Fundamentals of digital and ecological transitions

Climate change and applied Zoology: understanding human-induced effects on wildlife

Lesson 6

Dr. Chiara MANFRIN

cmanfrin@units.it

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Institution of PAs

- Recognized as efficient tools for protecting ecosystems, Protected Areas (PAs) are areas that are delimited and managed with the aim of conserving biodiversity. Creating a balance between biodiversity conservation and sustainable human activities, PAs restore the resources needed for the economic and social development of neighbouring populations.
- In some PAs, the establishment of highly protected areas with no fishing/hunting activity, accelerates the restoration of ecosystems and fishery/wildlife resources.

https://doi.org/10.1016/j.jeem.2022.102768

Protected areas (PAs)

- 15% of the Earth's land surface;
- Categorized by the International Union for Conservation of Nature (IUCN)
- Different type of PAs

WELL MANAGED MARINE PROTECTED AREAS SUPPORT FISHERIES

MPA

IN EUROPEAN WATERS

evidence shows that well-managed MPAs benefit fish and invertebrates.

+13%	+19%	+121%	+251%
SIZE	DIVERSITY	DENSITY	BIOMASS

EXAMPLE: TORRE GUACETO PROTECTED AREA, ITALY

15x

The MPA not only exports adults and juveniles; large-sized spawners produce **15 times** more eggs and larvae within the MPA than outside.

100 km

Sea breams move up to 100 km into fishing grounds.

EXAMPLE: COLUMBRETES ISLANDS PROTECTED AREA, SPAIN

20x

The spawning potential of lobsters within the MPA has increased by up to **20 times** compared to exploited areas.

4 km

Individuals move up to 4 km into fishing grounds.

SOURCES: PISCO 2011, Goni et al 2010, Guidetti & Claudet 2010, Guidetti 2007, Goni et al 2006, Di Franco et al (in press)

ADULTS, LARVAE AND EGGS SPILL OVER INTO FISHING GROUNDS

Larger individuals inside MPAs produce significantly more eggs and larvae. Some larvae and eggs then drift to fished areas outside the MPA, up to hundreds of kilometers depending on the species.

2x

Catches double where the MPA is co-managed with fishermen

10%

Lobsters from MPAs are larger, generating a 10% net income for fishermen

KEY PRINCIPLES FOR MPAs TO WORK:

- Well designed
- Enforcement & compliance
- Part of an Integrated Management Plan
- Sustainably financed
- Local community engagement and staff capacity

WWF works globally to support Marine Protected Areas and ensure they contribute to securing food and livelihoods for people while conserving critical habitat and species. In some European MPAs, for example, collaboration with fishermen have allowed them to increase the quantity and quality of fishing yields and revenue.

www.panda.org/mpa

WWF

Design by Catalyze

WELL MANAGED MARINE PROTECTED AREAS SUPPORT FISHERIES

MPAs IMPROVE THE HEALTH OF OCEANS BY:

MPA

- Protecting and Restoring Marine Habitats
- Increasing Resilience to Environmental Changes
- Protecting Species and Rebuilding Fish Stocks

KEY PRINCIPLES FOR MPAs TO WORK:

- Well Designed Networks of MPAs
- Enforced and Complied With
- Local Community Engagement
- Part of an Integrated Management Plan
- Sustainably Financed

MPAs SUPPORT LIVELIHOODS

In Apo Islands, Philippines, fishers have doubled their catch rate 18 years after the MPA was created. As a result, they go out to sea less, saving on fuel and time.

A global review shows that well-managed MPAs can substantially increase fish size, density, biomass and species richness.

SOURCES: Harrison et al., 2012, Lester et al., 2009, Russ et al., 2004

MPAs CAN PUMP FISH INTO ADJACENT AREAS

As fish populations recover within MPAs, juveniles and adults can spill over across the boundaries and replenish fishing grounds.

EXAMPLE: APO ISLAND PROTECTED AREA, PHILIPPINES

Surgeonfish and jackfish represent 40-75% of local fishery yields.

Since the MPA was established, their population has tripled...

...resulting in an increase in catch per unit effort of **+50%**

MPAs CAN EXPORT LARVAE INTO ADJACENT AREAS

Larger fish inside MPAs produce disproportionately more eggs and larvae. Some larvae then drift to fished areas.

EXAMPLE: GREAT BARRIER REEF PROTECTED AREA, AUSTRALIA

The coral trout and the stripey snapper are exploited locally.

