Arianna Azzellino

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DDL 29

POLITECNICO
MILANO 1863

AS 29

- L’articolo 14 (Semplificazioni in materia urbanistica e amministrativa) prevede, al fine di accelerare gli interventi di rigenerazione urbana, la semplificazione di talune disposizioni **riguardanti i limiti inderogabili di densità edilizia, di altezza, di distanza fra i fabbricati e i rapporti massimi tra spazi destinati agli insediamenti residenziali e produttivi e spazi pubblici o riservati alle attività collettive, al verde pubblico o a parcheggi,** da osservare ai fini della formazione dei nuovi strumenti urbanistici o della revisione di quelli esistenti.

Densification and Carrying Capacity

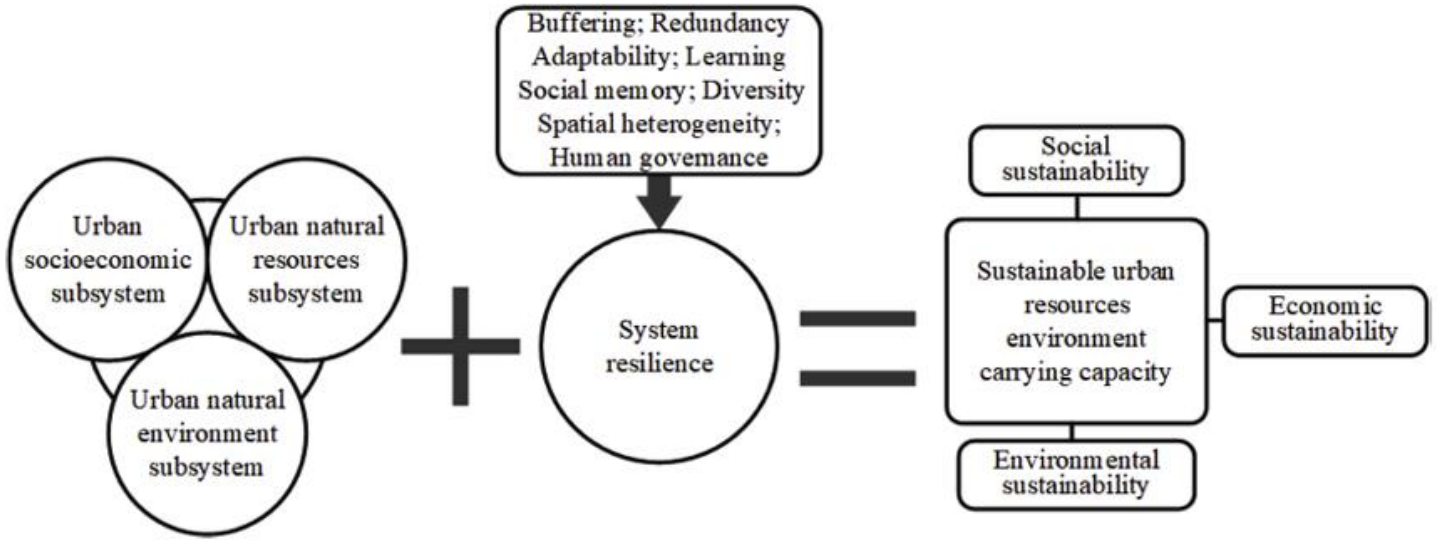


Fig. 5. The rationale for the achievement of sustainable urban resources environment carrying capacity.

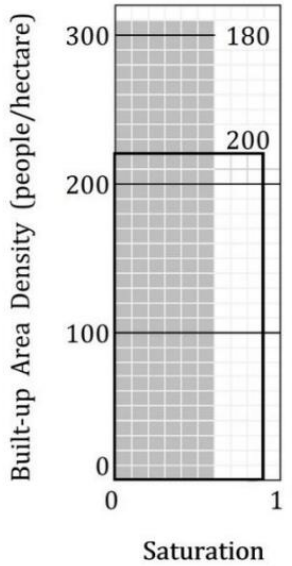


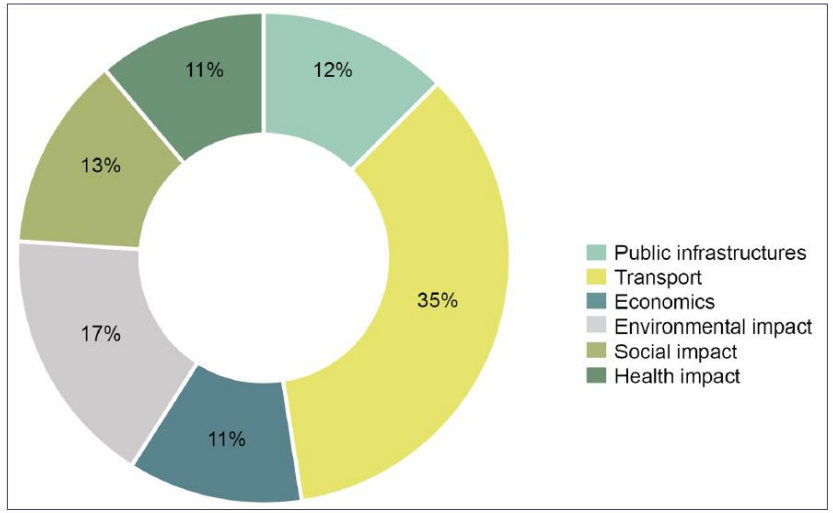
Figure 4. Urban density in the 1990 footprint of Hyderabad, India, in 1990 (180 people per hectare) represented as the area of the grey rectangle, where its *X*-axis value equals the zone's saturation (~0.6) and its *Y*-axis value equals the zone's built-up area density (310 p/ha). The thick-outline rectangle represents its urban density in 2014 (200 people per hectare), when in built-up area density declined to 220 p/ha while its saturation increased to 0.9.

Systematic review and comparison of densification effects and planning motivations

BUILDINGS & CITIES

SPECIAL COLLECTION:
URBAN DENSIFICATION

RESEARCH



Berghauser Pont *et al.*
Buildings and Cities
DOI: 10.5334/bc.125

Figure 1 Distribution of the studied outcome categories discussed in the scientific papers.

