

## Preserving Nature to Protect Human Health



## Public policies to reconnect humans with nature

The link between the environment and health manifests in multiple ways. In recent years there has been a focus on zoonotic diseases and the impact of forest clearing on outbreaks of zoonoses<sup>1</sup> transmitted by wild animals, yet this is far from the beginning and end of this story. The positive impact of nature on humans must seem obvious to the vast numbers of people on the planet who encounter it on a daily basis. However, growing urbanisation around the world has gradually meant that others are cut off from this reality, to the point that we need to call science into service to put this issue back at the centre of public policy.

Urban green spaces are important for supporting both biodiversity and human health, a clear indicator that this subject falls within the concept of “One Health”. Nature in urban areas must allow biodiversity to flourish and provide animals with corridors so they can move between the natural areas on the outskirts of cities. Nature helps combat the effects of climate change by cooling down heat islands. Unsealing urban soils and encouraging their renaturing boosts the natural process of water infiltration to avoid flooding. Finally, our inner voice tells us and science shows us that nature in urban areas is also good for physical and mental health. Humans are not made to live without the presence of nature.

This may explain why, out of the 23 targets of the Kunming-Montréal Global Biodiversity Framework of December 2022, the first to be unanimously adopted was precisely the one that aims to: *“Significantly increase the area and quality, and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature, and contributing to inclusive and sustainable urbanization and to the provision of ecosystem functions and services”*.

In December 2023, France published its National Biodiversity Strategy, which adapts this framework to a national level. Measure 21 aims to *“Bring nature back into cities to help with adaptation to the impacts of climate change and improve the well-being of residents”*. It sets out the funding available for urban renaturing projects, giving priority to the most deprived neighbourhoods. In a situation where budgets are limited, the studies conducted by Santé publique France contribute to a better understanding of the multiple health benefits provided by nature. If these benefits can be translated into economic terms, as with a preventive measure, we can hope that they will be given fair consideration when assessing the costs associated with urban greening projects.

Sylvie Lemmet, Ambassador for the Environment,  
Chair of the Board of Directors of Santé publique France.

1. Infectious diseases that pass from animals to humans.



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# SPECIAL ISSUE

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**T**hroughout the industrial era, also known as the Anthropocene, nature has played a key part in the modernisation of Western societies. It has provided humans with the resources vital for development such as water, arable land, minerals and fossil fuels. In this respect, many of our modern comforts are derived from nature. However, mankind has focused on creating artificial and inorganic living environments, becoming ever more distant from nature, our original cradle.

Scientific data based on observations of the environment and biodiversity are unanimous: this development model has caused lasting damage to nature. The exploitation of natural resources combined with the creation of artificial urban and agricultural spaces and standardised food production models have caused transformations on a global scale: climate change, biodiversity collapse, a deterioration in the quality of natural resources and widespread contamination by synthetic chemical pollutants. These disruptions have proven consequences, not only on land and aquatic ecosystems, but also on the physical and mental health and well-being of human populations – particularly the most vulnerable and socially disadvantaged.

But instead of dwelling on the gloomy picture painted by these issues, they should be viewed as drivers for collective action towards restoring, strengthening and preserving the links between humans and nature. This kind of collective action is key to preserving and improving our health and ensuring that future generations enjoy a healthy environment. To achieve this, we need to give priority

to methods of development that also deliver co-benefits for health and biodiversity.

This issue of *La Santé en action* uses solid scientific knowledge to place this major public health and environmental challenge at the top of the agenda. The different articles illustrate the complex relationship between health and nature using a wealth of scientific data put forward by international bodies such as the World Health Organization (WHO) and international platforms of experts such as the Intergovernmental Panel on Climate Change (IPCC) or the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). These data document the impacts of human activity on the environment, including accelerated climate change and biodiversity loss, as well as the repercussions of this decline in biodiversity on human health. While risks such as the emergence of zoonotic or vector-borne infectious diseases have been clearly identified, other consequences relating to premature mortality and physical or mental health are illustrated here by several authors. Mental health is a particular concern and while the incidence of eco-anxiety has yet to be documented in the general population, research has led to a clear scientific consensus: access to nature improves mental health. Access to nature also offers benefits in terms of cardiovascular health, immunity and the emotional and social development of children.

This issue also showcases the work of diverse professionals (doctors, perinatal care providers, teachers, ecologists and local authorities) who target different populations on different continents. The interviews illustrate the abundance of initiatives that are helping to bring people and nature closer together. They highlight the key factors for success and the levers for individual or systemic change. On an individual level, this

can mean getting involved in biodiversity observation programmes or benefiting from nature prescribing, as offered to people in Quebec. On a systemic scale, there is one effective lever: the development of public policies spanning different sectors that promote the introduction of and access to nature in the city. This further depends on such policies minimising any potentially negative effects, including the introduction of invasive species or the gentrification of urban areas. The authors also emphasise the importance of evaluating these kinds of interventions, which remain scarce at present, so that they can be scaled up and deliver long-term protection of health and nature. This is crucial for meeting the challenges of global change. ■



# The diversity of concepts that lie behind the word “nature”

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Will the concept of “*harmony with nature* [1]” guide us towards better health for humans? The idea has been gaining ground in recent years. The World Health Organization (WHO) calls on countries to preserve nature, the source of human health [2], highlighting that “*peace with nature*” is a pillar of well-being [3] (see figure 1). Meanwhile, the European Union is funding scientific projects that aim to “*develop a common framework to improve recognition of and promote contact with nature* [4]”.

So what is nature? This widely used term can have very different meanings, be they static or dynamic, including or excluding humans [5]. For example, WHO defines nature as “*the entirety of the physical and biological world not made by humans* [6]”, although it may be influenced by

humans. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) points out that the role of humans in this description varies according to different systems of thought. For example, in the context of Western science, nature encompasses biodiversity, ecosystems, the biosphere and evolution; this definition emphasises the notion of “*ecosystem services*”, namely, the goods and services that nature provides to human societies and that are necessary for it to function [7]. In the context of other knowledge systems, the definition of nature may carry a more spiritual meaning associated with an entity such as Mother Earth (planet Earth as the entity that sustains all living beings) and include an explicit recognition of an interdependent relationship between humans and nature [7].

## In France, 114 indicators measure biodiversity

Western scientists prefer to use the term “biodiversity”, which they consider more precise and quantifiable than “nature”. Biodiversity describes the diversity and variability of living organisms (plants, animals, fungi, microbes) and ecosystems, which are communities of living beings interacting with non-living elements in their environment. This diversity and variability span a range of notions such as species diversity, genetic diversity within a species, behavioural diversity, distribution of species within ecosystems and ecosystem functioning [7]. Unlike nature, biodiversity can be measured using various quantitative and qualitative indicators applied to the different notions described above. To understand the scale of the task,

## KEY POINTS

■ **What is nature? Although widely used in everyday language, this term covers a more complex set of meanings than it would seem, with differing interpretations depending on the cultural system of thought. Western scientists prefer to talk about the more precise and quantifiable concept of biodiversity. A growing body of research is attempting to shed light on the links between nature and human health.**

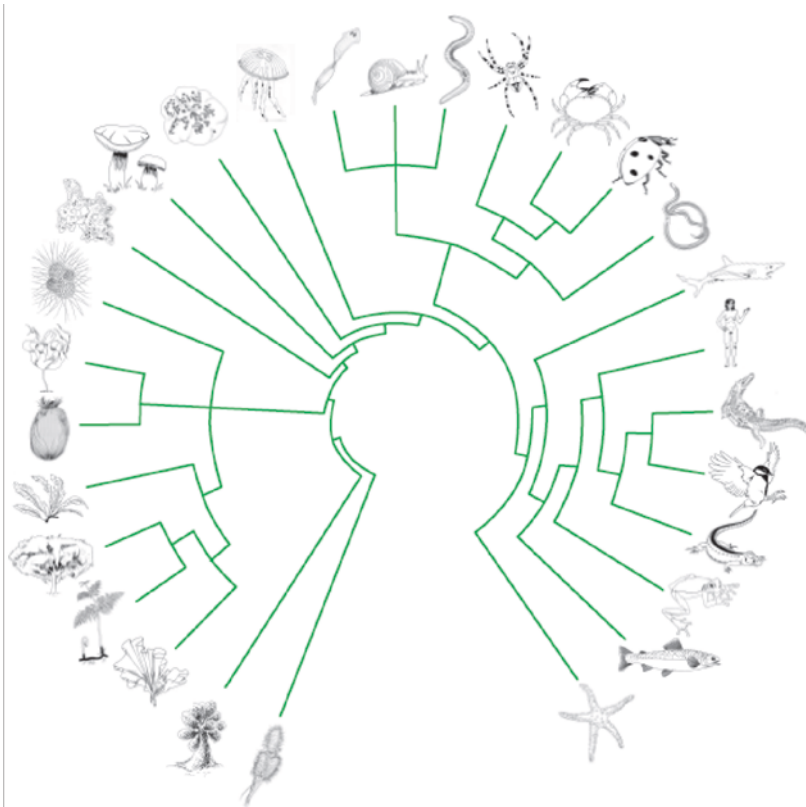
we can start with the following numbers: around two million different species are known on Earth, but the Muséum national d’Histoire naturelle (the French Natural History Museum) estimates there may in fact be between eight and twenty million. Figure 2 illustrates the richness and diversity of living organisms that have resulted from a shared evolutionary history. In mainland France, there are around 6,000 species of vascular plants (with stems, leaves and roots) and 3,000 non-vascular plants, nearly 40,000 species of invertebrates and 1,500 species of vertebrates. Biodiversity in the French overseas territories is both exceptionally rich and unique. The overseas territories together host more species in all groups than mainland France. There are 35 times as many plants, three times as many molluscs and 70 times as many endemic birds<sup>1</sup> in the overseas territories than in mainland France. While mainland France counts no endemic mammals or reptiles, the overseas territories are home to around 100 such mammal species and ten reptile species [8].



