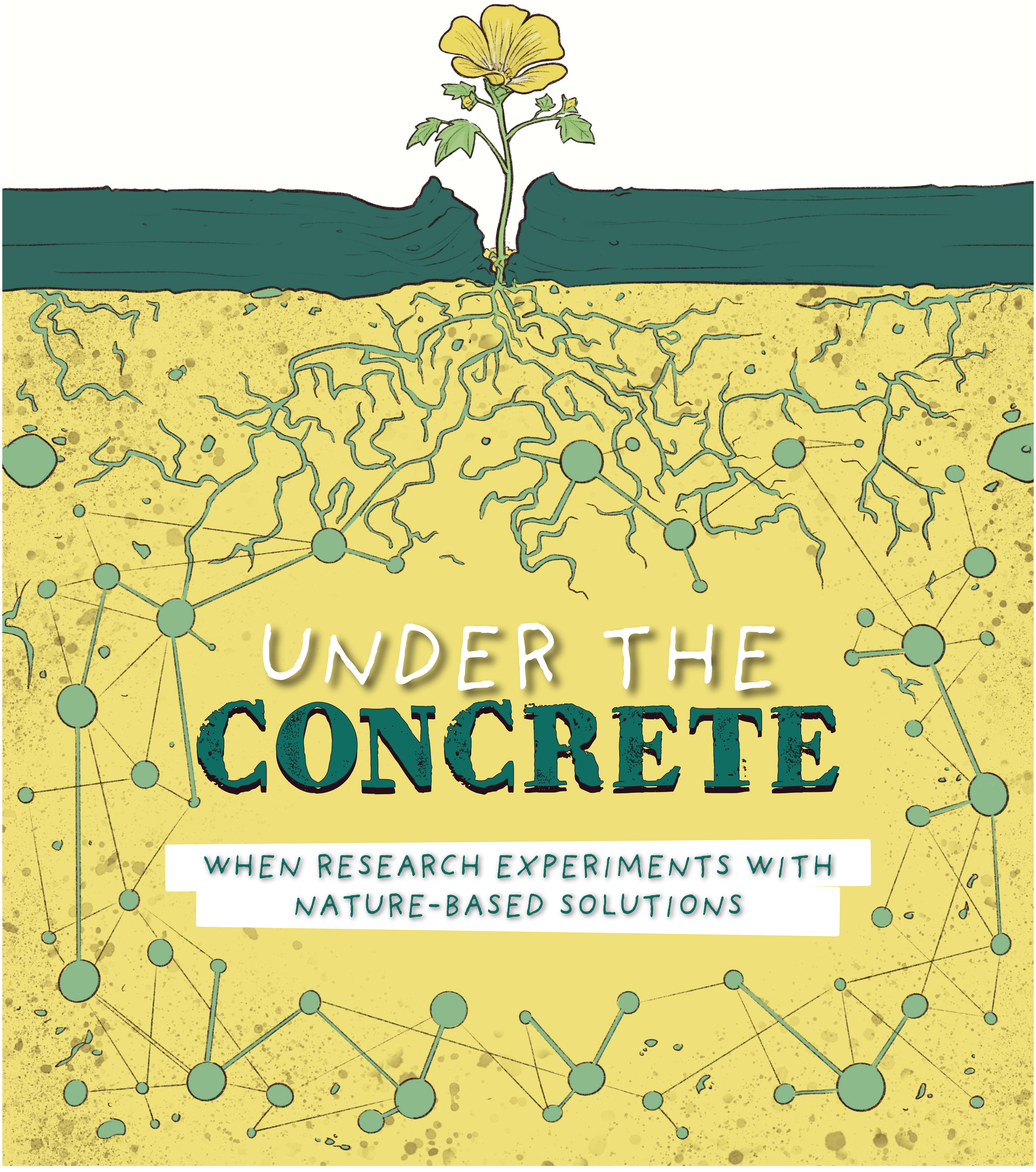
Macha Bellinghery



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CARDIMED

amU Aix
Marseille
Université

WHAT'S HAPPENING ON OUR CAMPUS?