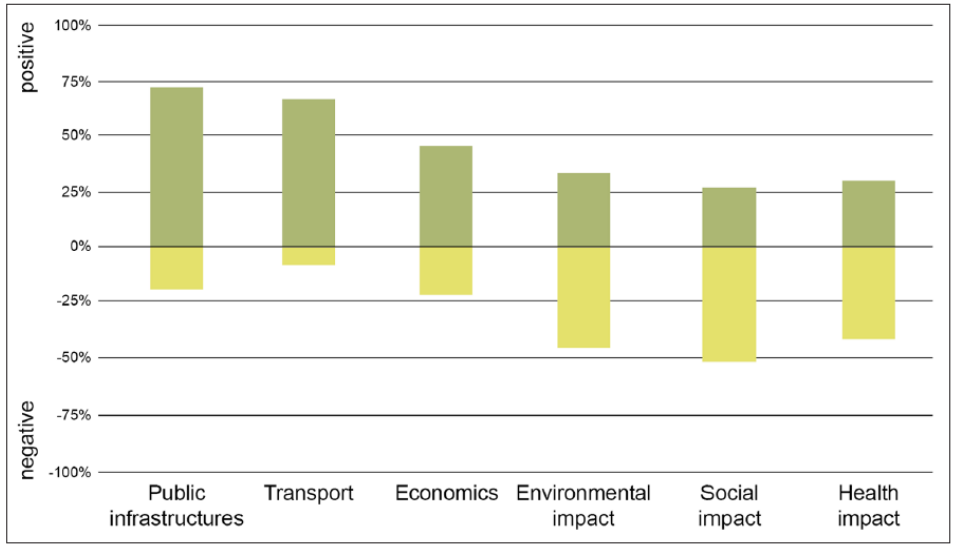
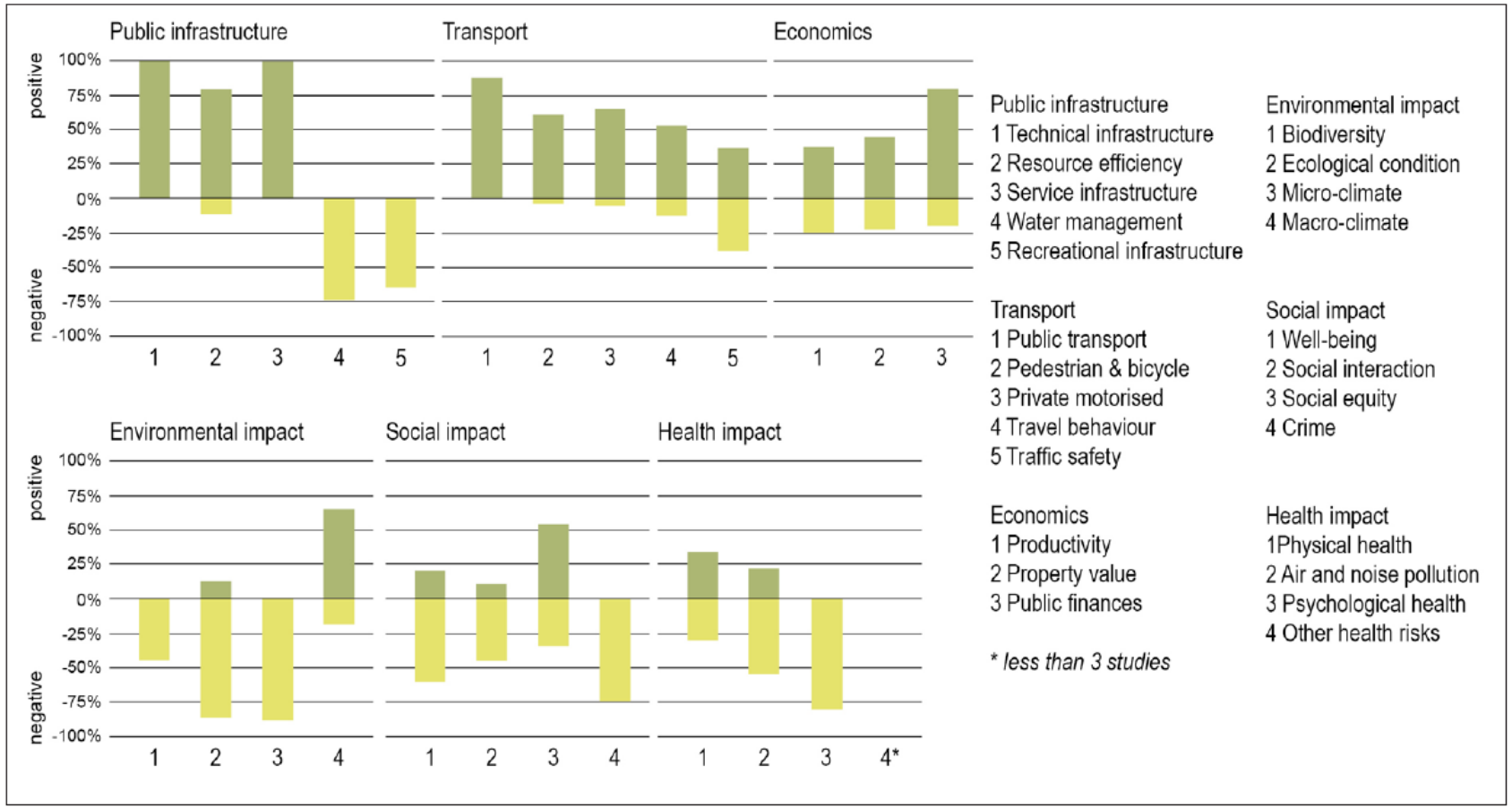
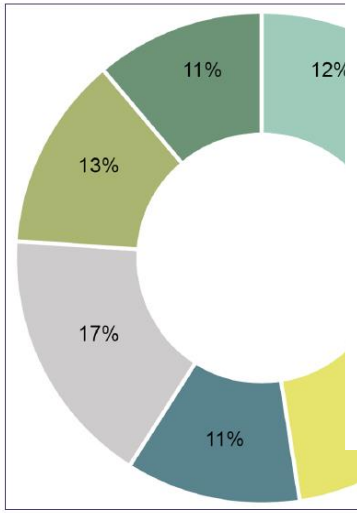


Figure 2 Reported relation between density and sustainable urban development where studies related to public infrastructure, transport and economics more often report a positive relation with density, while ecological, social and health effects of higher densities are for the most part negative.
Note: For further information, see the supplemental data online.