± 50%

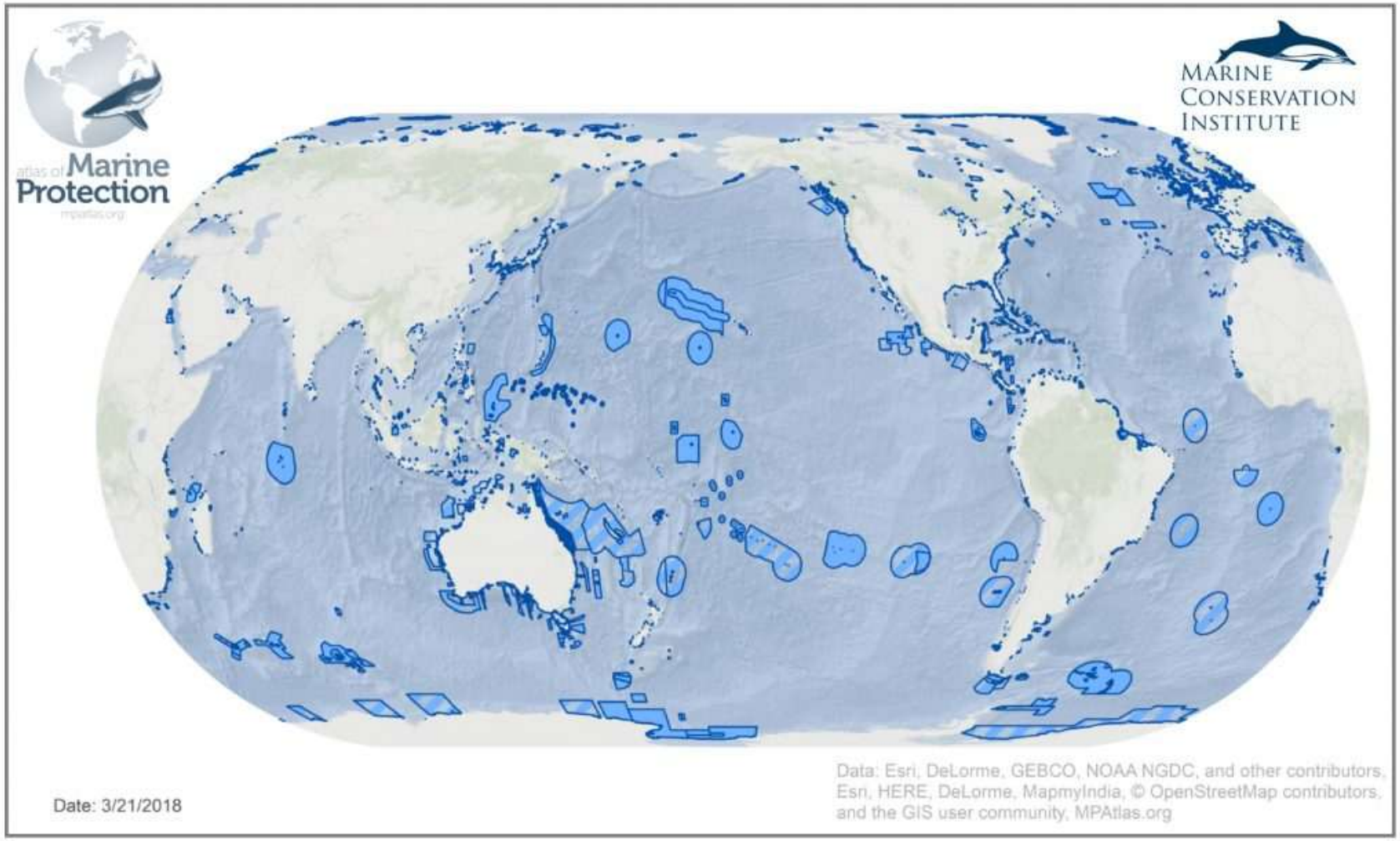
Local MPAs produce ± 50% of total juvenile recruitment in nearby fished areas.

Globally, WWF works to support Marine Protected Areas and ensure they contribute to securing food and livelihoods for people while conserving critical habitat and species.

www.panda.org/mpa

WWF

Design by: Catalyze


atlas of Marine Protection
mpatlas.org
MARINE CONSERVATION INSTITUTE
Date: 3/21/2018
Data: Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, MPAtlas.org