**Figure 1** – World Health Organization campaign on social media, 2023.



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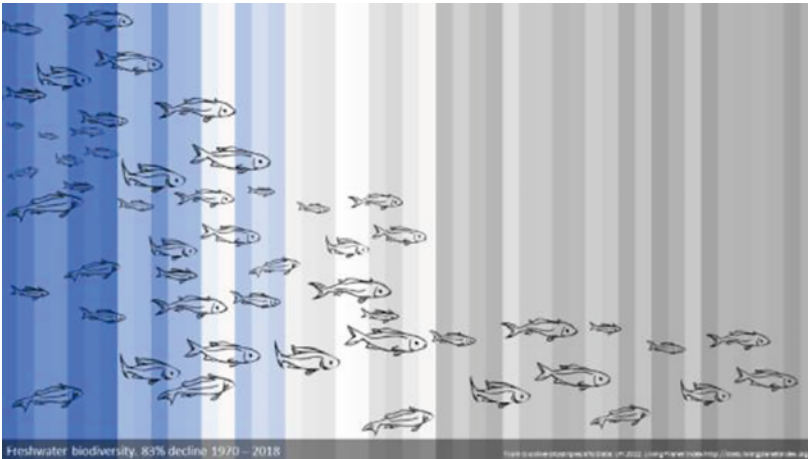
**Figure 2** – The tree of life represents the main groups of living organisms: each branch of the tree represents a group of living organisms and each node of the tree represents an ancestor common to these groups. © G. Lecointre, J.-F. Desjournet, MNHN.

The French Office for Biodiversity (OFB) monitors 114 indicators to define the state of biodiversity in France and how it is changing, providing information not only on particular species (e.g. the disappearance of butterflies in certain departments of mainland France), but also on environmental pollution (e.g. changes in the physical and chemical pollution of waterways) or behaviour (e.g. the changing use of plant protection products in agriculture) [9].

### **A considerable potential impact on health**

*"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [10]", according to WHO. Bringing together nature and health implies finding a common ground between two very broad terms, both of which are highly dependent on the cultural and social context. Given the dimensions of biodiversity, the potential number of influences it could have on human health are considerable. Currently, published works on "nature*





**Figure 3** – Decrease in biodiversity in freshwater rivers between 1970 and 2018. Online: biodiversitystrips.info (Living Planet Index database, 2022, [www.livingplanetindex.org](http://www.livingplanetindex.org) [22]).

and health” or “biodiversity and health” can be classified into three main categories:

*The study of spaces considered as “natural” in which biodiversity is broadly overlooked*

These are usually outdoor spaces in urban areas, where there is vegetation or water. For example, the literature review *Nature and Health* by Hartig *et al.* actually concentrates on “nature as represented by aspects of the physical environment relevant to planning, design, and policy measures that serve broad segments of urbanised societies [11]” Another literature review by Nejade *et al.* considered studies targeting “engagement with natural outdoor environments [12]”. Such spaces may in fact be entirely human-made (urban green spaces, gardens, etc.).

*The study of interactions, whether intentional or not, reciprocal or not, between human populations and one or more non-human, wild or domestic species*

When these studies view an interaction as a risk, they often cite particular species: for example, the *Aedes albopictus* mosquito is designated as the vector of the chikungunya virus. When an interaction is perceived as beneficial, studies tend to refer to unspecified generic groups: planting “trees” in Philadelphia would reduce

mortality [13] or “pets [14]” could reduce loneliness among elderly people in care homes.

*Studies of the “ecosystem services” that are fundamental to health*

This approach takes into account the way in which ecosystems, on the one hand, contribute to operating the “Earth system” (e.g. the major biogeochemical cycles, such as water or carbon cycles), and on the other hand, provide raw materials useful to

human societies (food or intangible resources that feed the human imagination) [6; 15]. These contributions are considered to be free services provided by nature to humans. Today, the main services taken into account are supply and production services, regulation services and cultural services: for example, a forest will supply wood, regulate the local climate and store carbon dioxide (CO<sub>2</sub>), provide a place for walkers and be a source of inspiration for artists.

**How should we view interdependencies?**

The scientific community still has a great deal of work to do to define, conceptualise and study the links between nature, biodiversity and health. Two propositions for conceptual approaches are “One Health” and “Planetary Health”.

● **One health** is a concept that emerged at the turn of the 21st century. The One Health High-Level Expert Panel (OHHLEP), founded in 2021, defines it as an “integrated and unifying approach that aims to sustainably balance and optimise the health of people, animals and ecosystems. It recognises that the health of humans, domestic and wild animals, plants and ecosystems are closely linked and interdependent [16].” It should be noted



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that in France the 4<sup>th</sup> National Environmental Health Plan (PNSE) adopts a different terminology and definition, stating that the “*concept of One Health [...] constitutes the basis of health ecology and a field of research concerned with the interdependencies between ecosystem functions, socio-cultural practices and the health of human, animal and plant populations taken together*” [17].

● **Planetary Health**, a concept introduced by the NGO Friends of the Earth in the 1980s and taken up by the scientific journal *The Lancet* in 2015, is a call for interdisciplinary work recognising the interdependence between humans and the planet, which seeks solutions for living in good health while respecting the limits of our planet [18]. It is largely based on the *Ottawa Charter for Health Promotion* [19], considered a founding text of Planetary Health [18].

To our knowledge, there is no official definition of nature associated with One Health and Planetary Health. However, in practice, One Health seems to be more concerned with quantitative measures of biodiversity. Planetary Health is moving towards a more holistic definition of nature, recognising the value of indigenous knowledge (viewing interdependencies through a different prism to that of modern Western science) and giving an important place to psychological and social implications. For the time being, the two have differing scopes, with One Health placing greater focus on zoonotic diseases<sup>2</sup>, while Planetary Health looks at the environmental and social determinants of health [20].

Reflecting on the meaning of these words, their link with health, their contradictions and the implicit values

that underpin them, means thinking more broadly about our way of living in relation to the other species that inhabit the Earth. At a time when these species are disappearing rapidly (see figure 3) and the climate crisis is spiralling out of control, we must be wary of letting words disembodiment reality. “*Man has reached the point on this planet where he is looking for all the friendship he can find. In his solitude, he needs all the elephants, all the dogs, all the birds*” [21]. ■

1. Natural species present only in a defined geographical area.

2. Infectious diseases transmitted from animals to humans. (Editor's note.)

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# Why is nature vital to us?

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Scientists today are making two incompatible observations: firstly, that nature – with its geological, biological and ecological components – is essential for the survival and evolution of all living beings on Earth, including humans; secondly, that humans, through technological innovations and social organisation, are disrupting the functioning of natural systems to an alarming extent. It is therefore important to recognise the close links and interdependencies between human health and the health of domestic and wild animals, plants and the environment in general (including ecosystems), which is the rationale behind the “One Health” concept [1]. This vast subject demands that multiple sectors, scientific disciplines and communities work together to overcome the threats to health and to ecosystems<sup>1</sup>. While non-exhaustive, this article aims to shed light on the interconnections between nature, biodiversity and health. Understanding these interconnections is something of a prerequisite for committing to the One Health approach (see article The diversity of concepts that lie behind the word “nature” in this issue).

The ways in which nature and biodiversity contribute to human health are best understood through the anthropocentric prism<sup>2</sup> of “ecosystem services”. These fall into four categories:

- Provision of resources (e.g. food, materials)

- Regulation of ecosystems, to ensure they function properly (e.g. climate, pollination)
- Social and cultural services, which are the non-material benefits of biodiversity in the relationship between humans and nature (e.g. recreation, inspiration)
- Support for all the other services (e.g. soil formation, water cycle)

Ecosystem services are based on the structures, processes and functions of the biosphere<sup>3</sup>, which can be represented using a cascade model (see figure 1) to conceptualise the causal pathways by which nature, biodiversity and ecosystems provide services and benefits to human societies, including health and well-being [2].

The notion of ecosystem services reflects a utilitarian view of nature: an ecosystem service is not a fundamental property of the ecosystem itself, but something useful to human beings. However, beyond this instrumental value given to nature and biodiversity, there is also intrinsic value.