Systematic comparison effects and motivations





studied outcome categories discussed in the scientific papers.

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Note: For further information, see the supplemental data online.

Densificazione

ISPRA

Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

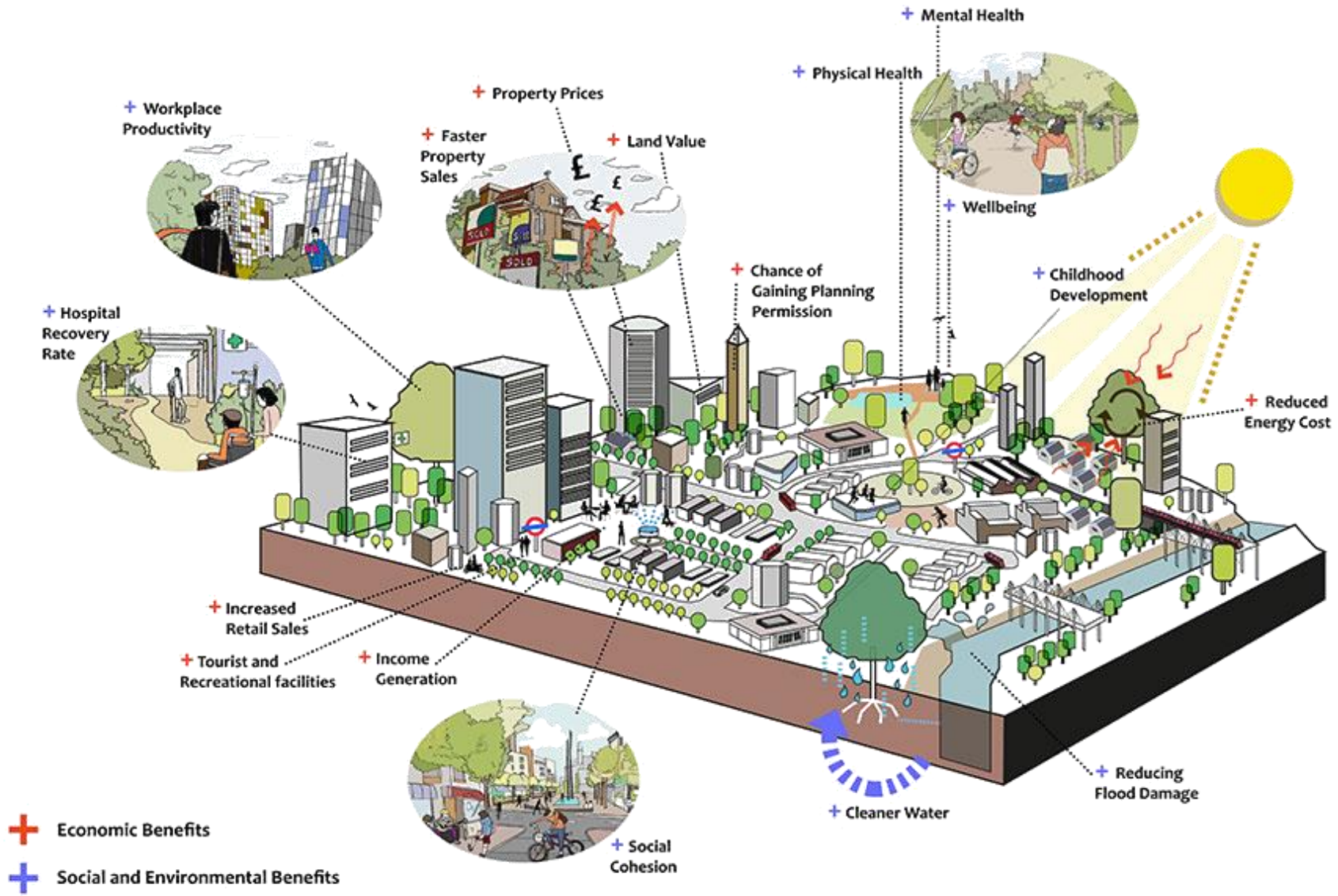
DENSIFICAZIONE

TOSCANA

2015

2016

Densificazione



A. Azzellino – Politecnico di Milano, DICA

Spazi verdi e salute pubblica

Green space and mortality in European cities: a health impact assessment study

Evelise Pereira Barboza, Marta Cirach, Sasha Khomenko, Tamara Iungman, Natalie Mueller, Jose Barrera-Gómez, David Rojas-Rueda, Michelle Kondo, Mark Nieuwenhuijsen

Summary

Background Natural outdoor environments including green spaces play an important role in preserving population health and wellbeing in cities, but the number of deaths that could be prevented by increasing green space in European cities is not known. We aimed to estimate the number of natural-cause deaths among adult residents that could be prevented in cities in 31 European countries, if the WHO recommendation for universal access to green

Lancet Planet Health 2021; 5: e718–30

Institute for Global Health (ISGlobal), Barcelona, Spain (E Pereira Barboza MPH, M Cirach MSc, S Khomenko MSc,

