

Urban Ecosystems and Sustainability

Good morning everyone, I am Nicola Palmieri from Il Pianeta Naturale association, partner of the Wave KA 210 project. Today I will tell you a story that concerns us all: that of urban ecosystems.



The Urban Ecosystem

The urban ecosystem (Cities as Urban Ecosystems).

Every city is a unique ecosystem. It doesn't matter if they are millennia-old historic centers, technological metropolises, industrial, or tourist cities: all share a fundamental challenge, which is: how to balance anthropogenic needs and the natural environment?





The Urban Ecosystem

Stressed Cities

On one hand, we have stressed and unlivable cities, where the presence of concrete and asphalt is so overwhelming that it takes your breath away, and natural habitats are hard to find.

Livable Cities

On the other hand, we have livable and resilient cities, with green spaces that invite relaxation.



The Urban Ecosystem

What underlies the difference between these two types of cities is the **different level of integration between the urban and natural fabric.**

Urban ecosystems will be able to best leverage the benefits of nature if they are more integrated.



What Our Cities Lack

What truly distinguishes an urban ecosystem from a natural one? If we think of a forest, where everything is interconnected, and then of a city, we will see that the urban context is missing several fundamental pieces of the puzzle.

What Our Cities Lack

Local production

Almost no city produces its own food or raw materials; we are completely dependent on external sources.

Biodiversity

Urban habitats are fragmented like separate islands, which prevent animals from moving and plants from reproducing naturally.