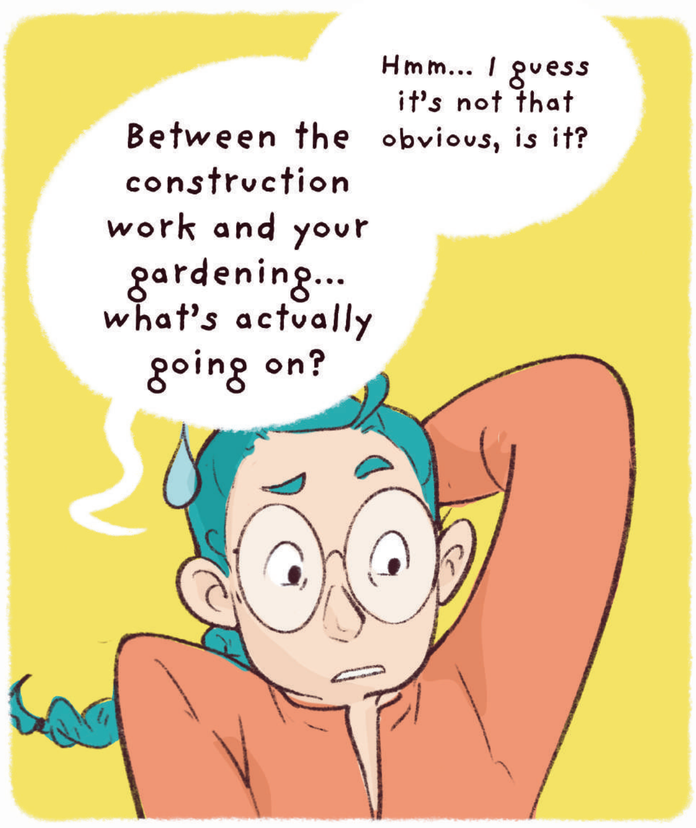














Our goal is to test:

NATURE-BASED SOLUTIONS

Solutions that harness the power of nature to solve our problems...

... especially those brought about by climate change.

Oh, "natural remedies", just another trendy concept.

Hmm... or perhaps the end of collective amnesia?

In our desire to separate from the living world, it is as if we have forgotten the richness of our interdependence with other species, the microscopic world, and the natural cycles of nature.

PLANT SALE

TOUS AU VERT !

And in the city, for example, we really suffer from this separation!

So, it's in our best interest to restore a mutually beneficial relationship.

To achieve this, we have 2 PROJECTS

REMOVE WATERPROOFING to infiltrate rainwater and let the soil breathe.

RENATURALISATION To improve biodiversity and our living environment.

Our research teams and students also measure the impacts of these solutions.

We operate on two campuses in Marseille.

But around the Mediterranean, thanks to Europe, other initiatives are underway...

If these solutions prove successful, they act as models for building more resilient cities of the future!

NBS Ideas

REDISCOVERING THE WATER CYCLE

Hey! Come take a look over here!

Global changes require us to be more efficient in conserving our resources.

The main one?

WATER!

However, our impervious urban surfaces prevent rainwater from infiltrating naturally...

As water flows through our old town centers, the rain often ends up...

...in the sewer system and our wasted stormwater plants!

So, to start with, the soil needs to become permeable again in order to restore the water cycle!

Replace asphalt and concrete with:

open-ground areas...

... or permeable surfaces on footpath!

Plan water flows to strategically hold water on the site rather than letting it run off.

Infiltration ditches to temporarily hold water and allow it to seep into the ground.

In short: reconnecting water, soil, and vegetation!

Take a look, you can see change happening right here on our campuses.

MPUS ST. CHARLES

ST. JÉROME

And it works!

During the last storm, this swale filled completely with water then drained slowly over an hour...

... which means that water goes into the soil and roots of plants rather than the gutters!

WHAT DOES THE GROUND HAVE TO SAY?

Oh...

What's this?

Unsealing is also a story about the soil itself

Yet no one sees it. It is treated as nothing more than a support, when in fact it is a living ecosystem, with its own flora and fauna, air, groundwater, and so on.

And when we learn how to read the soil, it teaches us so many things!

pH

TEXTURE

BIOLOGICAL ACTIVITY

3 Kg

DENSITY

COMPACTNESS

We are analyzing the soils liquid samples to understand how it currently works

Does the water drain properly there?

How does it look?

Are there certain plants that improve the flow of water?

We analyze its solid samples to understand its history

We also observe... how the soil breathes!

BiP BiP

CO_2

Temps

After being buried under urban development, isn't this type of soil contaminated?

In fact, the transfer of contaminants through the soil is common in urban areas.

So we monitor contamination levels, because we don't want to compromise the quality of the water that can finally seep through!

The goal, by finally letting the soils breathe, the goal is to return to a more natural cycle.

Organic matter

Nutrients

And in your opinion, how and when will this urban area return to normal?