	Exposure-response function	Annual preventable deaths (n; 95% CI)	Annual preventable mortality rate (deaths per 100 000 inhabitants; 95% CI)	Annual preventable age-standardised mortality rate (deaths per 100 000 inhabitants; 95% CI)	Annual preventable impact on deaths (%; 95% CI)	Years of life lost (per 100 000 inhabitants; 95% CI)	Change (%)
Main analyses							
NDVI	Rojas-Rueda et al (2019)	42 968 (32 296–64 177)	22·08 (16·60–32·96)	19·90 (14·94–29·77)	2·25% (1·69–3·36)	245 (184–366)	..
%GA	Gascon et al (2016)	17 947 (0–35 747)	10·61 (0–21·14)	9·19 (0–18·31)	0·94% (0–1·87)	102 (0–204)	..
Sensitivity using city average values							
NDVI	Rojas-Rueda et al (2019)	4939 (3691–7462)	2·92 (2·18–4·41)	1·49 (1·12–2·25)	0·26% (0·39–0·19)	28·51 (21·30–43·07)	–89%*
%GA	Gascon et al (2016)	1254 (0–2512)	0·74 (0–1·48)	0·01 (0–0·03)	0·07% (0–0·13)	7 (0–14)	–93%†
Sensitivity using NDVI data retrieved from April to August							
Mean NDVI	Rojas-Rueda et al (2019)	41 941 (31 520–62 657)	24·80 (18·64–37·05)	19·37 (14·54–28·98)	2·20% (1·65–3·28)	240 (180–358)	–2%*
Maximum NDVI	Rojas-Rueda et al (2019)	48 075 (36 160–71 704)	28·42 (21·38–42·39)	22·45 (16·87–33·54)	2·52% (1·89–3·76)	274 (206–409)	+12%*
Sensitivity by employing different counterfactual exposures							
30%GA	Gascon et al (2016)	24 378 (0–48 463)	14·41 (0–28·65)	12·60 (0–25·04)	1·28% (0–2·54)	139 (0–276)	+36%†
NDVI reference for 30% GA	Rojas-Rueda et al (2019)	51 814 (38 962–77 314)	30·63 (23·04–45·71)	24·45 (18·37–36·55)	2·71% (2·05–4·05)	296 (222–441)	+21%*
Target NDVI reference 25% GA, based on an alternative GAM with biome, latitude, and precipitation	Rojas-Rueda et al (2019)	51 667 (38 851–77 098)	30·55 (22·97–45·58)	28·18 (21·18–42·09)	2·70% (2·04–4·04)	295 (222–440)	+20%*
Mean NDVI by biome	Rojas-Rueda et al (2019)	62 682 (47 182–93 343)	37·06 (27·89–55·19)	30·52 (45·53–22·96)	3·28% (2·47–4·89)	359 (270–534)	+46%*
Median NDVI by biome	Rojas-Rueda et al (2019)	64 753 (48 745–96 412)	38·28 (28·82–57·00)	31·76 (23·89–47·37)	3·39% (2·55–5·05)	370 (279–551)	+51%*
NDVI 0·2	Rojas-Rueda et al (2019)	808 (604–1219)	0·48 (0·36–0·72)	0·44 (0·33–0·66)	0·04% (0·03–0·06)	5 (4–7)	–98%*
NDVI 0·3	Rojas-Rueda et al (2019)	7733 (5798–11 605)	4·57 (3·43–6·86)	3·39 (2·54–5·09)	0·41% (0·30–0·61)	44 (33–67)	–82%*
NDVI 0·4	Rojas-Rueda et al (2019)	25 432 (19 122–37 956)	15·04 (11·31–22·44)	11·07 (8·32–16·52)	1·33% (1·00–1·99)	145 (109–217)	–41%*
NDVI 0·5	Rojas-Rueda et al (2019)	58 850 (44 362–87 383)	34·79 (26·23–51·66)	27·62 (20·81–41·05)	3·09% (2·32–4·58)	336 (253–499)	+37%*
Sensitivity by employing different sources of data for percentage of GA (cities with Urban Atlas and Corine Land Cover or UK Land Cover Map data)							
Corine *vs* Urban Atlas	Gascon et al (2016)	23 956 *vs* 15 561	16·2 *vs* 10·5	14·36 *vs* 9·16	1·42% *vs* 0·92%	156 *vs* 101	+54%†
UK Land Cover Map *vs* Urban Atlas	Gascon et al (2016)	3339 *vs* 2365	14·2 *vs* 10·0	14·61 *vs* 10·46	1·36% *vs* 0·96%	137 *vs* 97	+41%†

NDVI=normalised difference vegetation index. %GA=percentage of green area. GAM=generalised additive model. *In relation to the main analysis of NDVI reference for 25% of greenness. †In relation to the main analysis of 25% of green area based on land cover.

Table 1: Results of the health impact assessment for main analysis and sensitivity analyses by employing distinct spatial level of analysis (ie, city-level), counterfactual scenarios, and sources of data

The World Health Organization recommended the availability **of a minimum of 9 m² of green space per individual with an ideal UGS value of 50 m² per capita.**

World Health Organization. Health Indicators of Sustainable Cities in the Context of the Rio+20 UN Conference on Sustainable Development; WHO: Geneva, Switzerland, 2012.

Benefici del verde urbano

- Aumentato valore del verde urbano post-Covid19

Urban Forestry & Urban Greening 56 (2020) 126888

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug

Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study

Francesca Ugolini [a,*], Luciano Massetti [a], Pedro Calaza-Martínez [b], Paloma Cariñanos [c], Cynnamon Dobbs [d], Silvija Krajter Ostoić [e], Ana Marija Marin [e], David Pearlmutter [f,a], Hadas Saaroni [g], Ingrida Šaulienė [h], Maja Simoneti [i], Andrej Verlič [j], Dijana Vuletić [e], Giovanni Sanesi [k]

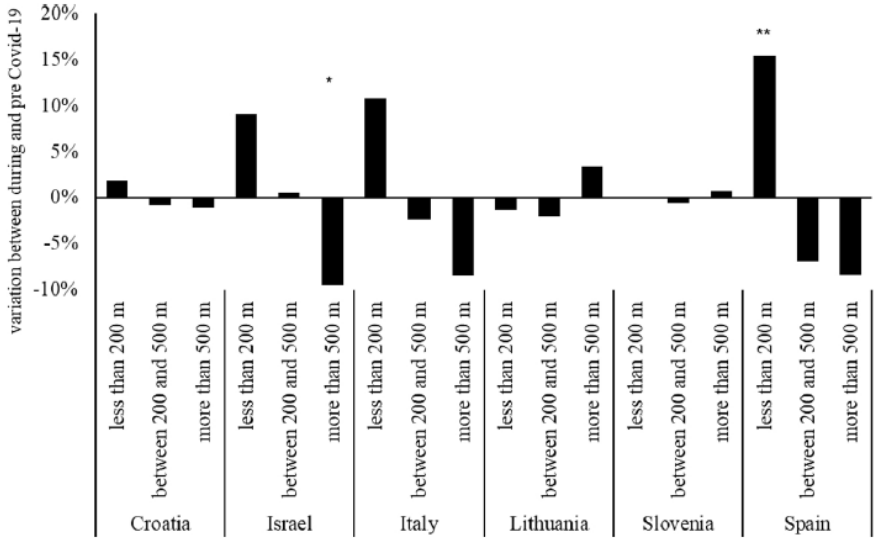


Fig. 1. Percentage of variation in the distance traveled to UGS during the containment period relative to the pre-pandemic period, among UGS visitors. Significant differences between the two situations (before vs. during COVID-19) were identified by the Chi-square test. Differences are indicated by * at $\alpha < 0.05$, ** at $\alpha < 0.01$ and *** at $\alpha < 0.005$.