## A web of interconnections

It is clear that nature is essential for all of our planet's ecosystems to flourish. High biodiversity increases the stability of the biosphere

## KEY POINTS

■ **Nature is a vital environment for human societies. Water, air, food production and therapeutic resources are key to population survival and human well-being largely depends on the quality of natural environments. Yet the depletion of biodiversity jeopardises this balance, directly threatening the health of humans and other living beings.**

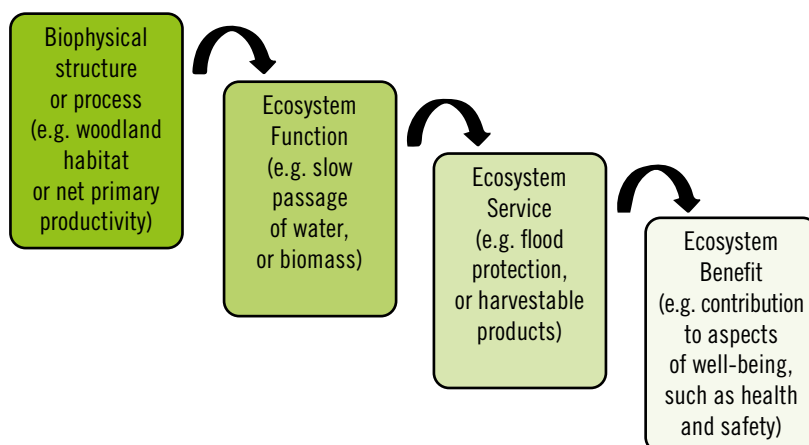
and its ability to adapt to changes in environmental conditions. The biosphere supports the livelihood and well-being of the human race. However, the degradation of nature and the loss of biodiversity can threaten biosphere health, both directly (zoonoses<sup>4</sup>, pollution) and indirectly (effects of climate change). The main links between nature, biodiversity, ecosystems and human subsistence, health and well-being [3] (see figure 2) are presented below.

## Fresh water

Freshwater systems are the source of all life on earth. Biodiversity contributes to freshwater systems



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**Figure 1** – Simplified diagram of the cascade model of ecosystem structures, functions and services that benefit human societies (adapted from M. B. Potschin, R. H. Haines-Young [2]).

functioning smoothly by maintaining and regulating the flow of surface water, helping to purify water and contributing to the atmospheric cycle of water, reducing extreme weather phenomena and soil erosion through the sedimentation of waterways. Inversely, the availability

of good quality fresh water supports biodiversity, which in turn supports other ecosystem services.

Healthy ecosystems reduce exposure to water-related health risks. Biologically diverse ecosystems such as wetlands contribute to water quality. They also protect people from chemical and biological hazards as filtration and sedimentation processes remove pollutants and excess nutrients [4].

#### *Air quality*

Nature, ecosystems and their level of biodiversity play a key role in regulating air quality for all living beings. Through biosynthesis<sup>5</sup>, trees and forests produce oxygen and store carbon dioxide, cleaning up the atmospheric environment both locally and more widely. In urban environments, vegetation can capture some of the particulate and gaseous pollutants





(e.g. fine particles and nitrogen oxide (NO<sub>x</sub>) emitted by combustion engine vehicles), improving air quality in certain configurations and proportions [5].

Reducing sources of air pollution must be a priority [6]. This is because poor air quality due to environmental factors is a cause of premature death around the world [7], with considerable economic repercussions (increased medical costs, lower productivity due to poor health of workers). It damages crops, forests, soils, lakes and rivers [8], threatening biodiversity.

### *Coasts, seas and oceans*

The oceans cover 71% of the planet's surface and make up 95% of the space available for life. Seas and coastal environments provide many ecosystem services, the productivity, stability and resilience of which depend on biodiversity [9]. On a global scale, aquatic ecosystems have an impact on climate mechanisms, with the circulation of ocean currents helping to regulate extreme events. They also store 16 times more carbon than the terrestrial biosphere. Yet the acidification and warming of oceans are affecting this balance.

The services provided to humans by these ecosystems include first and foremost food production: in 2022, 20.7 kg of fish were consumed on average per person worldwide, 51% of which came from aquaculture. In terms of marine stocks fished, 62.3% (2.3% less than in 2019) were fished within biologically sustainable levels [10]. In addition, access to high quality blue spaces (such as unpolluted beaches), marine biotechnologies<sup>6</sup> and the pharmaceutical potential of the seas [11] provide other physical and mental health benefits.

### *Soil, agriculture, nutrition and food security*

Fertile soil is a prerequisite for vegetation to grow, and this is imperative for natural environments and for food production. With populations and human activities being concentrated in small areas, combined with changes in climate and land use, there have been irreversible losses of biodiversity through deforestation,



**Figure 2** – Main links between nature and human well-being (adapted from The Global Health Observatory, WHO [3]).

surface sealing in urban areas, soil erosion, contamination, acidification, salinisation, etc. Soil degradation, caused by loss of land to urban construction and intensive agriculture, means lower quality soils and fewer nutrients available to plants [12], which in turn leads to higher use of chemical *inputs*<sup>7</sup>. Another consequence is that the increase in surface water run-off affects aquatic ecosystems, in particular by dispersing pollutants as far as the ocean – the final spillway. The decline in genetic biodiversity resulting from intensive farming also poses a risk for food and the economy (e.g. the depletion of *Penicillium camemberti*, a microorganism used in the manufacture of Camembert cheese).

Healthy food must be accessible and affordable for all in order to maintain good health. This is because a diet lacking balance, whether in terms of food quality or consumption behaviours, is one of the main risk factors for non-communicable diseases such as cardiovascular disease, metabolic diseases (obesity, diabetes), ischaemic strokes, and

so on. Furthermore, food waste in rich countries – estimated at 20% in France according to the French Agency for Ecological Transition (ADEME) – puts unnecessary pressure on agriculture and on soils that are already overstretched.

### *Infectious diseases*

The links between biodiversity and infectious diseases are complex [13]. They can be caused by exposure to pathogenic organisms such as bacteria, viruses, fungi and parasites. Zoonoses are infectious diseases transmitted by vertebrate animals to humans. Infectious diseases fall into three categories:

- Direct transmission: the host, a sick animal or human or an asymptomatic carrier, transmits a pathogen directly to a human through close contact (HIV, Ebola, avian flu, Mpox, etc.);
- Indirect transmission by vectors<sup>8</sup>: a vector (mosquito, tick) transmits a pathogen, from an animal or a human who may or may not be sick, to a human (dengue fever, Lyme disease, Crimean-Congo haemorrhagic fever, malaria, etc.);

● Indirect transmission via environmental contact (water, soil): examples include aspergillosis<sup>9</sup> and tetanus. They may also be transmitted due to temporary contamination of the environment: drinking water contaminated by the cholera bacterium, vegetable gardens contaminated by echinococcus eggs<sup>10</sup>, water and mud contaminated by the leptospirosis bacterium<sup>11</sup>, and so on.

Biodiversity collapse can lead to an increased risk of infectious diseases. The reduced diversity of host animal species increases the risk of transmission to humans. Furthermore, when humans encroach on ecosystems, they increase their exposure to zoonoses and the risk of new zoonoses (*see article Human health suffers from a simplistic view of biodiversity in this issue*). The degradation of ecosystems is giving way to invasive species, reservoirs or vectors, which are sources of infectious disease outbreaks.

A high level of biodiversity tends to regulate epidemics but it can also entail a risk of infectious diseases, either by encouraging pathogen reservoirs to develop, or through direct or indirect contact with humans. Consequently, sensitive environments require management strategies in order to promote biodiversity conservation and simultaneously reduce the risk of infectious diseases [14].

### *Microbes in the environment and in the human body*

Microorganisms include bacteria, viruses, fungi, archaea<sup>12</sup> and protists<sup>13</sup> (such as algae and protozoa<sup>14</sup>). In humans and in natural environments, microbes form complex communities made up of thousands of individuals belonging to multiple species. Although invisible to the naked eye, microbes are an important component of global biodiversity and play a fundamental role in the functioning of all ecosystems [15], including those in the human body. Disruptions to microbial populations can have lasting repercussions on ecosystem services and human health [16].

Ecosystems that support and promote health include diverse microbial communities. Those in the human microbiome<sup>15</sup> inhabit the gastrointestinal, urogenital and respiratory

tracts, as well as the skin, and are an extremely important determining factor in various aspects of physical and mental well-being. A high level of biodiversity in the microbiome contributes to the correct operation of various functions (metabolic, immunological, etc.).

Environmental and human microbiomes interact. Different environmental exposures can introduce factors that promote or suppress the growth of certain microbes. A lack of diversity in the human microbiome is associated with various non-communicable pathologies such as obesity, diabetes, asthma, allergies and certain autoimmune diseases, which are observed in urban environments [17]. There is also growing interest in the interaction between the microbiome and psychiatric disorders [18].

### *Medicine and healthcare*

Biodiversity provides pharmaceutical and cosmetic active ingredients. Plants, animals and certain ecosystems are used in traditional medicine, the beneficial functions of which have yet to be fully explored [11; 19]. Around a third of modern pharmaceuticals are derived from compounds found in the natural world, and many other medicines are designed to mimic natural products. Penicillin, aspirin and quinine are well-known examples. Thanks to these medicines derived from nature, many previously fatal diseases can now be treated. The discovery of new compounds derived from the biodiversity of natural ecosystems will also play an important role in future healthcare [19].