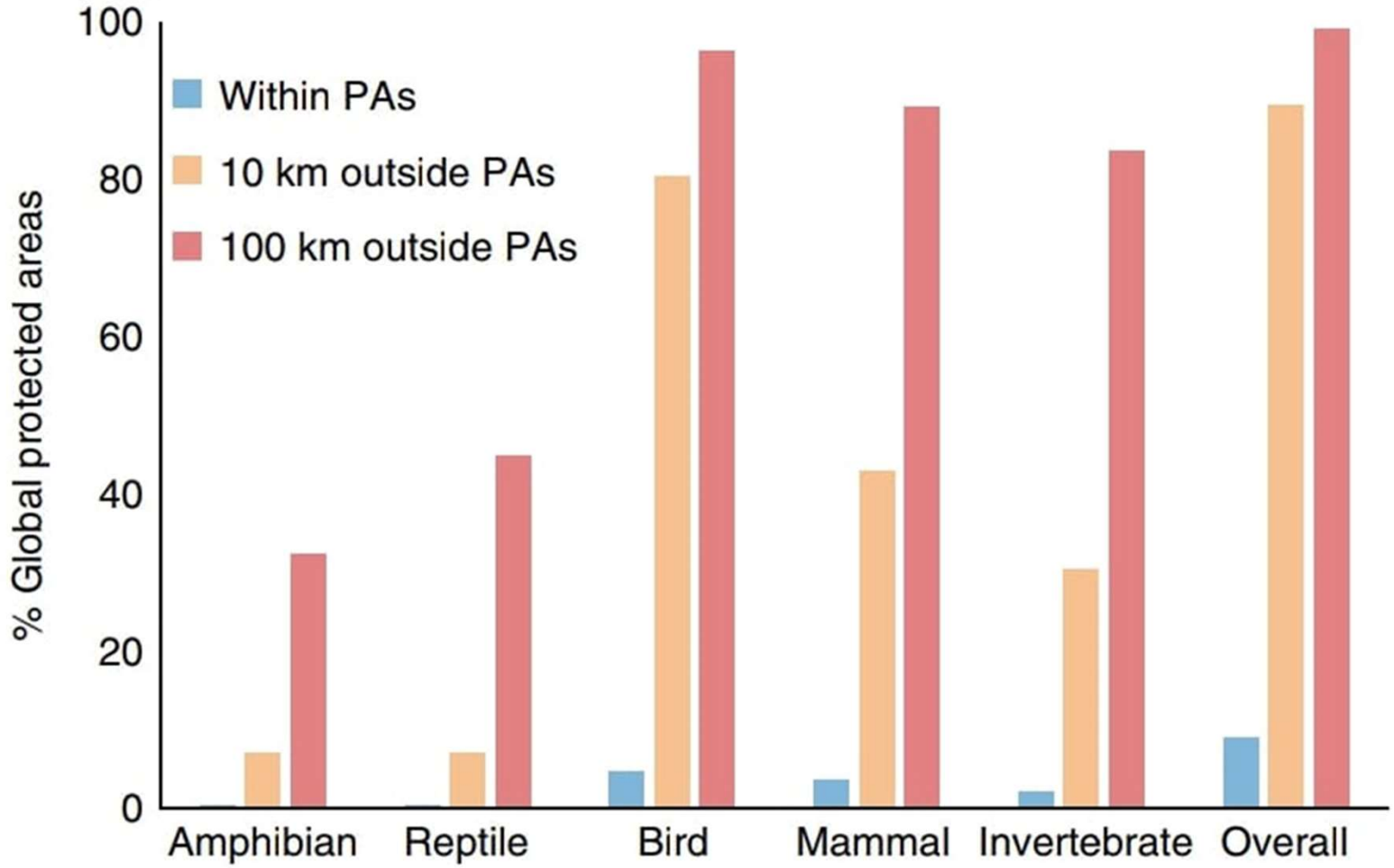


Fig. 2 Proportion of global terrestrial PAs and the surrounding areas (1(and 100 km distance to PA boundaries) colonized by different taxonomi(groups. We designated PAs as invaded when at least one animal species

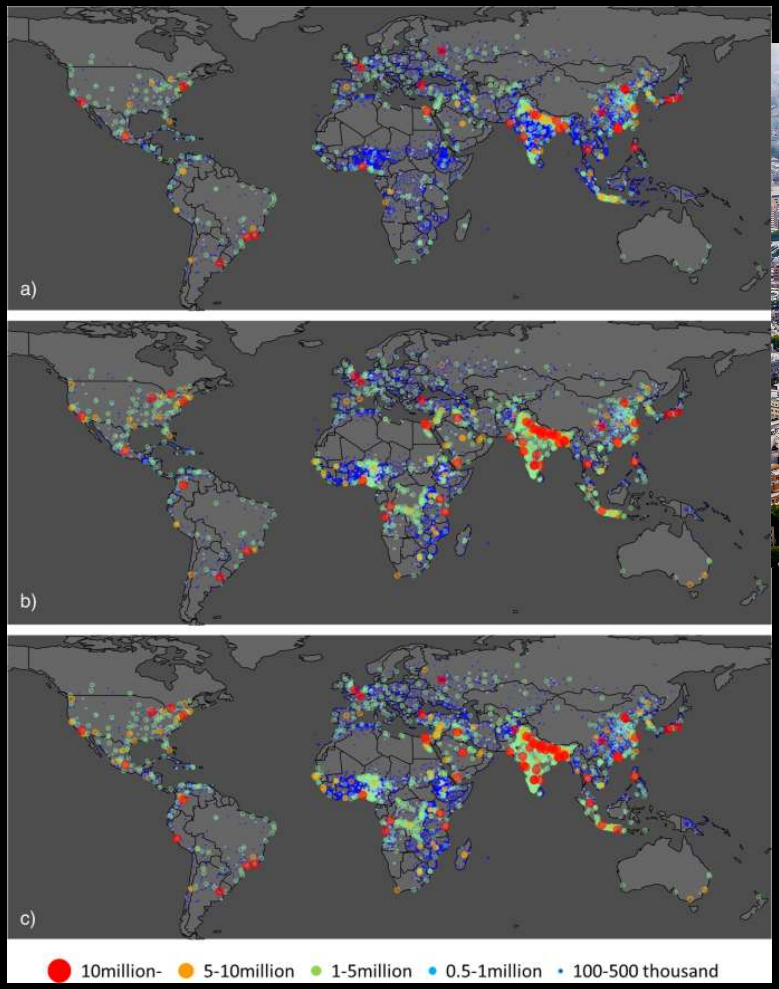
- We are used to thinking of our modern **cities** as grey masses of **asphalt**, **concrete**, **skyscrapers**: in many ways, this is not such a far-from-real stereotype. This, of course, does not mean that it is not possible to bring some healthy **greenery** into **urban environments**.