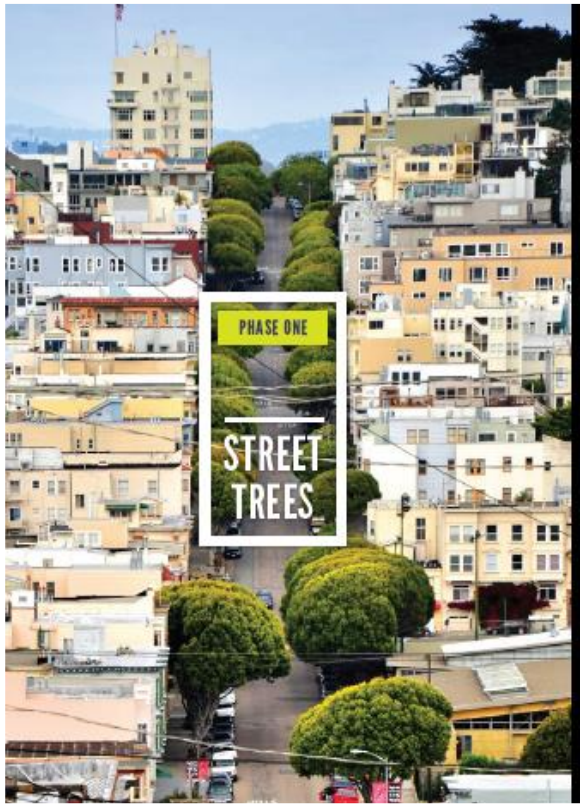
Urban green services

San Francisco has one of the smallest tree canopies of any major U.S. city.

URBAN TREE CANOPY COMPARISON Sources: SF Planning Department (2012), City of Seattle (2007), City of Portland (2012), Million Trees NYC (2012), City of Chicago (2012) and Million Trees LA (2006).

Using aerial photos, the size of an urban forest can be monitored and its growth or decline tracked over time. The benefits and services provided by trees are directly related to the extent of a city's canopy cover. Larger leaf surface areas indicate the increased capacity of trees to clean air, absorb stormwater and beautify streets and neighborhoods.

13.7%	17%	21%	23%	24%	30%
SAN FRANCISCO	CHICAGO	LOS ANGELES	SEATTLE	NEW YORK CITY	PORTLAND



BY THE NUMBERS

Scientists at the U. S. Forest Service and elsewhere have developed tools to quantify the many benefits and ecosystem services provided by urban trees. These estimates indicate the magnitude of benefits our trees collectively return to the city - millions of dollars. For every $1 spent on public street trees, it is estimated that San Francisco receives $4.37 in benefits -- a tremendous return on investment[1].

669,000
Estimated number of trees in San Francisco.[2]

$1,700,000,000
Estimated capital value of San Francisco's urban forest (i.e. replacement cost for all existing trees within the city).[2]

516,468,000 *gal*
Estimated gallons of water trees divert from the sewer system each year.[3]

$98,272,878
Increase in property values provided by San Francisco's trees annually.[4]

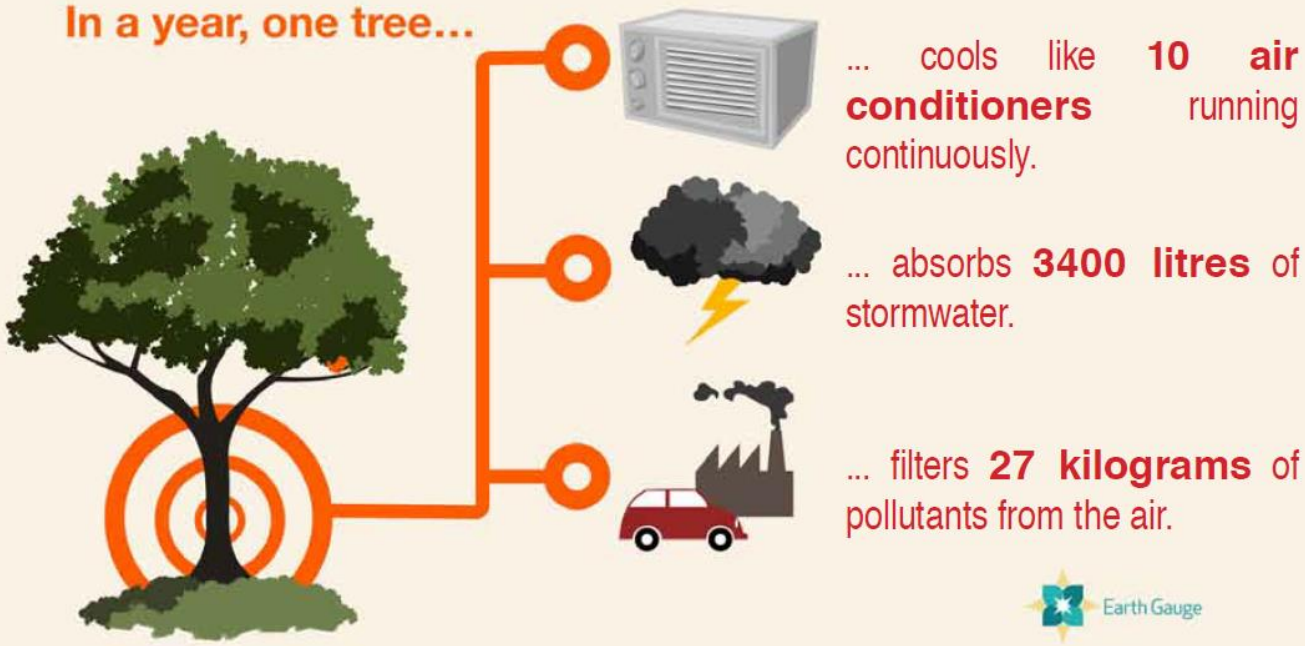
196,000 *tons*
Amount of carbon stored by the city's trees each year.[2]