### *Access to nature*

Being out in nature and interacting with quality green and blue spaces is good for physical health and mental well-being. Greater exposure to green spaces is associated with indicators of good health (lower cortisol<sup>16</sup> and blood pressure) and better self-reported health [20]. Spending time in nature is also associated with a lower risk of health problems and a reduced risk of death from all causes [21]. These benefits stem from the availability of safe spaces for physical

activity, enjoying food, relaxing and socialising with friends and family. In dense and artificial urban environments, access to natural spaces is key to a better quality of life, health and well-being for humans. However, this access to nature must not compromise the ecosystems and all the communities that live there.

### **Key messages that call for action**

Nature provides the basic conditions for the survival and health of all organisms, including humans. It is essential for regulating the water cycle, maintaining air quality and enabling soil formation and food production, both on land and in the oceans. It is a resource with potential therapeutic properties awaiting discovery. The natural environment is a setting conducive to a healthy lifestyle.

Although nature can present health risks, it is not a hostile world that is set apart, but a living environment that is indispensable to humans. A healthy, functional and resilient natural environment plays a role in mitigating extreme events and the effects of natural disasters, limiting exposure to pathogens and protecting health.

The pressures exerted on natural environments threaten the health of humans and other living organisms. Climate change, overexploitation of soils, depletion of resources and biodiversity loss mean an increase in extreme events, the threat of ecological collapse and impacts on food systems as well as access to drinking water. Environmental degradation also leads to conflict and population displacement, with health consequences for the people concerned.

Measures to protect nature – and therefore human health – are becoming a vital necessity. Strengthening “environmental resilience” and ensuring diverse and functional ecosystems will help to mitigate long-term health effects. To achieve this, all sectors need to take the following action: consider and communicate the links between nature, biodiversity and health; prepare long-term strategies for sustainable management of the natural environment;



integrate nature, environment and health considerations into all policies, both national and local, taking a One Health approach; seek nature-based solutions to societal, economic, environmental and climate challenges; compile and use environmental data; share information on best practices. ■

1. A community of living beings, animals and plants, and the environment in which they live. (Editor's note.)
2. A view that sees humans as the centre of the universe. (Editor's note.)
3. The zone of the Earth where the conditions for life are found. (Editor's note.)
4. Infectious diseases passed from animals to humans. (Editor's note.)

5. The production of organic molecules by living organisms. (Editor's note.)
6. All technologies that use organisms to produce or transform substances on an industrial scale. (Editor's note.)
7. In the agricultural sector, the term "inputs" most often refers to fertilisers and pesticides. (Editor's note.)
8. See Santé publique France's "Vector-borne diseases" dossier. Online: <https://www.santepublique-france.fr/maladies-et-traumatismes/maladies-a-transmission-vectorielle>.
9. Disease affecting humans and various animal species caused by certain aspergilli, which are ascomycete fungi that are widespread in nature. Most species are moulds. (Editor's note.)
10. Larval forms of certain tapeworms that cause echinococcosis. (Editor's note.)
11. Infection caused by a spirochete – bacterium in the form of a long spiral filament – which is carried by certain animals, such as rats. (Editor's note.)
12. Prokaryotic microorganisms, morphologically similar to bacteria, but with unique molecular,

metabolic and membrane characteristics. (Editor's note.)

13. Single-celled eukaryotes: organisms whose chromosomes are enclosed in a nucleus separated from the cytoplasm by a membrane. (Editor's note.)
14. Single-celled organisms. (Editor's note.)
15. A collection of microorganisms living together in an environment.
16. One of the most important hormones of the adrenal cortex, transformed by the body into cortisone in response to an enzyme. (Editor's note.)

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## "Our connection with the Earth is fundamental"

### Interview with Kellyann Tekarihwenhá:wi Meloche

Mohawk of the Iroquois Nation (Bear Clan),  
Specialist in emergency management,  
**George Diamond**,  
Cree Elder, Waskaganish First Nation,  
Health promoter (honorary)  
for the Cree Health Board  
and James Bay social services.

### KEY POINTS

► *Miyupimaatiiiun* means "living well" in the Cree language<sup>1</sup>. For the Indigenous communities of Canada, whose elders have lived in harmony with their ecosystems for hundreds of years, Mother Earth is fundamental to this concept of well-being. Nature is viewed as a nurturing mother: it is a part of humans just as humans, animals and plants are a part of nature.

### *La Santé en action: How does your First Nation view health and well-being?*

*Kellyann Tekarihwenhá:wi Meloche:* From our point of view, the concept of health and well-being calls for a holistic approach. The medicine wheel is central to our teachings: it refers to the physical, psychological, emotional and spiritual balance that we carry in our hearts. It's about our relationships, about our spirit thriving and being anchored in the right place, without negativity or resentment.

*George Diamond:* We learn from a very young age to be environmentally aware and to follow in the footsteps

of people who set a good example in our communities. When I was a child, we had to share, we had to look after each other. *Miyupimaatiiiun* means "living well" in the Cree language. The Earth is part of our well-being. We learn at an early age that we are what we eat and drink, and if the Earth isn't healthy, then neither are we.

*K.M.:* Nature provides us with what we need in all circumstances. Mother Earth nourishes us if we know how to listen. On the land, we feel anchored and that reminds us that we are part of Mother Earth. An individual cannot be whole without this connection. It is essential to the spiritual dimension of the human being. Through teachings, we learn how to live from the Earth. Now, this brings me to a very difficult subject. When Christianity arrived in our communities, it became forbidden to speak our language or practise our traditions. Several generations were sent to residential schools. We were brutally separated from our connection with the Earth and our way of being. Some of the younger generations are now torn because, on the one hand, shame of their culture was violently instilled in their elders yet, on the other hand, their inner fire is telling them: "*You are Indigenous, this is your way of being, these are your teachings and practices*". They see, for example, Latin Americans who are connected to their culture of origin, so they ask themselves: Why not me? Why am I not connected to my teachings, my culture, my history, my language? This disconnection has serious consequences for the health of our people. Health and well-being are first and foremost a question of our connection with the Earth.

### *S.A.: How can your peoples' wisdom about the Earth inspire Europeans?*

*G.D.:* We never harvest too much. We only take what we need. When we have more than we need, we give it to others.

*K.M.:* This means that we always leave enough plants, because we want them to be there when we return. This applies to all crops: medicines, berries, food, everything. We always ask permission from the plants or animals before harvesting and we make an offering, such as tobacco, as a token of reciprocity. Picking berries, for example, keeps your feet on the ground. It allows you to take time with the Earth, teaches patience and then rewards you with abundance for taking this time.

*G.D.:* Our connection with the Earth is both fundamental and soothing. It's a type of therapy. If someone is going through a difficult period, it can help to spend some time alone in nature to heal. These lands have helped the survivors of the indigenous residential school system to find a measure of peace despite the horror it caused in our communities. At one point in my community of Waskaganish, we had a lot of problems with young people, with alcohol consumption and that sort of thing. After one particularly violent weekend, we decided to get some elders together. They told us that young people had lost touch with the Earth. They weren't well rooted. So we decided to launch a programme of healing through the Earth, taking the children with us. It was a great success and we called it *Aashumii*<sup>2</sup>, which means "Pass it to me". Knowing how to take care of yourself on the land gives you a sense of security.

**K.M.:** Knowledge about the healing properties of plants is passed down from generation to generation. It's important to take young people onto the land to share this knowledge.

**G.D.:** When I look at young people, I see that this connection with the Earth is not as strong as it should be. That's why they really benefit from Earth healing programmes. They need to reconnect with their camp<sup>3</sup>, their loved ones who are there and their family, which is what the Earth means: all the good things that are there for you.

**K.M.:** If our camps are not swept away by a disaster, they are passed down through the generations. So when we go back, we reconnect with the time we spent with our elders.

#### **S.A.: What can we do if Mother Earth is sick?**

**K.M.:** Yes... What do we do if Mother Earth is sick? Because she looks after us, we must look after her too. We are abusing our resources and what Mother Earth gives us: that's what's making her sick. Look at all we receive from Mother Earth! We have to give back.

**G.D.:** What we teach young people is quite different from what mainstream society says. We don't encourage recycling. Instead we reuse everything we can. An abandoned object can still have a use. There are

also a number of development projects in our region, including mining and hydroelectric dams. They may be necessary, but they destroy the environment and leave the Earth sick. They do not take into account the seventh generation principle, which is dear to our tradition<sup>4</sup>.

#### **S.A.: Could public health networks incorporate these approaches into their practice?**

**K.M.:** We need to enable people to learn about their environment and the natural solutions to the problems of our time; we must not limit ourselves to scientific research, but also incorporate our generational knowledge. Public health has a very strong voice in modern medicine. This voice should be used to call for generational lessons to be incorporated. Knowledge is linked to geography and the land. However, one of our elders said that he didn't want to talk to Western medicine users about our traditional medicine, because it would be inappropriate and its resources would be over-exploited. We ask permission to harvest our medicines. We come with a good spirit and we're not looking for profit. In the hands of others, without this relationship to Mother Earth, our traditional medicine might not work.

**G.D.:** Even traditional food is medicine for us. An elder once said: *"The food of the Cree people nourishes not only the body, but also the spirit"*. It takes a lot of energy to harvest traditional foods. For example, when you lay a fishing net, you need to collect floats. Then you have to collect rocks for the weights, and paddle off to set up your net. Later, you check it and collect all the fish. Next, you come back and have to clean them, prepare them, smoke them, dry them and cook them. Finally, you eat them. So you've used up all that energy to be able to eat your traditional meal.