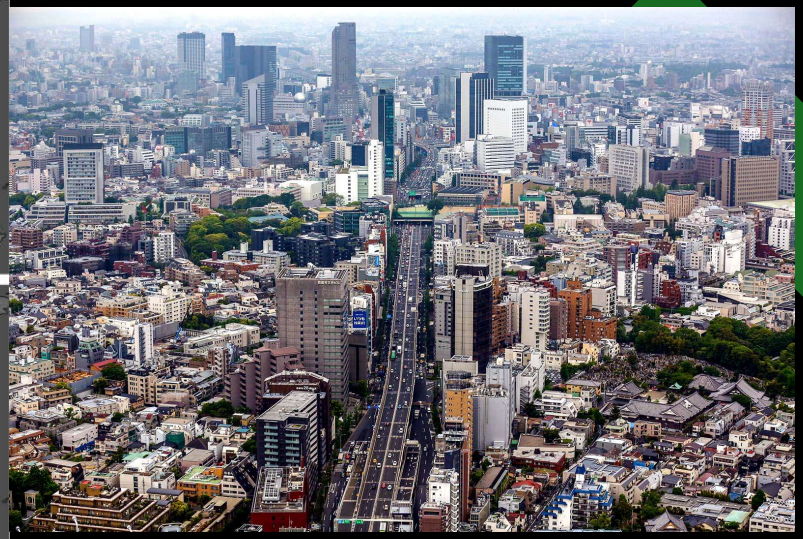
Urbanisation is the process of development and organisation that leads a built-up area to take on the typical characteristics of a city.

Industrial Revolution in the early 19th century

- Creation of urbanisation works transport networks, sewerage networks.
- Surrounding area affected by city expansion.- Pollution, chaos and stress.
- Societal behaviour and customs.

Future population projection in urban agglomerations worldwide and throughout the 21st century





Kii, 2021. doi.org/10.1038/s42949-020-00007-5

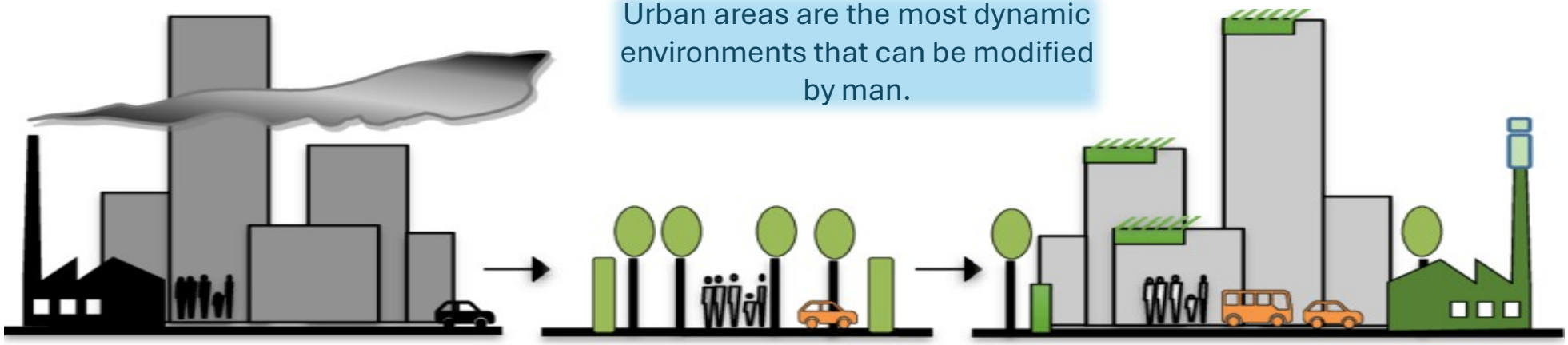
a Data for 2010. **b**, **c** Projections for 2100 under scenarios SSP1, 2, respectively.