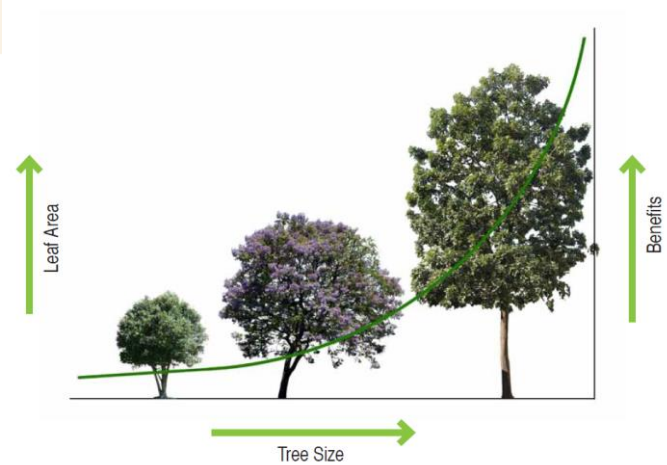
$9,439,309
Value of environmental benefits (hydrological, air quality, and carbon storage) provided annual by the urban forest.[2,4]

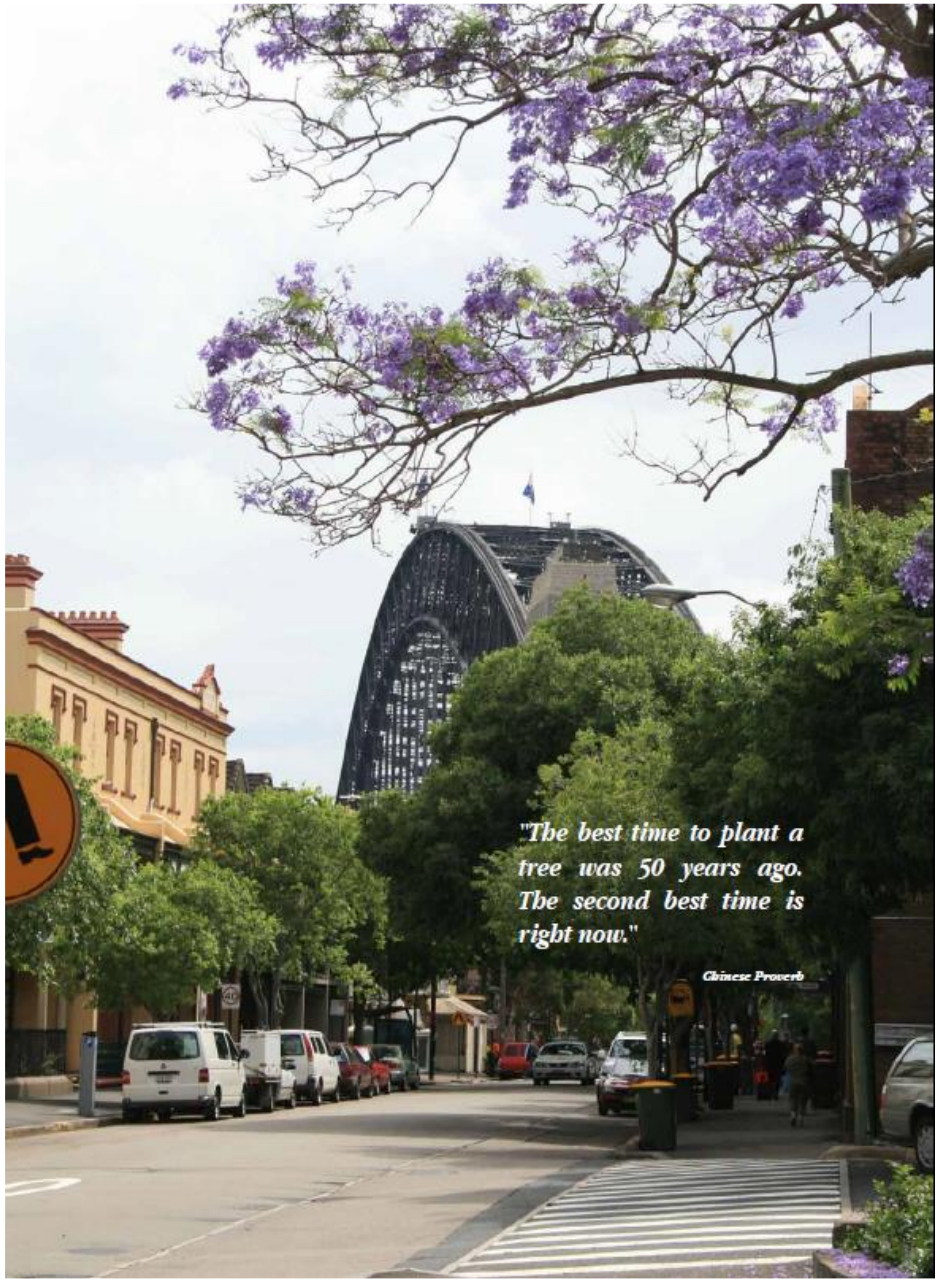
260 *tons*
Amount of atmospheric pollutants filtered by the urban forest annually.[2]

1 *City of San Francisco Resource Analysis of Inventoried Public Trees*, Davey Resource Group (2013).
2 *Assessing Urban Forest Effects and Values: San Francisco's Urban Forest*, United States Forest Service (2007).
3 Based on estimate of on average 774 gallons intercepted annually per tree (Davey Resource Group 2013).
4 *San Francisco Bay Area State of the Urban Forest Report*, USDA Forest Service (2007).

Urban green services







Sydney

Figure 18 - 100% canopy coverage - natural undisturbed bushland as it would have been over much of the Sydney LGA.

Figure 21 - Haymarket in central Sydney has one of the lowest canopy covers in the LGA with less than 10% cover.

Figure 19 - Avalon in Sydney's northen coastal area illustrates it is possible to achieve 60-75% canopy coverage in urban areas.

Figure 22 - Redevelopment areas such as Green Square promise to deliver significant improvements in canopy cover.

AS 29

- Piano nazionale per la rigenerazione urbana (2 mesi dalla legge)
- Priorità
- Classificazione siti idonei rigenerazione
- Criteri e modalità per il riparto annuale delle risorse del Fondo

AS 761 Gasparri, Paroli

CAPOII

GOVERNANCE DELLA RIGENERAZIONE URBANA

Art. 3.

