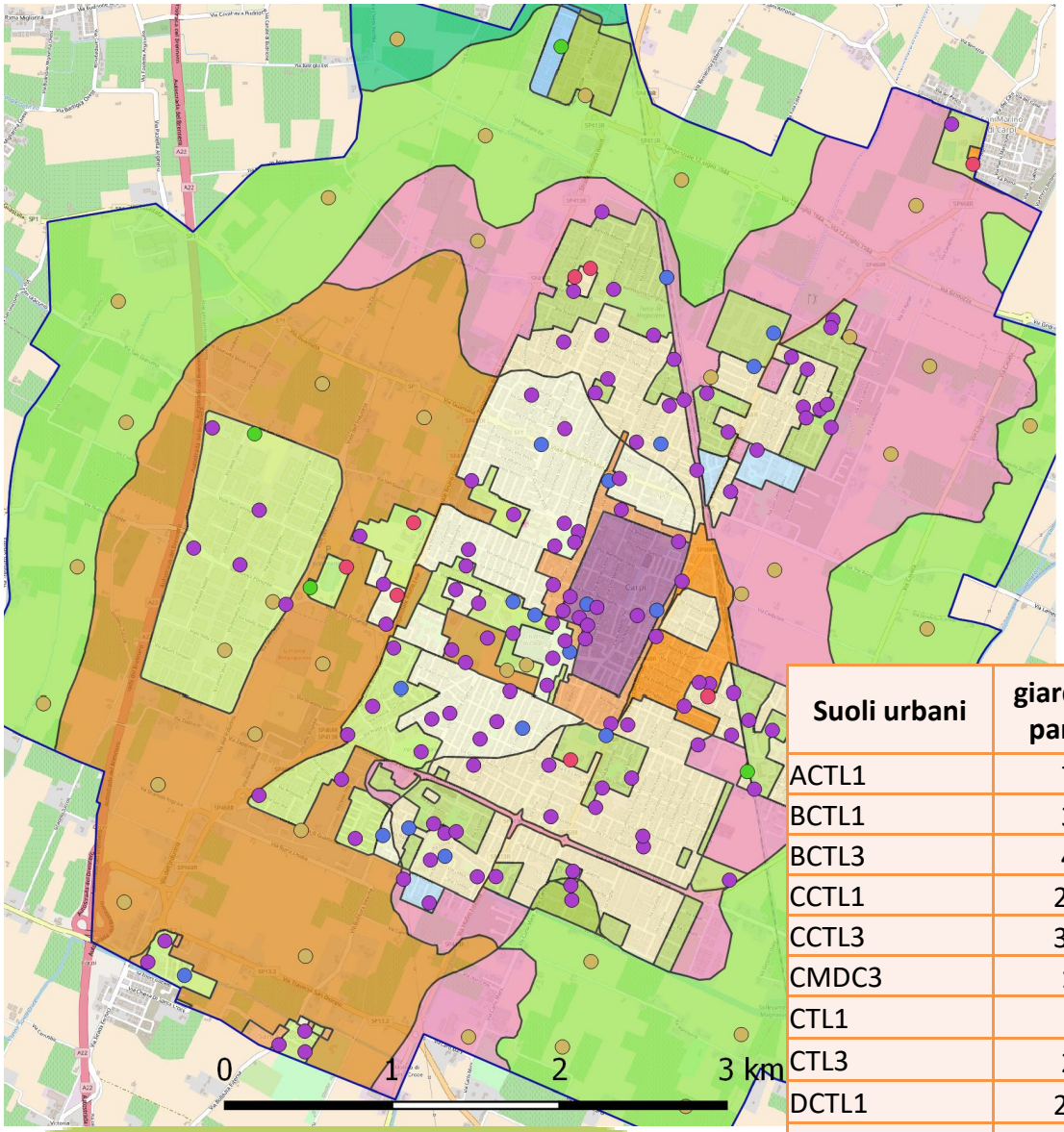
3. Land use



5. Urban soil units

6. Urban soil survey

4. Aerial photos



punti rilevamento

- AG
- GP
- RT
- SP
- VI

suoli urbani

- ACTL1
- BCTL1
- BCTL3
- CCTL1
- CCTL3
- CMDC3
- CTL1
- CTL3

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Suoli urbani	giardini/ parchi	rotonde/ aiuole	agricolo	verde sportivo	verde industriale	N
ACTL1	7	2				9
BCTL1	3	2				5
BCTL3	4					4
CCTL1	24	2	1	1		28
CCTL3	31	5	1	1	1	39
CMDC3	1					1
CTL1			7			7
CTL3	2		8			10
DCTL1	23	4	4	2	2	35
DCTL3	20	3	0	3	0	26
DMDC3	1	0	1	0	1	3
ECTL3		2				2
MDC3			15			15
SMB1/SMB2			1			1
All Grps	116	20	38	7	4	185