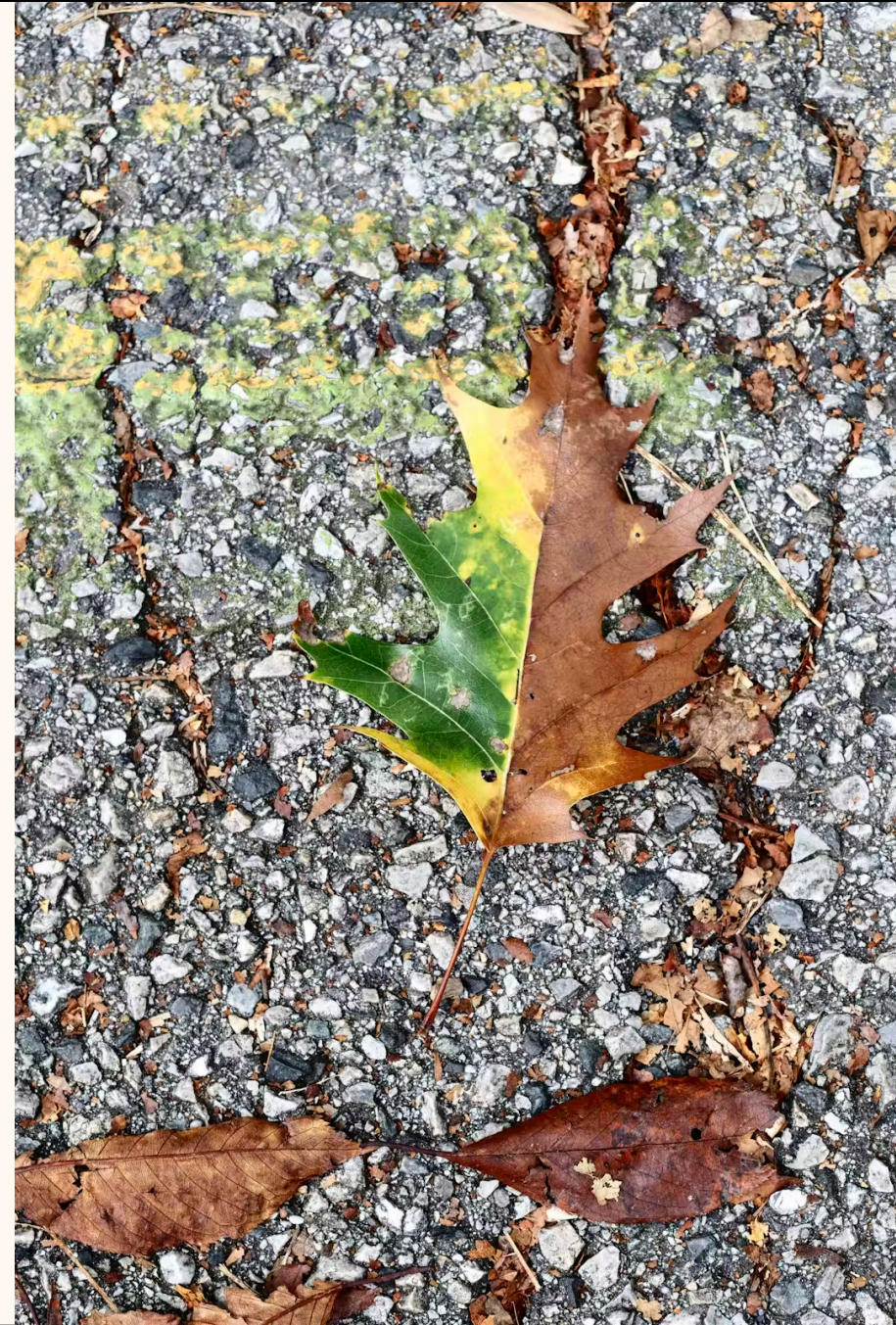
What Cities Lack

Healthy Soils

Under the asphalt, the soil is compromised, nutrient and water cycles are altered, and humus is almost nonexistent.

Resilience

Fragile cities that amplify floods, droughts, and heatwaves, instead of absorbing their impacts.





What Cities Lack

Natural processes: predation, decomposition, and ecological succession are missing, which are fundamental for maintaining balance in natural ecosystems.

❏ **But there are also positive notes:** many abandoned urban areas spontaneously transform into new "wild" zones with high biodiversity.



Ecological Succession

Nature, left to its course, rebuilds an ecosystem from scratch, starting from pioneer organisms, reaching climax communities through **ecological succession**.

This demonstrates the regenerative capacity inherent in natural systems, even in degraded urban contexts.

The Emergency of Urban Heat Levels

Urban heat islands represent an urgent problem.

In summer, in cities with over 50,000 inhabitants, temperatures can exceed those of nearby rural environments by **10-15°C**.



Urban Heat Islands

The phenomenon is due to asphalt and concrete absorbing heat during the day and releasing it at night, to sparse vegetation, and to air conditioners that cool interiors but heat the outside.

Poorer neighborhoods suffer most from these effects.



Natural Solutions

01

Green Corridors

Create green corridors that allow wind to flow through the city.

02

Plant Trees

Plant trees and create parks, transforming empty spaces into green lungs.

03

Green Building

Incentivize green building to better insulate buildings.

Natural Solutions



Reflective Materials

Use light and reflective materials for sidewalks, buildings, and roads, capable of repelling heat.

Cairo is cooler than the surrounding desert due to the presence of greenery.



Water Features

Design fountains and water features that provide cooling through evaporation.