(Soggetti istituzionali della rigenerazione urbana)

1) il riconoscimento di una volumetria ovvero di una superficie lorda aggiuntive rispetto a quelle preesistenti come misura premiale;

2) la possibilità di delocalizzazione delle volumetrie o superfici lorde aggiuntive di cui al numero 1) in area o aree diverse, **fatto salvo il criterio del pareggio di bilancio ecosistemico;**

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d) gli interventi coerenti finalizzati **a pareggiare o migliorare il bilancio dei servizi ecosistemici, energetico e idrico;**

4. Gli interventi attuativi della programmazione comunale di rigenerazione urbana destinati a beneficiare del contributo economico del Fondo nazionale per la rigenerazione urbana di cui all'articolo 10, oltre che delle altre agevolazioni stabilite dalla presente legge, assicurano le seguenti condizioni:

a)realizzazione di edifici della classe Adi certificazione energetica e, in ogni caso, miglioramento dello standard di efficienza energetica degli stessi in conformità alle direttive europee;

b)adeguamento sismico per il raggiungimento dei livelli di sicurezza previsti dalle norme tecniche;

c)realizzazione di aree verdi e servizi ecosistemici;

d)adeguamento e incremento delle dotazioni quantitative e qualitative di servizi pubblici, anche su superfici non naturali;

e)ri-permeabilizzazione di suolo già impermeabilizzato anche attraverso la rinaturalizzazione e riforestazione del suolo ai fini della mitigazione del rischio idrogeologico in ambito urbano e periurbano e dell'impatto visivo sul contesto di riferimento;

f)promozione di una compartecipazione a titolo gratuito in favore dei comuni per l'incremento di edilizia residenziale pubblica e sociale nei programmi di ristrutturazione urbanistica;

g)uso sociale dei luoghi;

h)recupero del tessuto produttivo e commerciale compatibile con l'insediamento e il riequilibrio insediativo;

i)abbattimento delle barriere architettoniche delle parti comuni dell'edificio;

l) consumo di suolo pari o inferiore a quello originario, comprese le opere infrastrutturali. Qualora in attuazione della programmazione comunale fosse verificata l'impossibilità di rispettare l'obbligo del riuso, sono consentiti gli interventi di nuova costruzione di cui all'articolo 3, comma 1, lettera e), del testo unico di cui al decreto del Presidente della Repubblica 6 giugno 2001,n.380, previa asseverazione del pareggio di bilancio non economico dei servizi ecosistemici. Al fine del pareggio di bilancio dei servizi ecosistemici, nella scelta della localizzazione delle opere, è sempre scelto il suolo a minor qualità di servizi resi.

An example tree's asset value calculated using CAVAT[103] (Capital Asset Value for Amenity Trees)

£0	£110	£2,300	£4,250	£6,500	£13,000	£19,000	£22,500
Cumulative cost	Cumulative cost	Cumulative cost	Cumulative cost	Cumulative cost	Cumulative cost	Cumulative cost	Cumulative cost
£65,000	£180	£8,000	£30,000	£65,000	£200,000	£225,000	£120,000
CAVAT value	CAVAT value	CAVAT value	CAVAT value	CAVAT value	CAVAT value	CAVAT value	CAVAT value
Existing mature tree (90 years) When a tree is healthy and there is no requirement to remove it	**Replacement sapling (At planting)** The replacement tree has only a fraction of the value of the mature tree it replaced, (0.28%)	**Established young tree (30 years)** After 30 years the replacement tree still has only 12.5% of the value of the tree it replaced	**Early mature tree (60 years)** Even after 60 years the value of the replacement tree, now showing the characteristics of the species in maturity but still significantly smaller than the tree it replaces, still is worth less than 50% of the tree it replaced	**Mature tree (90 years)** After 90 years the tree has achieved the same value as the tree it replaced	**Mature tree (175 years)** At the peak of its maturity, the tree's value as a public asset has continued to grow	**Veteran tree (250 years)** Careful management has largely maintained the quality and completeness of the mature tree. Its value now includes the many additional benefits that come with veteran status	**Senescent tree (300 years)** The structure of the tree has reduced but its quality and health have been maintained by careful management. It retains significant asset value

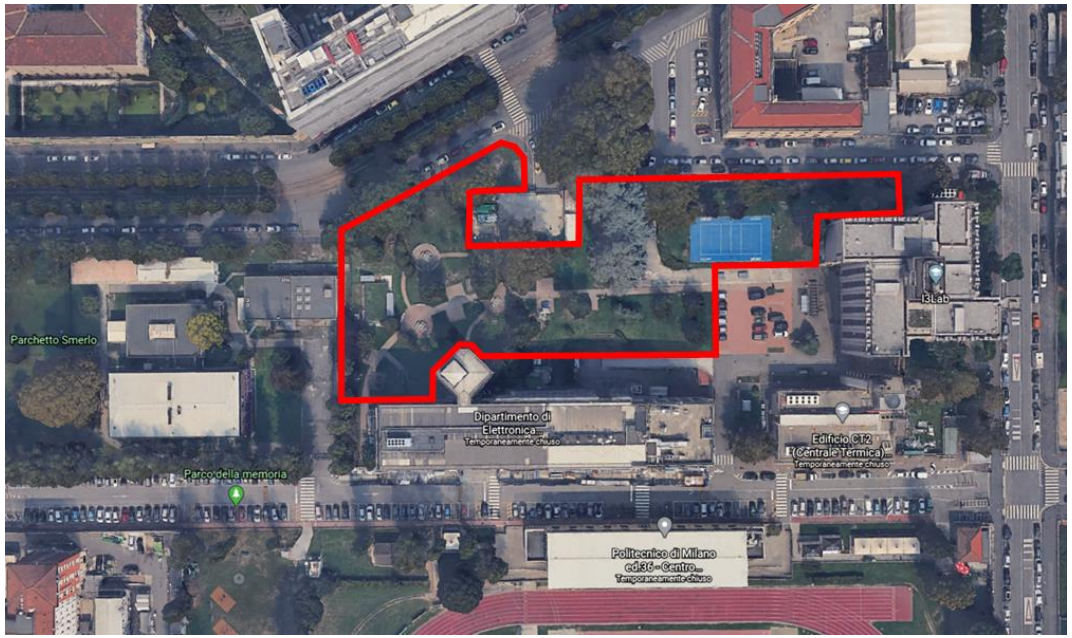
This example assumes:
- Both the existing mature tree and its replacement sapling are in a publicly accessible urban area. Trees in cities will generally have a higher value, but equivalent costs.
- The replacement sapling is planted carefully, and allowed to thrive.
- The location is one where a tree can grow without constraint to maturity and reach its full potential.
- It shows if a mature tree has to be replaced, it must be done in a way that can achieve the potential lifelong asset value.