Urban climate ⟷ Climate change & pollution

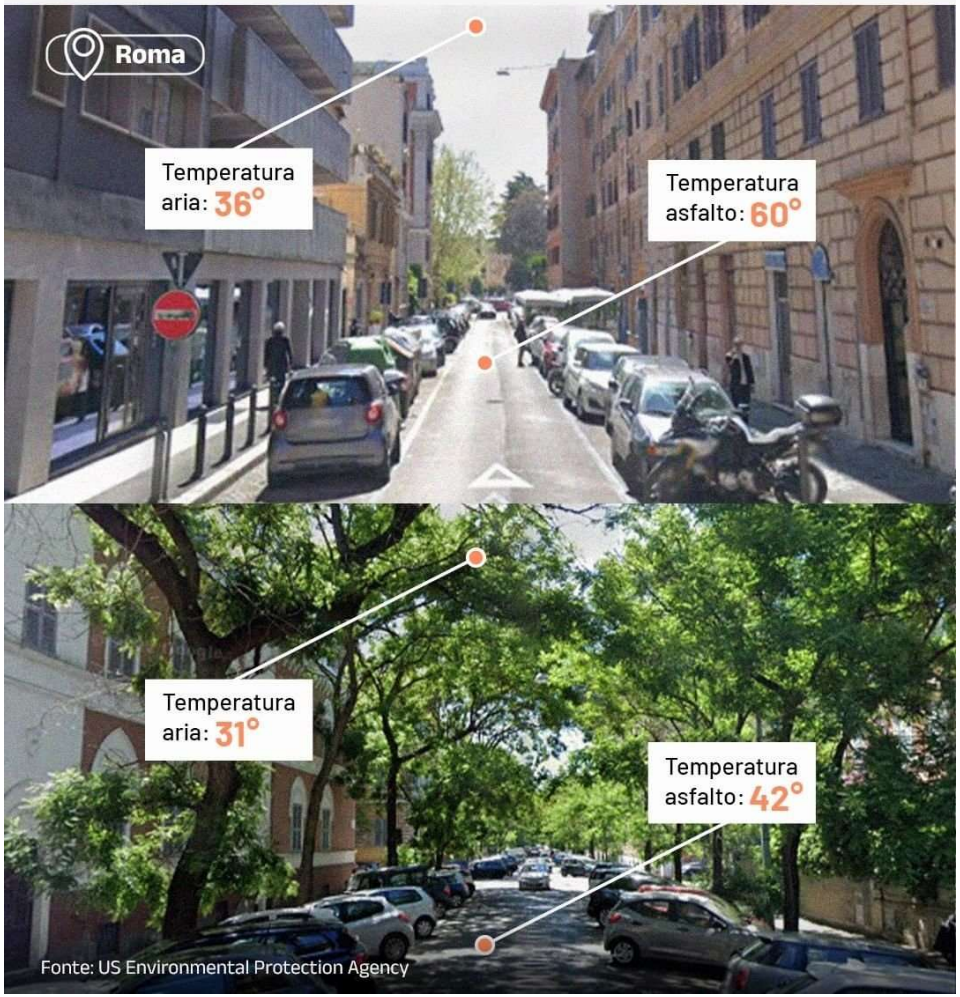
Characteristics of cities that generate climate effects:
-building materials with high thermal capacity
-distribution of buildings, streets and green areas
-fast loss/removal of water from the surface of streets

→ *green ext-/intensification* → **Urban vegetation elements**

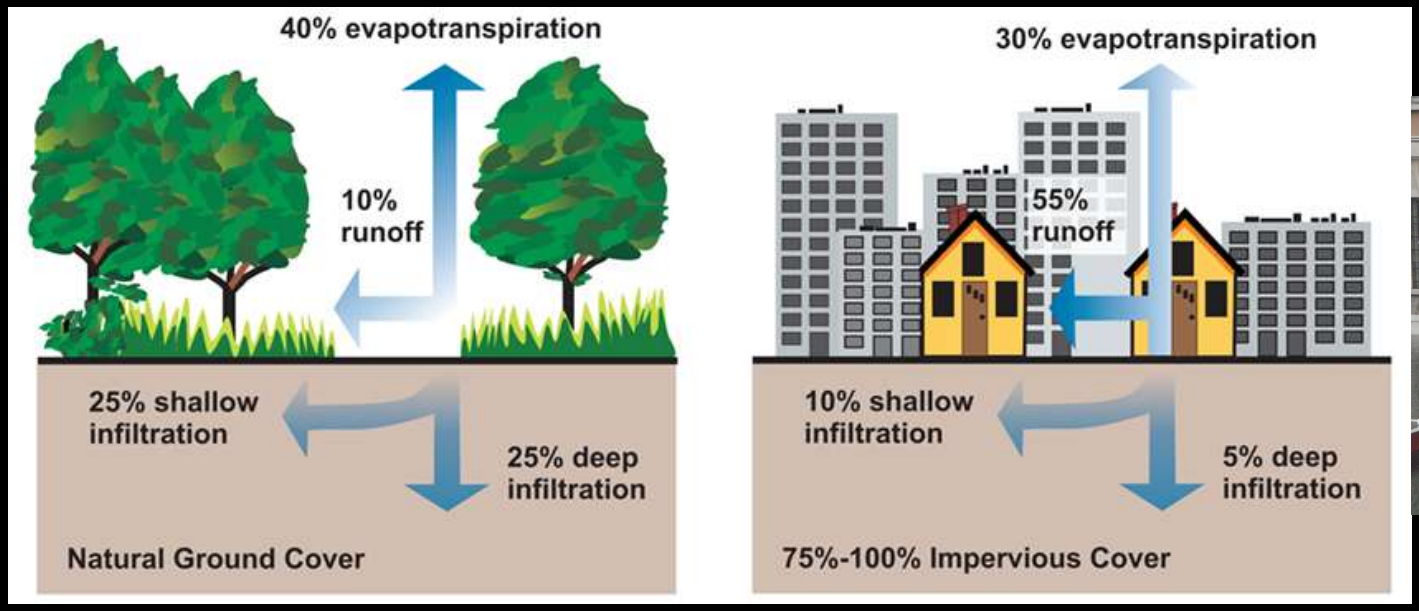
Urban areas are the most dynamic environments that can be modified by man.