The Story of Medellín

Example of Possible Transformation

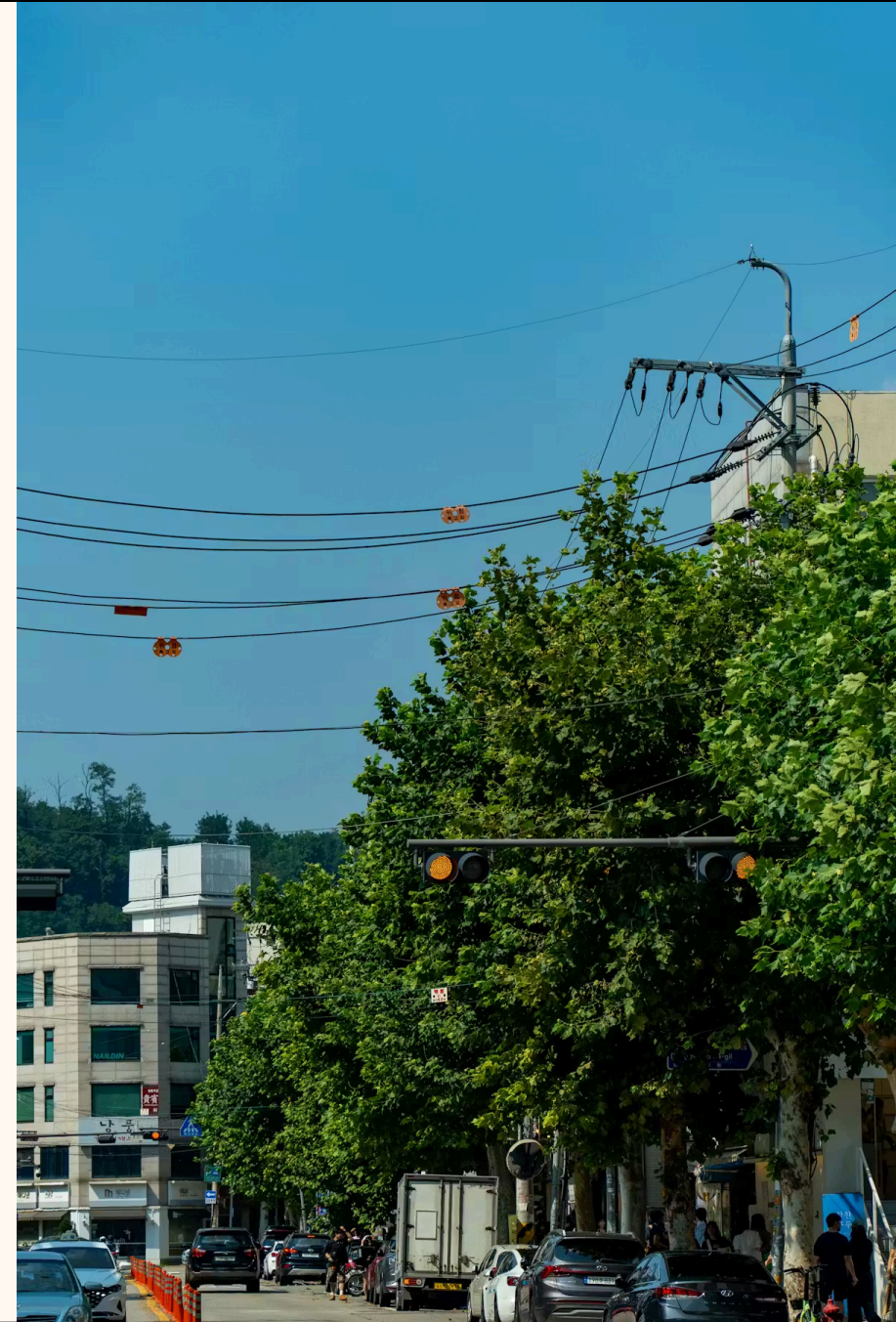
Medellín, Colombia, demonstrates that targeted interventions can improve liveability and urban appearance. Strategies such as green corridors have been adopted, reducing urban temperature by 2°C in just three years.



The History of Medellín

The urban geography was redesigned by planting trees, shrubs, and bushes along roads, waterways, and even on rooftops.