**K.M.:** And we usually do it as a family, don't we? We go out together and work together.

**G.D.:** In the old days, we cooked food over an open fire<sup>5</sup>. So we had to collect our firewood. It was all connected. When we cook our traditional food over an open fire, we usually take a piece of meat that is cooking

and make an offering to the fire. It's a practice that has been handed down to us. Sometimes we acknowledge our deceased loved ones, particularly those who have had a positive influence on us.

#### **S.A.: What final lesson would you share with our readers?**

**G.D.:** Certain words are important to us. We are proud to speak our languages.

**K.M.:** *Konnikhonrf:io* means "to have a good spirit". Every time we do something or attend a meeting, we start with this simple phrase. If you don't start with that word, then everything is skewed. When we go to get medicine or prepare food, we have to do it with a good spirit; otherwise you're putting negativity into the food you're ingesting. In our language, we also say *Nia:wèn ko:wá*, which expresses gratitude: we start with people, then we go to Mother Earth, the waters, the greenery, the trees. We go from the ground to the Creator.

**G.D.:** Yes, we really show our gratitude. And I would like to thank the readers of *La Santé en action* for taking the time to learn from our teachings: *Chiniskumitinaw*. ■

**Interview by Marie-Jo Ouimet, public health specialist doctor, Quebec National Institute of Public Health (INSPQ).**

1. The Cree language is spoken in many parts of Canada, from the Rockies in the west to Labrador in the east. (Editor's note.)

2. Programme details: <http://www.nationnews-archives.ca/article/aashuumiih-2006/>

3. Traditional dwelling on the land. (Editor's note.)

4. Principle which consists of taking into account the long-term repercussions of decisions taken today for descendants seven generations away. (Editor's note.) Online: <https://theseventhgeneration.org/blog-the-seventh-generation-principle/>

5. Fire inside a tipi, not in a fireplace or stove. (Editor's note.)

## THE FIRST NATIONS IN CANADA

Along with the Inuit and Métis, the First Nations are the Indigenous peoples of Canada. More than one million people across the country identify as Indigenous, of whom 64% are First Nations. These people represent 50 nations or language groups and 630 communities. The majority (54%) of First Nations people live in urban areas rather than on reserves. Online: <https://www150.statcan.gc.ca/n1/daily-quotidien/220921/dq220921a-eng.htm>



# Human health suffers from a simplistic view of biodiversity

**Philippe Grandcolas,**

Research Professor at the French National Centre for Scientific Research (CNRS), Deputy Director of CNRS Ecology and Environment,

**Gudrun Bornette,**

Research Professor at the CNRS, Scientific Delegate for Health Ecology, CNRS Ecology and Environment.

## KEY POINTS

► In contemporary societies, the living world is sometimes seen as a source of direct aggression: this animal is venomous or harmful, that plant is allergenic. It is vital to deconstruct stereotypes about biodiversity, to understand how it functions and interacts in order to correct the damage of human activity on ecosystems, which are sources of numerous pathologies. As there is no simple solution for engineering daily life alongside plant and animal species, we must look at how to optimise the co-benefits.

Our Western societies often imagine nature as a wilderness that would not be a good place to live. On the flipside of this concept is the idea of a domesticated nature, presumed tamed and under control, with our cultivated plants and farm animals. In this somewhat dualistic vision, the first is the source of many ills, while the second enables us to live in good health. Our cultural perceptions of biodiversity dwell on stereotypes of nature as a wilderness distanced from humans, yet we are actually stakeholders in ordinary biodiversity [1].

This cultural perception has also been reinforced by the scientific community. In the 20<sup>th</sup> century, the development of the life sciences and

modern medicine meant that research focused on what a few model organisms had in common with humans, mainly in the laboratory. Organisms such as drosophila, zebrafish and mice have become biological models, or even analogues of humans, uprooted from the natural environment in which they previously lived.

The result has been extraordinary advances in knowledge but also, at times, something of a divorce from the problems of nature. As a result, the wildness (in the sense of “non-domesticated”) and the extraordinary diversity of the living world have been erased or given negative connotations in popular representations, except in terms of distant and exotic species (tropical forests, large African mammals, etc.). At present, health issues in tropical and equatorial countries, which bring into focus the fundamental relationships between wild fauna – and flora – and public health (in zoonoses like malaria, Ebola, Zika and chikungunya), seem to be far removed from our concerns, even for some members of the scientific community. The countries of the global North do not always pay enough attention to these issues, which people often associate with poverty and a lack of healthcare infrastructure, whereas the problem is more complex.

Very recently, in 1986, science defined the word and concept of biodiversity in order to reignite interest in the study of differences between individuals, species or ecosystems. By studying biodiversity we can tackle subjects such as human health from new angles, in particular using the

“One Health” and “Planetary Health” approaches (*see article* The diversity of concepts that lie behind the word “nature” *in this issue*). We now have a clearer understanding of how the health of ecosystems, domestic animals and cultivated plants are all linked to human health [2].

## Fragmented natural spaces

Our impact on habitats and the species that inhabit them is considerable. Firstly, we are fragmenting habitats, particularly through urban sprawl and the expansion of farmland, meaning humans can easily move in and out of ecosystems and settle extremely close to wild organisms. Caught in the trap of a partitioned natural world, animals are increasingly coming into contact with humans, who regard them at best as pets and at worst as pests. This close proximity to potential reservoir animals can lead to the evolution of pathogens that may transfer between animal species (wild and/or domestic) and to humans. These processes significantly increase the circulation of zoonotic infectious diseases and can even cause the emergence of new diseases. New diseases have been appearing at an average rate of one every 14 to 16 months since the mid-20<sup>th</sup> century, a rate that is accelerating as human and animal mobility increases considerably across the planet’s surface [3]. Ebola virus disease in Africa is a tragic example, with epidemics of this particularly morbid and deadly virus emerging in recently deforested areas, or following the consumption of bushmeat or contact with bats, which are reservoirs for the virus [4].

Our propensity to overexploit certain poached, domestic or peridomestic animal species<sup>1</sup> also brings us into closer contact with reservoir animals. Through actions that bring together species not normally found together in the wild – e.g. trafficking or displacement of domestic and wild animals whose health has been poorly assessed, destruction of natural habitats leading to increased contact between species, capture and domestication of wild animals – we cause further contact with potential sources of infectious agents and of zoonotic disease.

Climate change and the transport of exotic species, which may be potential or known reservoirs or vectors, are giving rise to new issues linked to cohabitation. In mainland France, these include the coypu, which is a known reservoir of leptospirosis since 1886 in Europe, and the tiger mosquito, the vector of dengue fever, which arrived at the end of the 20<sup>th</sup> century. More recently, in late 2023, exotic ticks of the *Hyalomma* genus, carriers of the Crimean-Congo haemorrhagic fever (CCHF) virus<sup>2</sup>, were identified on cattle farms in the south of France; early cases had already been identified in Spain in 2013.

### **Industrial livestock farming: A hotbed for pathogens**

Domestic livestock farms pose a problem because they act as a bridge between wild reservoir species and humans. For example, on small farms in Asia, the Nipah virus was transmitted from fruit bats to pigs foraging under the trees where they roost, then from the pigs to humans. Intensive farming also exerts problematic selective pressures on pathogens: by cramming genetically identical and weakened pigs or chickens into vast farms, we are selecting particularly virulent pathogens from wild reservoirs. Poultry farms, which account for a massive 71% of the world's bird biomass, allow virulent variants of the avian flu virus to persist because the host being killed or becoming very sick does not prevent transmission given the extreme proximity that the animals live in. Virtually all mutations that cause H5N1 to become virulent

in birds since it was first observed in China in 1996 have appeared in livestock birds [5]. These variants of an avian flu virus that mutated in poultry farms are now invading the world, killing wild bird colonies and their marine mammal neighbours, as demonstrated recently by the high mortality of gannets and elephant seals. They are now infecting dairy cows in the United States, with a potentially different mode of transmission. For now, this variant has a very limited affect on humans, only causing conjunctivitis, but other variants of H5N1 found in Asia appear to be less harmless. It seems that this disease of avian origin has not yet been transmitted from one human to another, but it does appear to be transmissible between members of the same species in other mammals.

With little or no knowledge of the concepts and theories of ecology, or any understanding of interactions with biodiversity, we often perceive the living world as a direct source of aggression and hold a simplistic view of biodiversity: this animal is venomous or harmful, that plant is allergenic. The list of potential threats is as long as biodiversity is vast. The way we live today, in megacities, in fact only makes us more fragile. We can see this with the issue of respiratory allergies to pollen, which are on the increase in urban areas due to exposure to pollution and earlier or more intense pollen production due to climate change. This problem may be exacerbated by the choice of particular ornamental species in urban areas, such as the plane tree, and reinforced in rural or peri-urban areas where allergenic exotic species have been introduced with crops, as in the case of ragweed with American clover seed.