CASE STUDY: THE LOSS OF THE BASSINI CAMPUS PARK OF THE POLITECNICO DI MILANO

SCS-CN Method to estimate runoff:

- Parco Bassini Green area: 5700 m^2
- Precipitation data ARPA di Lambrate 2017, 2018, 2019
- CN Green Area = 70
- CN unpermeable area = 98

Double or triple increase of the surface runoff volume compared to the green area condition



Parco del Campus Bassini

Year	Precipitation Volume [m^3]	Runoff Volume *CN=70* [m^3]	Runoff Volume *CN=98* [m^3]	Volume increase[%]	*Incremental* Runoff Volume [m^3]
2017	3909.06	767.47	2769.49	260.86	2002.02
2018	5704.56	1118.46	3780.92	238.05	2662.45
2019	6441	1114.28	4751.42	326.41	3637.14

COMPENSATION OF THE LOSS OF PERMEABLE AREA: GREEN ROOFS OR PERMEABLE PAVEMENTS

Extensive Green roofs
CN= 86

Tetto verde estensivo

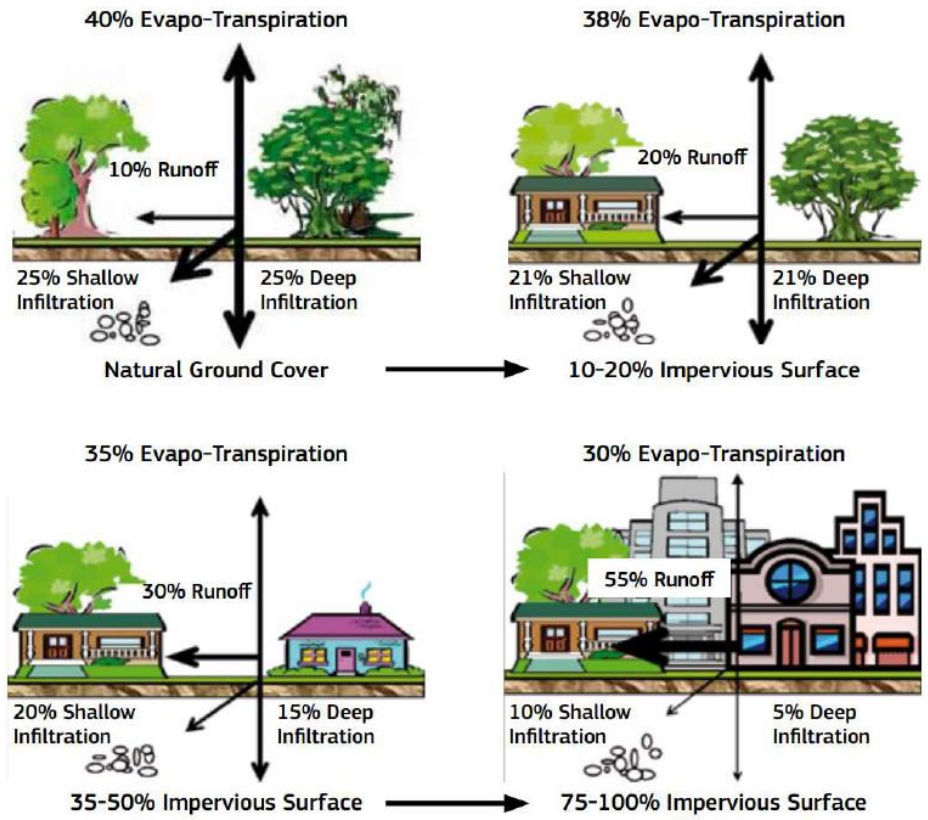
Anno	Volume Runoff *Tetto verde* [m^3]	Area da trasformare in *Tetto verde* [m^2]	Costo intervento [€]
2017	1383,7	8234,64	823 465
2018	1857,01	7888,12	788 815
2019	2265,27	8338,88	833 890

Permeable pavements
CN= 70

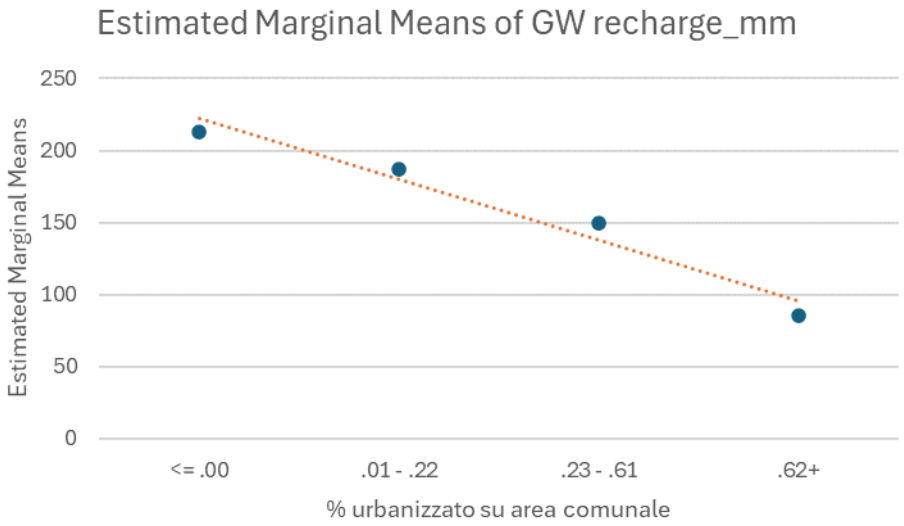
Blocchi di calcestruzzo drenante

Anno	Area da trasformare in *Pavimentazione Permeabile* [m^2]	Costo intervento [€]
2017 2018 2019	5700	285 000

Riduzione infiltrazione in falda



Studio fatto sul territorio della Provincia di Milano



Sulla base del modello idrologico BIGBANG (ISPRA)

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