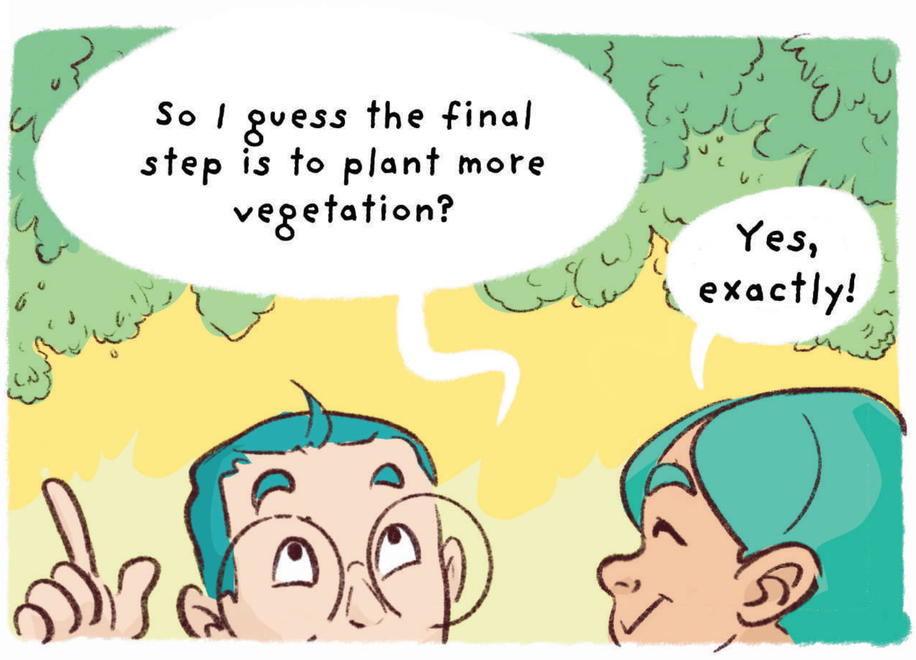
That's exactly what we're trying to figure out!

It is assumed that unsealing will help quickly. But depending on the extent of the damage, restoration could take... decades!

The natural process of soil formation is very slow...

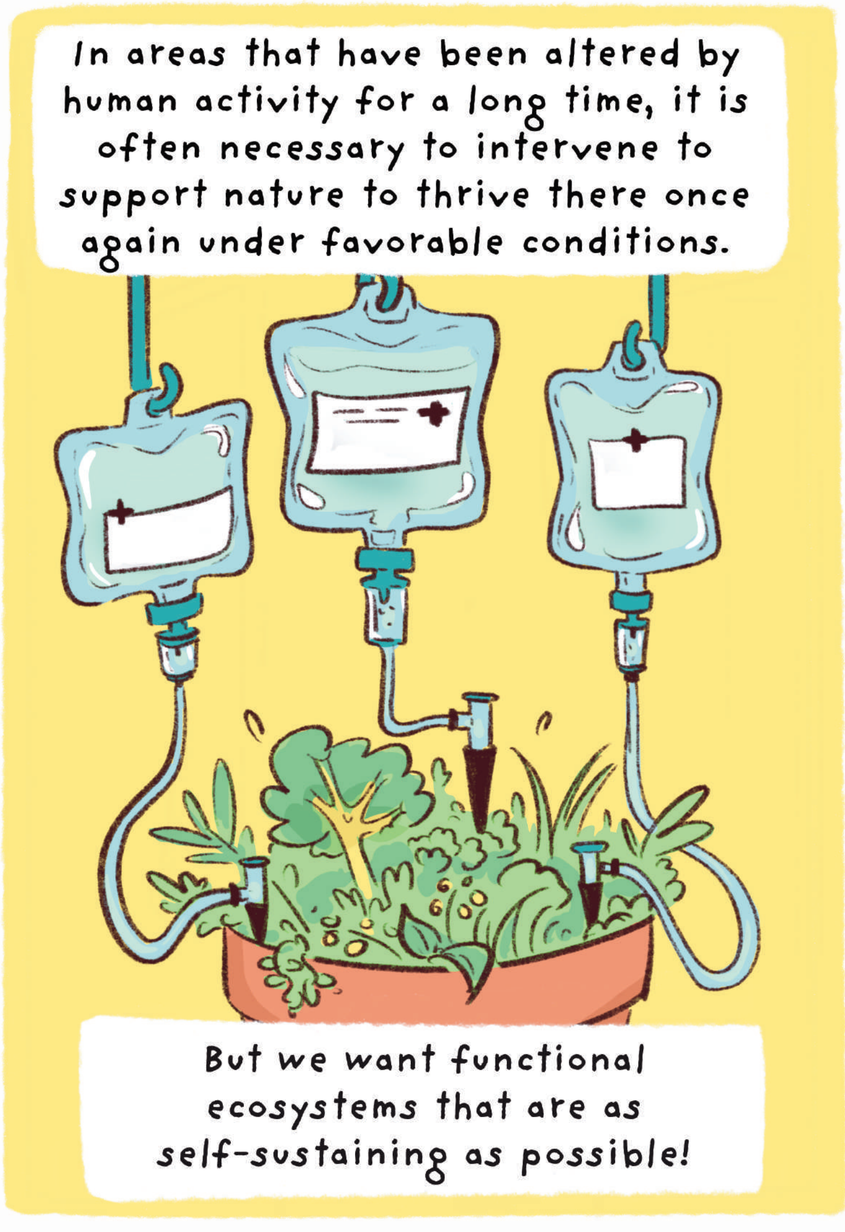
Once you know that, you understand better why it's important to preserve soils in the first place.