In terms of exposure, our problems are therefore evolving in tandem with the biodiversity crisis and its main drivers, which have been categorised by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IP-BES). Habitat loss and urbanisation, combined with climate change and increased global circulation of organisms, are leading to new artificially

constructed environments that are conducive to the establishment of opportunistic organisms and numerous pathologies. Multiple pollutants, both in our food and in the air, mean multiple exposures, which exacerbate our sensitivity. Finally, our horticultural, agricultural and forestry practices increase our exposure to exotic species that have been introduced deliberately (ornamental species) or unintentionally (alongside crops, stowaways in our transport systems). When studying our exposure, we must also take into account how food chains amplify or transform the issue. The quantity of a given product in the environment is not the only important indicator; our behaviour, the type of product and its availability also come into play, as does the magnifying effect of increased concentration through build-up in organisms linked to each other within food chains [6]. This process of biomagnification is classically associated with lipophilic substances such as DDT<sup>3</sup> but is now beginning to be considered for substances bound to proteins, such as some PFAS<sup>4</sup> [7].

### **The risk of depleted or unbalanced microbiota**

The human body is also home to its own biodiversity, known as the microbiota, with the gut microbiota being one example. Its composition and behaviour depend on our relationship with the environment and in particular our diet [8]. Two kilograms of bacteria from more than a hundred species occupy our bodies, in colossal numbers that exceed our own cells, i.e. 30,000 billion. Studies of microbiology and human health are only just beginning to understand how dietary factors, such as the importance of fibre or fermented products, or the harmful effects of pesticides, affect the health of the microbiota. Numerous problems such as gastrointestinal diseases, psychiatric disorders, degenerative diseases and cancer can disproportionately affect us when our microbiota is unbalanced, depleted or invaded by a given microorganism. We would therefore exert less pressure on both our internal and external environments by adopting a balanced diet made up of

seasonal vegetables and fruit as well as fermented products, all distributed via short channels and grown without pesticides.

This means we need to rethink our relationship with biodiversity to understand that we are part of it and linked to it in a highly complex way, if only through our food, the ecosystems of production and our microbiota. Wild and domesticated species are neither angels nor demons. They are part of our environment, interacting with each other, reproducing, dispersing and evolving with each generation.

The way we interact with them must take account of these essential properties of living organisms [9]. If certain species become problematic for us, we must not stimulate their reproduction or dispersal through poor management. For example, killing local badgers that are reservoirs for bovine tuberculosis stimulates the dispersal of badgers from neighbouring areas that come to occupy empty territories, increasing the probability of their contamination by infected wild or domestic animals; killing foxes gives rodents more free roam to transmit *Borrelia* bacteria and Lyme disease to us via ticks that live on them as parasites and that can also bite us. We should also avoid exerting inappropriate pressures that can favour the selection of undesirable genetic characteristics, whether this be the virulence of an influenza virus or antibiotic resistance in bacteria present on industrial farms, or through spraying contaminated effluents or bacteriostatic inputs (e.g. glyphosate) across open fields.

Preserving and limiting human intrusion into the living space of wild species is a way of both protecting biodiversity and limiting the circulation of pathogens in the environment and in humans. Understanding the power of biodiversity through these dynamic mechanisms will enable us to support the processes that are beneficial to us and to restrict or even block those that are seriously damaging. This means it is essential to severely restrict the fragmentation of natural ecosystems and our propensity to disperse organisms, whether intentionally or unintentionally, in order to

prevent biological invasions by potentially pathogenic organisms or vectors of pathogens. If we do not, we will be condemned to constantly fighting against them, with the tiger mosquito being a case in point in France today. Similarly, it is crucial for us to review our model of intensive meat production in factory farms raising genetically similar, immunocompromised animals, which are veritable hotbeds of pathogens, if we do not want the result to be yet more pandemics.

The way we live alongside ordinary plant and animal biodiversity in our megacities must be engineered as effectively as possible, without giving it total freedom to evolve or constantly intervening. The cost of this kind of management is significant, but the benefits are even greater. Innovations such as these can be developed and explored in partnership with local stakeholders in long-term socio-ecological research sites<sup>5</sup> (such as the “workshop zones” run by the CNRS), and by using nature-based solutions, as promoted by the SOLU-BIOD national research programme<sup>6</sup> [4]. ■

1. Many zoonoses are transmitted by peridomestic animals, which are animals that live near or visit human habitats: cat scratch disease, ringworm, rabies, etc.

2. See Santé publique France documents: <https://www.santepubliquefrance.fr/docs/elements-d-information-et-de-prevention-sur-la-fievre-hemorragique-de-crimee-congo> and <https://www.santepubliquefrance.fr/les-actualites/2024/fievre-hemorragique-de-crimee-congo-adopter-les-bonnes-pratiques-pour-se-proteger-des-piqures-de-tiques>.

3. Insecticide banned in North America and Europe, but still used to combat vector-borne diseases in many countries.

4. Perfluoroalkyl and polyfluoroalkyl substances, known as PFAS or “forever chemicals”, are a group of several thousand chemical compounds, including two herbicides currently authorised in France (diflufenican, flufenacet).

5. Interdisciplinary research network on socio-ecosystems and the environment in relation to societal issues. (Editor's note.)

6. <https://www.pepr-solubiod.fr/>

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# Nature and gardens in prevention and therapeutic care

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Throughout history, the human race has been faced with numerous infectious diseases. Advances in science, with the development of antibiotics and vaccines, as well as progress in sanitation and hygiene, have helped to reduce epidemics. In today's ultra-urbanised society, people are subject to the pressures of time, stress, pollution, social isolation and so on, resulting in an erosion of healthy lifestyles. These new living conditions are strongly implicated in the emergence of chronic illnesses, which now affect almost 20 million French people [1]. These include metabolic diseases, such as diabetes and obesity, as well as cardiological, neurological, vascular, neurodegenerative, cancerous and autoimmune diseases.

## Disrupted biological mechanisms

The processes of chronic inflammation, linked to permanent oxidative stress caused by an excess of free radicals, lead to dysregulation of the immune system, immune suppression and disruption of cell duplication, all of which can lead to tumour formation [2; 3]. The environment encountered throughout life, also known as the exposome<sup>1</sup>, induces reversible but transmissible epigenetic changes during cell division. In an

unfavourable environment, they can lead to the inactivation of certain essential genes in our innate immune system and promote expression of chronic inflammatory, metabolic or autoimmune diseases. The *phylogenesis* (see glossary) of the human species is intimately linked to ongoing contact with nature. This means that disconnection from or loss of experience of nature is detrimental [4]. This natural environment and all implicit contact with living things are essential to human equilibrium, as argued by Wilson in his theory of biophilia<sup>2</sup> [5].

Health is "*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*", according to the World Health Organization (WHO) [6]. This definition from 1946 highlights the dynamic continuum of an individual's health, from birth to death, in which the environment and lifestyle are factors in prevention and health promotion. The emergence of a pathology or disability breaks this continuum. The components of nature and our original biotope, which are fundamental to human development, also play an essential role in restoring balance after disease. The therapeutic benefit of plants is at the origin of horticultural therapy<sup>3</sup>, a concept that has been gaining ground in France since the 1990s.

Gardening therapy is recognised as a form of occupational therapy that addresses physical and psychological health. Numerous studies carried out in psychiatric and geriatric settings have demonstrated real neuropsychological and physiological benefits, including stress management, improved cognitive

## KEY POINTS

■ **Our modern lifestyles are disconnected from nature. This situation fuels a number of chronic diseases, often involving alterations to the immune system. Plant aromas play a role in stimulating the body's immunity. For this reason, an increasing number of hospitals, psychiatric units and care homes are offering gardening activities, led by a facilitator.**

ability and reduced cardiovascular and respiratory risks [7-9]. For example, after major surgery, simply being able to see a natural space reduces morbidity, mortality and length of stay [10-11].

Besides an opportunity to discover the medicinal and nutritional virtues of plants, what therapeutic properties can gardens offer? When it comes to supporting people with chronic illnesses, anything that combines *coping strategies*, collective resilience, psychological and emotional stimulation and close contact with nature is part of a truly integrative and holistic therapeutic approach.

So, as well as taking pride in the success of your tomato plants or smelling the rosemary, creating a beautiful garden together is a great way to de-stress. Inhaling *terpenes*, the aromas released by plants, induces *oxytocin* secretion and activates our cellular immunity [12]. The immunostimulant action of oxytocin is due partly to the inhibition of chronic secretion of *cortisol*, *adrenaline*, *noradrenaline* and *circulating*

*pro-inflammatory cytokines*, and partly to the direct activation of *natural killer T cells*. It also stimulates secretion of dopamine, serotonin and enkephalin in the brain, which are neurotransmitters involved in wakefulness, mood and motivation. As demonstrated by Li's 2010 studies on forest bathing<sup>4</sup>, the number and activity of *natural killer* cells correlated with the atmospheric content of pine terpenes [13].

### From a sterile to a living environment

In our gardens, the most fragrant plants, such as the Lamiaceae (rosemary, thyme, savory), are also the richest in terpenoids and antioxidant polyphenols, and this has meant that humans have instinctively used them for thousands of years for their culinary and therapeutic benefits. The 94 plants listed in the medieval text *Capitulare de villis* [14] are still recommended by the World Health Organization (WHO) for a balanced nutritional intake [15].