In città, gli alberi fanno la differenza

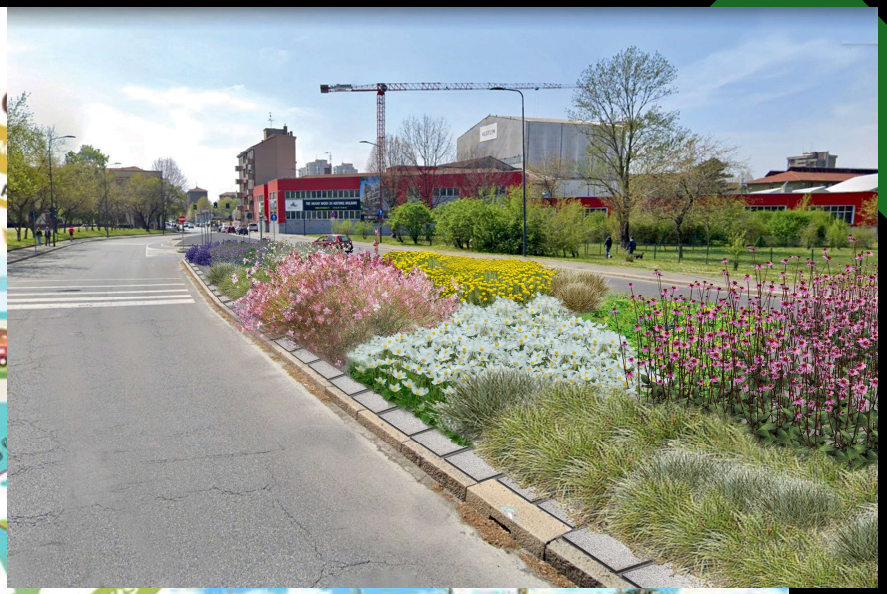


Run off


40% evapotranspiration
10%
runoff
25% shallow
infiltration
25% deep
infiltration
Natural Ground Cover
30% evapotranspiration
55%
runoff
10% shallow
infiltration
5% deep
infiltration
75%-100% Impervious Cover

Nature Based Solution

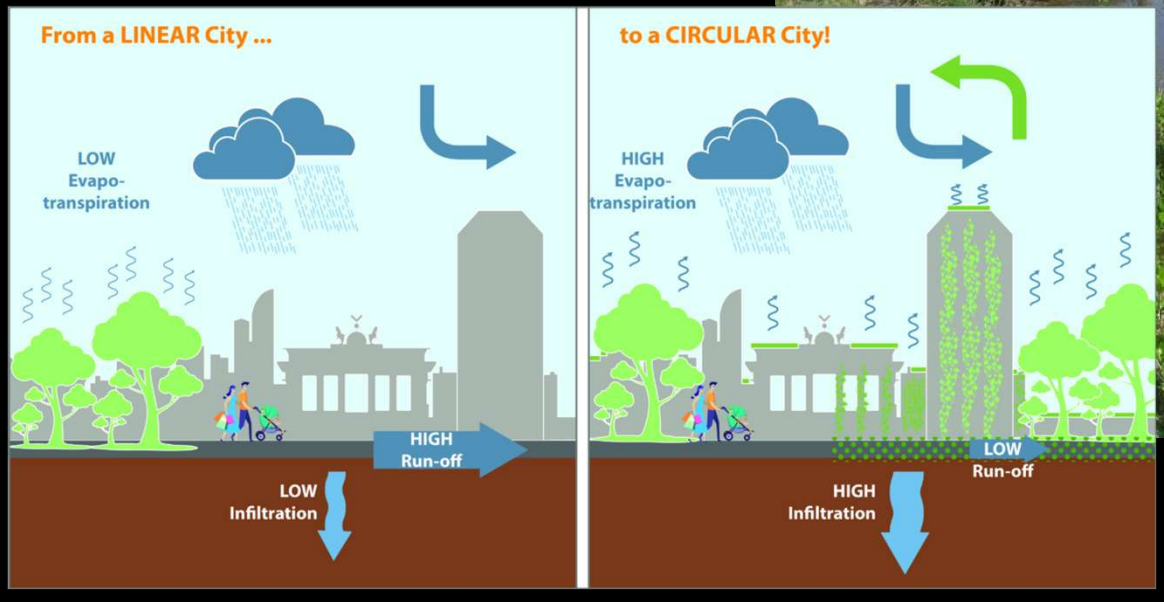
Desanding the road surface (in car parks, for



Vertical farm

In Berlin, vegetables are grown in the (disused) airport.