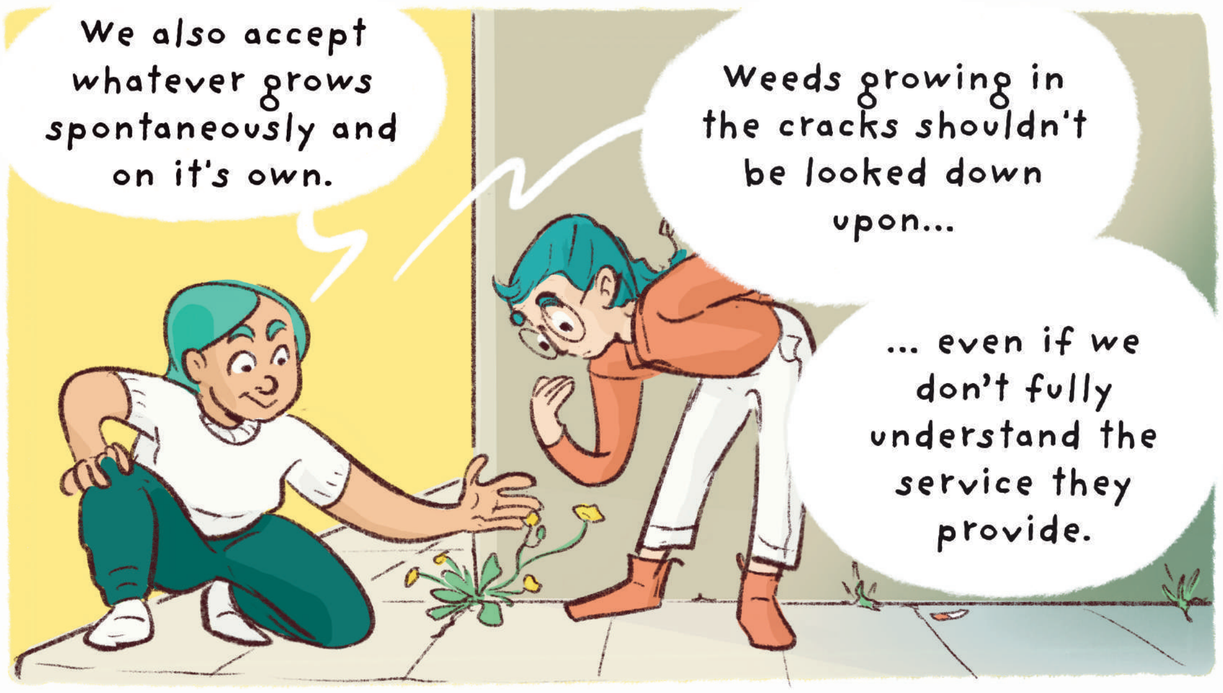
LET'S GO GREEN!













So, how do you decide what to plant?

Haha, that's a big topic!

Because we need to bring many stakeholders and their different ideas together, it can be hard to reach a consensus.

... between aesthetic considerations

...ecology...

... public health...

... or economics...

So we are constantly making compromises:

To agree on the various properties of the desired plants.

SPRING

To decide together when to mow, how short to cut the grass, and where to keep the grass clippings or mulch.

Of course, sometimes things don't go as planned...

... it's only natural, after all!

SALIX ALBA N°24

To reduce the risk of fire (near the road).