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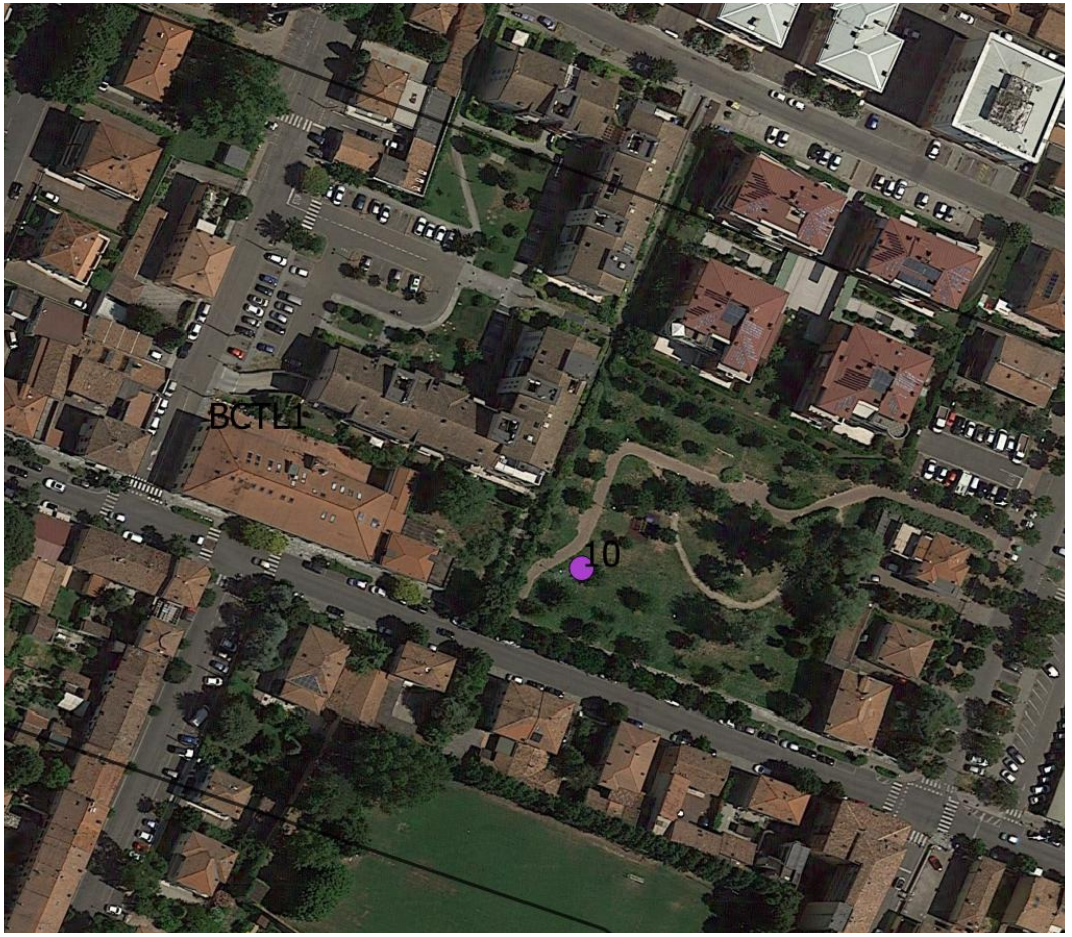
ESs in urban areas

BCTL1, public green area, about 10000 mq

- c.a. 74 Mg of C = 271.13 T CO_2
- c.a. 8000 m^3 of water infiltration
- c.a. 1500 m^3 of available water for plants and ET
- recreational value



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