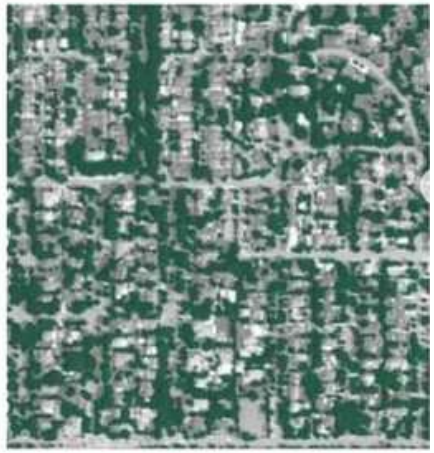
In Paris 300 varieties of s
on the roofs of the Galeri
Lafayette.


From a LINEAR City ...
LOW
Evapo-
transpiration
HIGH
Run-off
LOW
Infiltration
to a CIRCULAR City!
HIGH
Evapo-
transpiration
LOW
Run-off
HIGH
Infiltration

Denver

Median income: $47K

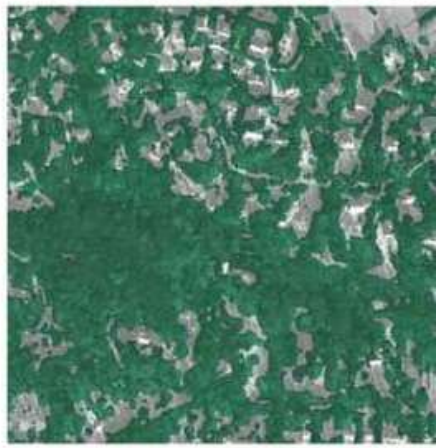
Median income: $198K



Baltimore

Median income: $31K

Median income: $154K



Boston

Median income: $50K

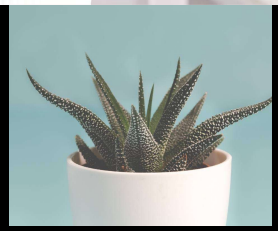
Median income: $190K

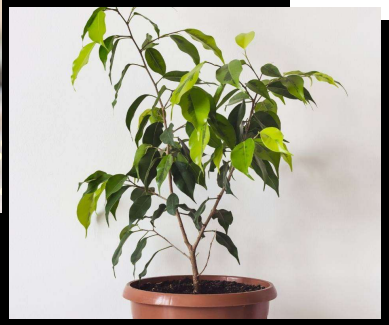
Portland, Ore.