EXPERIMENT IN PROGRESS

To educate and adopt the right practices.

GOAL: BIODIVERSITY

All these changes, all these negotiations... what's the point, really?

That's a real research question!

Our initial goal is to improve biodiversity, which is essential for our ability to adapt in the future!

BIOLOGICAL DENSITY

THAT IS WHAT WE WILL MEASURE OVER SEVERAL YEARS

TIME (OFTEN VERY LONG)

Oh I see, you can't rush these things!

It takes a long time before we see the full results... it requires everyone's ongoing commitment!

Students

Scientists

Site managers

Ultimately, greening campuses will help foster ecological connectivity within the city, providing:

Places for living, resting, and breeding.

Facilitated genetic exchange.

Connections/ pathways for small and big animals move safely.

We are already seeing encouraging results...

Even though some of the non-human users can give us a hard time.

Our small, shiny sensor.

A magpie that's a little too clever

We can adapt by learning to hide our equipment better, but not so well we can't find it again!

Others have already found a great way to enjoy greenings.

Wow... but... this is DELICIOUS!

WHAT'S THE IMPACT ON TEMPERATURE?

Hey !

From up there in cities, we can measure some interesting things too.

Heatwaves and the urban heat island effect put our health at risk every year...

... and we know that nature needs to return to the city to mitigate them!

To get more shade?

Yes, but that's not all!

When a leaf absorbs energy through photosynthesis, it transpires.

SOLAR ENERGY

As water evaporates, it lowers the temperature of its surface... and that of the surrounding air!

At the same time, a living soil also releases moisture into the air, creating a refreshing sensation.

All of that is "evapotranspiration."

And look at the the portion of solar radiation that is absorbed or reflected: the "albedo effect"!

Dark surfaces, such as asphalt or tar, absorb solar energy and heat up our cities.

If these dark surfaces are covered by trees for example, this has a reflective effect, keeping it cooler!

However, the best results take time to achieve...

The soils need to regain their vitality...

...so they can store enough water

...and the trees need time to grow and mature.

So you'll need to be patient!

A BOOST FOR AIR QUALITY?

That sensor is for measuring airborne particles, right?

People often say that trees purify the air... is that true?

In theory, yes: a tree in the city can absorb several kilograms of CO_2 per year through photosynthesis, as well as other pollutants on the surface of its leaves.

O_2

CO_2

But in practice, it's not that simple.

First, the tree needs to be healthy. An old or diseased tree won't be very efficient.

ATCHOUUUM

Also, vegetation can act as a barrier against fine particles... but only if it is strategically placed!

Finally, all trees release substances, some of which are fragrant.

Fresh scent of pine trees

These are called VOCs. (volatile organic compounds)

These compounds are harmless, but if they come into contact with urban pollutants...

V.O.C.s

Plant-based, harmless.

+

NOxYMORPH

Nitrogen oxide

From traffic, HVAC systems, or industrial activity...

=

OZONYX

Tropospheric ozone

HEALTH HAZARD

... when combined, they form secondary pollutants that are harmful to residents, such as ground-level ozone!

But all this greenery makes my hayfever torture for my allergies!

Pollution actually makes us much more sensitive to allergens like pollen!

Trees, on the other hand, remain our allies in improving air quality.

So, to maximize their profits, we have to choose:

Trees that will thrive in this type of space...

... species that emit as little pollen and VOCs as possible...

And strategically plant these trees!

IS OUR HEALTH AT RISK?

One day, an anxious email arrived...

Is greenery a danger?

With all this nature on campus, what do you plan to do if diseases were to break out?

Of course, when we increase the biodiversity there are the parts we all love...

... and the one we like the least!

Some species can carry diseases:

VECTOR: mosquito

PATHOGEN: dengue virus, Zika virus, etc.

HOST: human

VECTOR: sand fly

PATHOGEN: Leishmania parasite, Massilia virus

HOST: dog

RESERVOIR HOST: rodents

PATHOGEN: bacteria causing leptospirosis, hepatitis, etc.

HOST: dogs, humans

Lure: human scent and CO2

Trap with food

We are here to actively monitor changes in the population density of these species in the new green spaces.

I, for example, catch mosquitoes with this!

It is a collaboration across many disciplines:

Scientists who monitor the density of these populations over time.

Those who identify and count species.

Scientists who look for pathogens in feces.

So far, we haven't identified any problems. Even if a danger is present (mosquitoes), that doesn't mean there's a risk (harmless, inactive during the day, etc.).