Therapeutic gardens can be found in residential or healthcare facilities. They are used as part of therapeutic support to promote the patient's well-being and recovery. Gardens also contribute to the well-being of the caregiving community and patients' families, helping to increase patient resilience [16]. Every garden is tailored to the suit the facility, according to the types of pathologies and patients treated there. Caregiving staff oversee the garden, usually with the help of a facilitator. When patients can move from a sterile environment into this living environment they can build their resilience and assert their own choices, becoming carers rather than cared for. Through the garden, patients can transform their suffering and isolation into shared pleasures and improve their experience of follow-up care. Gardening in a group also means optimising recovery chances by developing collective resilience.

A therapeutic garden is an asset to a facility if, through its design, construction and use, it meets the needs of patients, carers and families. The success of this kind of

initiative depends on four essential stages: setting up a team that represents the institutional vision; drawing up a plan collectively, specifying the garden's objectives and therapeutic uses; designing and creating the garden in its designated space and landscape; planning how to assess the uses, mediation and benefits offered by the garden. While it may start off relatively modest, the garden will evolve over time, becoming more attractive and meeting the therapeutic objectives of the facility with increasing success, through a process of participation [17-18].

Since 2008, over a hundred new therapeutic gardens have been created in France, in care homes, hospitals, psychiatric units and clinics.

### Oncology: Plants as a medium for healing

Paradoxically, when it comes to cancer, few therapeutic gardens exist to support patients, despite clear demonstrations that physical activity in contact with nature reduces the risk of recurrence by 25% after treatment for breast or bowel cancer [19-20]. Avoiding recurrence is an important issue, as addressed by Objective 8 of the French 2014-2020 Cancer Plan, which focused on reducing "*the risk of a second cancer*".

In 2021, a therapeutic garden was created as part of the Cité des Soins holistic care programme at the Anjou Clinic in Angers (Maine-et-Loire), to complement the oncology care pathway. It was designed and constructed through a participatory approach involving patients, families, care staff and managers. The 125 m<sup>2</sup> garden set within the clinic grows vegetables, herbs, flowers and small fruit trees, either in the ground or in raised planters. To achieve health benefits in the medium and long term (tolerating and adhering to treatment, physiological improvements, better performance on psychometric scales, stimulation of immune response and fewer relapses), a facilitator from the Institut Agro Angers-Rennes runs plant therapy sessions for groups of six patients, who are supervised in the garden for two hours a week.

Individual and group feedback is given by questionnaire after each session and at the end of a 14-week cycle. The satisfaction rate is 100%, with respondents reporting a sense of healing, sharing of emotions and an improved ability to tolerate treatment. These results demonstrate collective resilience in the face of disease, through gardening and other activities [21].

### Neurocognitive disorders: Active gardening

A number of associations have driven the widespread creation of therapeutic gardens in care homes in response to France's 2008-2012 health plan, which made gardens compulsory for cognitive-behavioural units and high dependency units [18-19]. It is recommended that people with neurocognitive disorders take an active and effective approach to gardening in a safe, natural environment. Multi-sensory stimulation is offered through the presence of plants, water and animals, and the different workshops organised. Touching the leaves, flowers, fruit and bark offers reminiscence therapy. Handling plants and soil delivers the additional benefit of helping to restore the microbiota that is so essential for these patients. These gardens are also an asset for caregivers and patients' families, helping to prevent depression and burnout, the incidence of which is particularly high among those confronted by these illnesses. ■

1. Dr Christopher Wild (former director of the International Agency for Research on Cancer) sets out three types of exposome:

- the internal exposome (hormones, inflammatory stress markers, metabolites);
- the specific external exposome (pollutants, radiation, infectious agents, professions and lifestyles);
- the general external exposome, which relates to the socio-economic environment and living conditions. (Editor's note.)

Source: CNRS, *Le Journal*, January 2023.

2. Fundamental human love for living things. (Editor's note.)

3. Integrating horticulture and gardening activities into a process of therapeutic education or prevention of illness or exclusion, as an occupational and social therapeutic activity. (Editor's note.)

4. Ancient practice known in Japanese as *shinrin-yoku*, which consists of immersion in a forest. (Editor's note.)



## Glossary:

- **Adrenaline and noradrenaline:** neuromediators or neurohormones secreted by the adrenal glands in the event of acute stress or physical exertion.
- **Coping strategies:** cognitive and behavioural strategies that an individual uses to manage threatening external or internal events (according to Lazarus & Folkman, 1984).
- **Cortisol:** glucocorticoid hormone secreted by the adrenal glands, which is involved in the processes of carbohydrate and protein metabolism that provide energy for the body. It is also anti-inflammatory.
- **NK or Natural Killer T cells:** specialised cells in our immune system, capable of killing infected, altered or cancerous cells.

- **Oxytocin:** neurohormone secreted by the pituitary gland, known as the “love hormone” because of its major role in childbirth. It is essential to the survival of all mammals, both for its roles in reproduction and social organisation and its immunoprotective quality.
- **Phylogenesis:** the evolutionary history of a species.
- **Pro-inflammatory cytokines:** small proteins that enable cells to communicate with each other and activate or inhibit the synthesis of other molecules.
- **Terpenes:** aromatic compounds released by plants and trees to defend themselves and to communicate.

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# Our minds need more experiences of nature

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## KEY POINTS

■ **The sensory and emotional experiences gained through regular interaction with the natural world have an impact on our minds, helping to reset attention and reduce stress. They play an important role in children's cognitive and social development. However, our connection with the living world has eroded over the generations. If we want to avoid developing a form of environmental amnesia, a number of individual and collective approaches are possible.**

W e human beings are a living species, *Homo sapiens*, who live and develop in continual interaction with the other living species that inhabit the Earth. Even in Western societies that have been built “against nature” [1], we are in constant contact with the rest of the living world. We are part of biodiversity: thanks to nature we breathe, eat, equip ourselves with tools and heal ourselves; we also host microbiota that protect us. The World Health Organization (WHO) has established a clear association between contact with nature and health [2]. The International Platform for Biodiversity and Ecosystem Services (IPBES) goes further<sup>1</sup>, explaining that the proper ecological functioning of nature is directly linked to the quality of human life. Health – including mental health – is one of the 18 components of this quality of life.

In 1991 [3], Ulrich was the first researcher to propose a theory of *stress recovery*, showing that nature reduces stress and its associated

physiological tensions. For this study, 120 student volunteers watched ten minutes of a stressful video, followed by ten minutes of a soothing video, set either in a city or in a natural environment. The physiological indicators of stress all increased during the first part of the experiment and then decreased during the second, but more sharply and more quickly for those viewing the natural scenes compared with the urban scenes. In 1990 [4], the psychologists R. and S. Kaplan proposed their *attention restoration theory*, which asserts that nature can repair our capacity for attention and our general mental state. These two theories have been tested and expanded in other research [5; 6], leading to the current scientific consensus: access to nature improves mental health. In this context, nature is defined as a space containing living elements (fauna and flora), which may or may not have been constructed by humans, ranging from urban parks to relatively “wild” nature [5].

A recent literature review published by the journal *Lancet Planet Health* confirmed the positive effects of nature prescribing on mental health, depression and anxiety [7]. Furthermore, simply being, doing something or playing in a natural environment encourages concentration and social interaction, and can boost self-confidence [8].

## An essentialised and distant nature

Despite this knowledge, environmental health research has historically focused on the negative effects of natural environments (particularly polluted ones) on human health, paying very little attention to the positive effects of contact with nature. This perception of

nature as dangerous, as a reservoir of pathogens, persists in some areas of modern medicine and reflects the current dominant norms within Western societies. As a result, spending time in nature is seldom a priority: we “don’t have the time”, with even children staying away [9], out of fear [10] or perhaps also out of ignorance.

This situation can be explained by an “extinction of experience” with nature, a term first used by the ecologist Robert Pyle back in 1993 [11]. Adopted by scientific communities of conservation biologists over the last ten years or so, this hypothesis suggests that a lack of nature in residential areas combined with less desire to visit natural spaces result in a poor “experience” of nature. Nature can be experienced through commonplace features of the environment such as roadside plants, urban or rural birds, woods or urban parks close to home, private gardens or the green spaces shared by community housing. Our alienation from nature has consequences not only for health, but also for individual attitudes and public policies towards the natural environment. At present, in France and across the Western world, nature and our connection with the Earth are not generally considered as an important individual or collective need.

Instead, nature has become part of our collective imagination, in an increasingly essentialised way: a symbol of purity, a carefree spirit, fragility, childhood, happiness, a distant concept of something immaterial and hazy. We pass this simplified image of nature from generation to generation. In France, children play outside less and less [12]. They are held back by often illusive concerns about hygiene, safety or protection against dangers but also by their



parents or other adults around them, who themselves do not want to go out. This was the conclusion made by a paediatric research team led by K.A. Copeland [13], who studied why children attending childcare centres in the suburbs of Cincinnati (USA) rarely played outside. The fifty or so educators questioned were aware of the benefits of outdoor physical leisure activity for children (particularly with regard to problems of obesity, the original issue of this study) but all felt that these benefits were outweighed by the inconveniences caused by such outings to adults. They declared fearing reproach by parents because a child has fallen over or become ill, fearing bad weather, not wanting to create extra work (getting the children suitably dressed, cleaning up inside if they come back dirty), and the inconvenience of being outside themselves.