Median income: $39K

Median income: $161K

In our houses



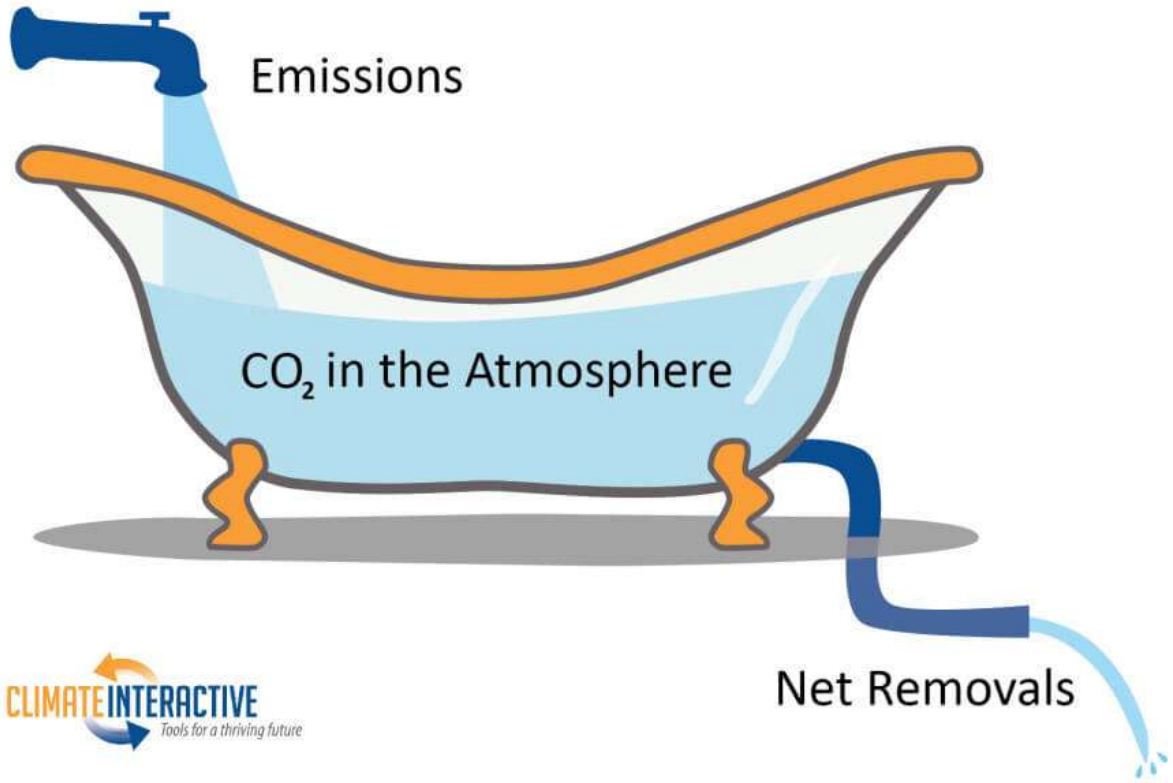


What we can do?

Industrial area

Green and Sustainability in Industrial Areas

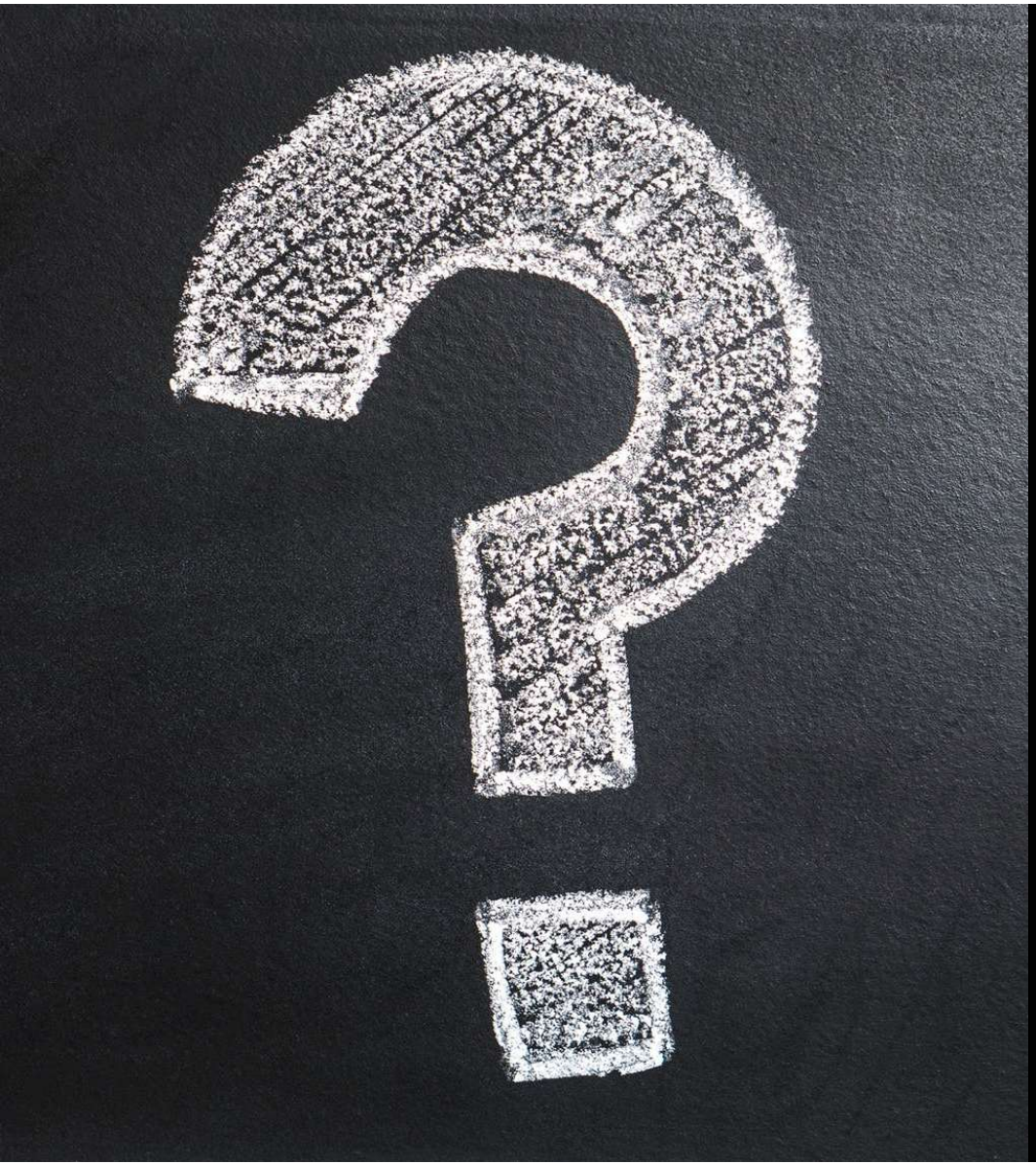
2,7 MWh of heat and 0,8 MWh of electricity



Overall framing by Dr. John Sterman, MIT Sloan

IF YOU CHANGE NOTHING, NOTHING WILL CHANGE

mobio



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