RISK

DANGER

Besides, let's not forget that many other factors in the city influence the movement of these potential pests...

It doesn't hurt to remind yourself that you can't control everything...

Hmm... Now I think of it, it seems crazy to prioritise a world wrapped in security over the richness of an ever-changing, natural world.

SO, HOW SHOULD WE RESPOND?

All these changes are designed to improve the campus environment. However, they aren't always seen that way...

Seriously... where am I supposed to park now?

All this dirt isn't very clean...

More detours because of all these construction sites, it's a real nightmare!

And so much to maintain!

Wow, it's tough to change these ideas!

It's true: bringing nature back into the city means challenging our habits and perceptions, which are dominated by cars, order, and concrete.

Still, we've all seen the value in reconnecting with nature.

Of course, but these negative reactions arise when we feel like we're being forced to accept the changes!

The key to the success of projects that incorporate nature-based solutions lies in involving as many people as possible from the very beginning.

Users can—and should—be fully involved in decisions on these matters.

When people feel heard and valued, it fosters collaboration, streamlines work, and creates tangible results and shared benefits for all!

- [x] Assess the needs regarding traffic flow and modes of transportation
- [x] Offer to participate meaningfully in planting projects or preliminary

Hmm, there are plenty of other areas where we could apply all of this...

What's more, the transformation of our campuses into real-world social experimentation sites is a real boon!

Look: people are hiking off the beaten path, away from the designated trails, that's interesting!

I can't wait to see how these changes will transform the habits and feelings of people with many different backgrounds.

We sure hope so!

RESULTS... LET THEM STEEP!

Nature-based solutions are neither simple nor free. They require:

time

care

partnership

Ecosystem health

Human well-being

In return, they offer excellent, unparalelled, strong balance.

Getting back to nature is always good for you, even if it stings, gets you dirty, challenges you, or makes you anxious.

We need to rethink our relationship with living things!

These solutions hold the promise of applications that will lead to major scientific breakthroughs.

WATER CYCLE

CLIMATE

SOILS

NATURE-BASED SOLUTIONS

VEGETATION

BIODIVERSITY

HEALTH

BEHAVIORS

NBS form an endless network of interactions, where everyone has a role to play.

The secret? COM-PRO-MISE.

That's it, there's just one last step.

What?!

This is a crucial part of rather communication:

How to move from local experiments and data collection...

... to raising awareness and providing information to society at large?

We need to explore potential connections with other areas of research, with citizens, and even with policymakers!

NATURE

Improving speeches

... information tools...

... the leverage actions...

... it's also research work!

Not to mention that science communication sometimes oversimplifies the issues and messages.

We need to find a way to convey essential knowledge without distorting it, and to widely disseminate the results so that we can take action and bring about change.

I see.

There's still work to be done.

Ultimately, in addition to being a testing ground...

... this project also serves as a space for discussion and awareness-raising to help our society address the climate crisis.

A vibrant public space, designed by and for those who use it...

...interacting with all layers of the biosphere, which sustain and protect one another.

Imagine if this could be the future in our cities?





CARDIMED (Climate Adaptation and Resilience Demonstrated in the Mediterranean Region) is a European project aimed at strengthening the resilience of Mediterranean ecosystems through Nature-Based Solutions (NBS): nature-inspired actions designed to address environmental challenges, particularly those related to climate change.

IN MARSEILLE, the project is testing practical solutions for unsealing and revegetation at two campuses (Saint-Charles and Saint-Jérôme) of the Faculty of Sciences at Aix-Marseille University (AMU). Researchers working in a wide variety of fields—including air, soil, and water quality; ecology; social psychology; health; communication; and land use planning—explain how their work helps restore soil health, improve biodiversity and user well-being, and raise public awareness of the benefits of these solutions.

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Scan the QR code!

Read the comic online, check out this project details, and much more!

Organisations :

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CARDIMED

amU Aix Marseille Université

SEMIDE EMWIS

RÉGION SUD PROVENCE ALPES CÔTE D'AZUR

DE L'AMPLEUR POUR LE VIVANT

Laboratoires :

cerege

Laboratoire Chimie Environnement

IUSTI

imsic UTLN - AMU INSTITUT MÉDITERRANÉEN DES SCIENCES DE L'INFORMATION ET DE LA COMMUNICATION

imbe Institut méditerranéen de biodiversité et d'écologie - marine et continentale -

LPED Laboratoire Population Environnement Développement UMR 151 AMU-IRD

IRBA

LPS

VetAgro Sup