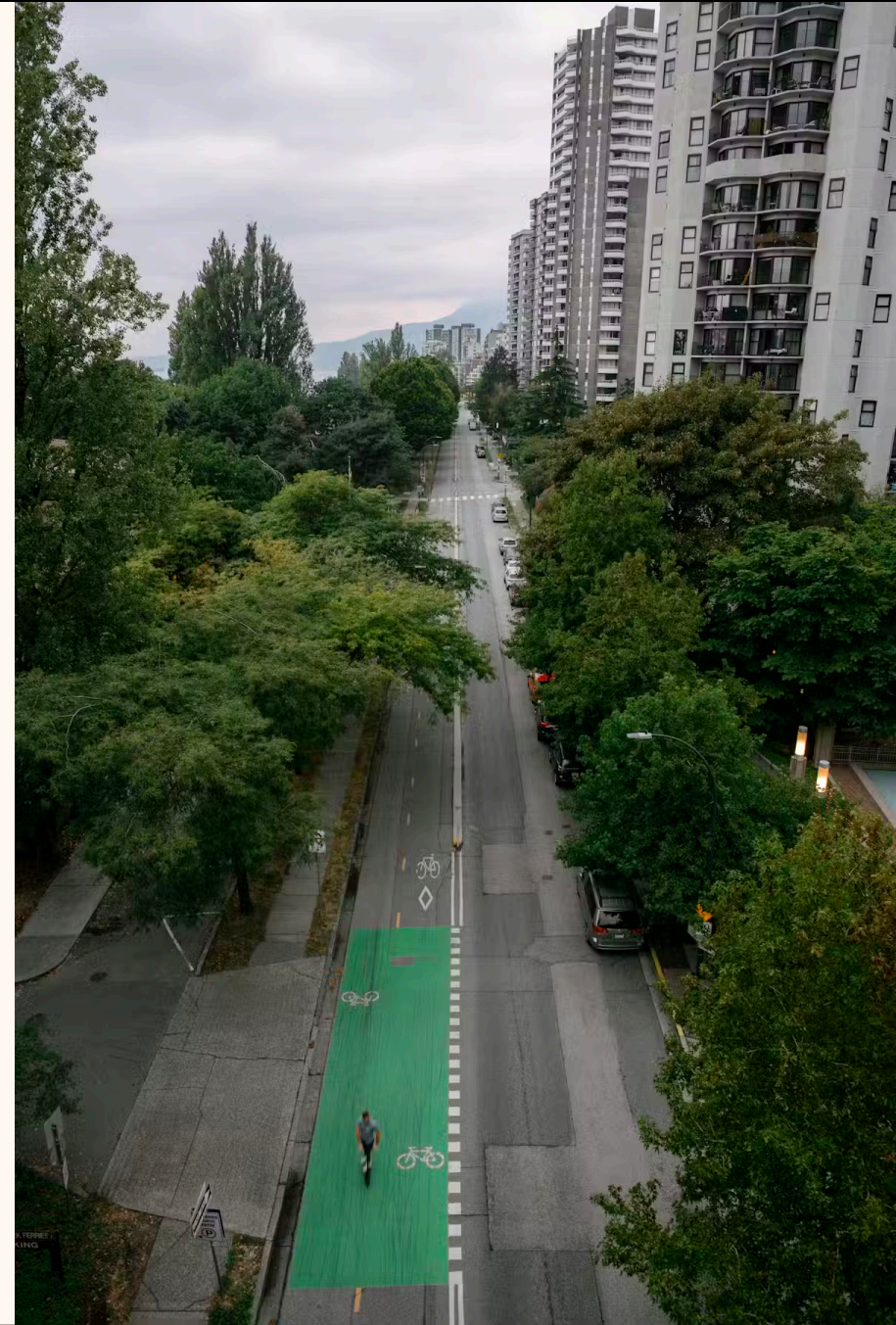
A green network was born that crosses the city connecting the center, residential neighborhoods, universities, and offices.



The Story of Medellín

The result is a porous and permeable city, traversable on foot or by bike. Architecture and nature coexist harmoniously.

Commercial spaces, covered squares, and sports areas integrate biodiversity. Cleaner air brings well-being and reduces respiratory diseases.



Medellín: Data and Results

Insights.



Average Air Temperature

From 31.6°C to 27.1°C



Surface Temperature

From 40.5°C to 30.2°C



PM2.5

From 21.81 $\mu\text{g}/\text{m}^3$ to 20.26 $\mu\text{g}/\text{m}^3$



PM10

From 46.04 $\mu\text{g}/\text{m}^3$ to 40.4 $\mu\text{g}/\text{m}^3$

Medellín: Health Impact



30.1 → 26.32 $\mu\text{g}/\text{m}^3$

Ozone



159.8 → 95.3 cases per thousand inhabitants

Acute respiratory infections

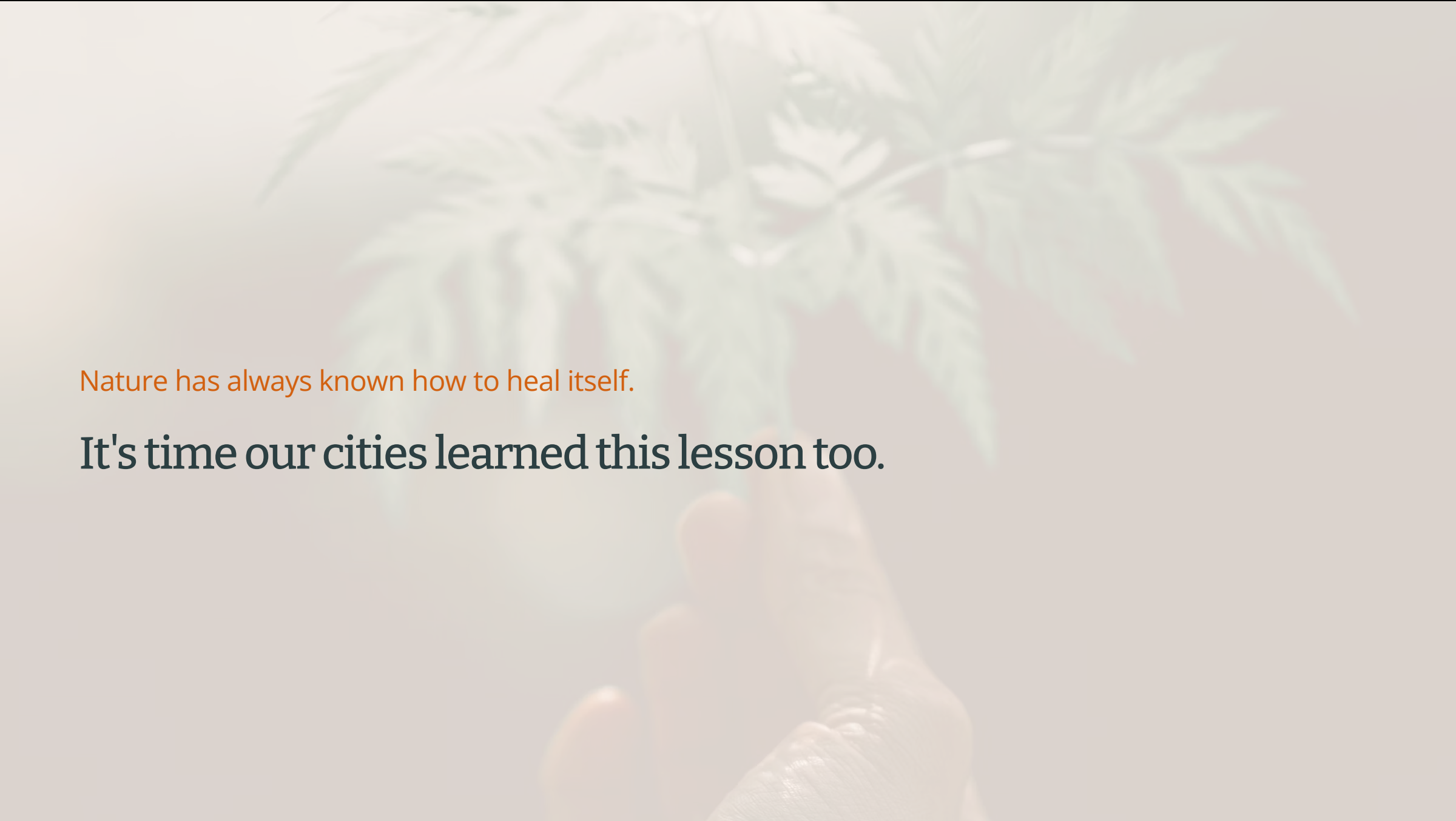
Medellín is no longer a city to emigrate from, but an international model.



A Possible Future

The European Union aims to make cities climate-resilient by **2050**.

More urban green spaces, sustainable water management, and innovative materials are needed. Reducing heat means less energy consumption and more livable cities for everyone.

A hand is shown from the bottom, reaching upwards towards a green fern frond that hangs down from the top. The background is a soft, out-of-focus mix of light and dark tones, creating a sense of depth and connection between the human element and nature.

Nature has always known how to heal itself.

It's time our cities learned this lesson too.