Yet, being active in nature accelerates cognitive, emotional and social development, and helps children to build their values and identity [8]. This is particularly true of free play in nature, where the elements offer an infinite number of sensory stimuli and potential actions, according to

Gibson (quoted by L. Chawla [8]). Patrick and TurnicliFFE, (quoted by A.C. Prévot [14]), believe that play in nature and in groups enables children to become truly and physically involved in “*experiential learning*”, enriched by the relationships they develop with others and with the world. This learning can take place alone [8], with a group of children or, according to L. Chawla (quoted by A.C. Prévot [14]), with a supervising adult to provide context.

Experiences of nature, for both children and adults, can also lead to an awareness that we exist within a wider space of living beings, which in turn prompts us to change our point of view on the place we can occupy within it, both individually and collectively [14]. People who are “*connected with nature*” in this way sometimes behave differently from others in relation to the environment [14]. Of course, they don’t only feel positive emotions about being in nature; some may feel strong negative emotions about the current biodiversity or climate crises (see article The distress caused by the prospect of an ecological cataclysm in this issue). However, because they are rooted in the living

world, they are also less likely to become depressed; on the contrary, they can take action and overcome their fear, sadness or anger [15]. This avoids a great deal of unhappiness and mental illness.

### Changing social norms

What are the different ways to experience nature? While individual desires and behaviours are significant driving forces, social norms, as well as practical and material factors, also play an essential role.

To address this, public authorities should (re)introduce elements of nature close to where people live, especially in urban areas. Green spaces must be accessible to residents, as freely possible. This should include areas of vegetation that are diverse in terms of living species and management strategies so that they respond to the different ways in which people relate to nature. For example, some people prefer well-mown and neat spaces, while others feel a greater sense of release in wild meadows.

It is also a collective responsibility to make these experiences of nature easy and accessible for everyone, for example, by constructing spaces



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and facilities in consultation with users, in a spirit of inclusion that helps to restrict environmental injustice (see article Delivering access to natural spaces for all city residents in this issue). Another way of encouraging these experiences is to limit anxiety-provoking messages in public communications or from people with authority (teachers, doctors) or influencers. Public authorities can be prescribers. In 2016, the public body Natural England – whose remit includes helping people to enjoy, understand and access the natural environment – put proposals to the UK government for ways to improve mental health care through activities in nature [16].

In a more holistic way, every one of us, alone or with others, can take a little time each day to get in touch with nature, whether through contemplation, gardening, hiking or any

other activity that suits us. Perhaps we also need to restore people's ability to experience nature, for example, by (re)educating them to pay attention and use sensory, emotional and cognitive approaches. This can be done by learning from other cultures and the way they represent nature, or by reading about the natural history of species that surround us, in order to open our minds to the knowledge, sensations and emotions that have disappeared from our social lives. This will lead us to reflect on the place we want to occupy alongside the rest of life on our planet. ■

1. <https://www.ipbes.net/conceptual-framework>.

2. There are a number of psychometric tools that use statements to measure someone's degree of connection with nature, such as the Environmental Identity (EID) scale, the Inclusion of Nature in Self (INS) scale and the Nature Relatedness Scale (NRS).

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# The distress caused by the prospect of an ecological cataclysm

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Eco-anxiety echoes all the emotions and feelings triggered by what we see as the abusive destruction of a place or life form – human, animal or plant [1]. Eco-anxiety is therefore the expression of the link that exists between the distress of ecosystems and psychological distress, when the former causes the latter. It is a sense of worry that befalls from anticipating the future, perceived as compromised in light of the various scenarios reported by scientists such as those of the Intergovernmental Panel on Climate Change (IPCC) or the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Although there is no apparent predisposition to eco-anxiety, the cause of which is primarily environmental, this specific form of distress may nevertheless be intertwined with other issues, whether personal (financial, family or professional difficulties) or social (social inequalities, etc.) [2]. Fear for the future of the world – in terms of how we live in it and the ways we are damaging it – is not an illness in the strict sense of the word, yet it can make people ill. However, eco-anxiety generally stems from a lucid analysis of the state of the planet and takes form because of a certain societal dysfunction. If the injuries inflicted on nature provoke a feeling of loss of meaning, or even indignation and anger, it is important not to “pathologise”

such emotions or normal reactions to undesirable events. Trying to control the conditions in which we live is a sign of good mental health. In this sense, eco-anxiety should not be considered a mental illness. Rather, it reflects a state of mind, a sensitivity to the world, a feeling of great distress caused by negative and sudden changes in the environment. It represents a fracture in the way we view the future, which we perceive as uncertain or even hostile.

## The strength of connections with nature

At present, the clinical characterisation of eco-anxiety remains vague. There is no reference to any psychological or psychiatric disorder linked to environmental change in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM) or in the International Classification of Diseases (ICD). A study carried out in 2013 on 132 participants showed virtually no correlation between pathological anxiety disorder [3] and concern for the environment. To identify possible pathological forms of eco-anxiety, various authors have suggested following the distinction usually made between adaptive anxiety and pathological anxiety. The pathological dimension is considered to exist when the person expresses distress that is judged to be excessive and inappropriate in relation to what would normally be expected in the face of the stressor, i.e., symptoms of intense anxiety, with a strong and debilitating impact on the individual and their activities, causing mental suffering and overwhelming their ability to cope.

## KEY POINTS

■ **Will eco-anxiety be the illness of the 21<sup>st</sup> century? Surveys show that an increasing number of people are affected. The psychological impact of biodiversity loss is now an established research topic. However, unless it has extreme negative consequences on well-being, eco-anxiety is not regarded as a pathology; it can even prove to be a driving force for local collective action, motivating people to confront their fears about the future.**

Eco-anxiety is certainly partially rooted in the strong ties that bind us to nature. In a way, it reminds us of our natural origins and our innate *biophilia*. The term “biophilia” comes from the Latin *bio* meaning “life” and the Greek suffix *-philia*, meaning “who loves” [4]. In the same way as phobias and aversions, we experience *philias*, i.e. positive attractions and emotions towards other species, other habitats or objects in our natural environment [5]. Being intrinsically attached to other species, it is normal to feel affected by the abuse they suffer. Biophilia helps us understand the extent to which eco-anxiety arises from a natural, physiological feeling. Deep in our gut, we identify as *Homo sapiens* who are connected to nature, rather than *Homo oeconomicus* who imagine themselves free from all ties with the natural world. Therefore, anyone who is troubled by the erosion of the wild, non-human world or aware that there is no “Planet B” will likely be affected by this state of mind and feel overwhelmed by the lack of alternatives in the future.

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The psychological impact of the decline of biodiversity is already a research topic [6]. To date, there is no epidemiological data to quantify the prevalence of eco-anxiety in the general population, or any other effects of environmental damage on well-being and mental health. Recent surveys suggest that eco-anxious people could account for between 17% and 29% of the population [7]. Distress about the disappearance of animal species is also growing [8]. In Quebec, according to the 2023 *Baromètre de l'action climatique* (*Climate Action Barometer*), 54% of residents surveyed declared experiencing eco-anxiety when thinking about the ecological crisis. Compared to the

previous year, more people stated that they often or almost always felt nervous or anxious (+6 points) and fearful (+6 points) about the future of humanity [9].

Ultimately, eco-anxiety is an adaptive function for coping with an unprecedented challenge for human societies [10]. Eco-anxious individuals find constructive responses to this threat, adopting pro-environmental behaviours. In fact, aside from the emotional upheaval, rediscovering meaning in the face of peril requires an individual to reflect on their priorities, the trajectory of their life and their choices concerning studies, profession, parenthood and even housing and living space. This intimate

process means individuals question their identity and values, gradually leading them to perceive and define themselves differently.

The challenge of this journey is to avoid becoming swamped by a sense of powerlessness or overwhelmed by the course of events, with no control over the broad directions followed by our societies. The eco-anxious suffer from a form of *hubris*<sup>1</sup>, which is ineffective given the scale of the task. This thwarted desire for power, as benevolent as it is disproportionate, this ambition to heal the world, are resolutions that are difficult for an individual to take on by themselves. Like the titan Atlas supporting the weight of the heavens on his shoulders alone, one person cannot bear all the suffering of the planet.

### A driving force for change

To prevent eco-anxiety becoming a burden, it is therefore important for individuals to return their focus to the immediate environment, where they can take direct action. Getting involved in action locally and joining environmental movements are effective strategies [11]. Civic engagement has many virtues, including calming the sense of disconnection often felt by eco-anxious people. Being surrounded by people who are equally sensitive to the world and share similar concerns reinforces the feeling of belonging to a group. A united approach with a collective goal also helps individuals to feel reassured, to maintain motivation over time and to achieve a sense of authenticity with themselves and in their relationships with others [12]. Building social connections, cooperating and being part of a network are key to navigating eco-anxiety with greater peace of mind. Studies show that positive attitudes within a network of individuals encourage respect, cooperation and – by extension – happiness among the members of such networks, whether these include family, friends or neighbours [13].

When someone is feeling eco-anxious, it is also good to remember that nature is still there, wild and alive. Awakening the senses, soaking up the beauty of the sights and sounds, savouring the peaceful



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atmosphere, the clean air and the fresh, pleasant smells are all simple, comforting experiences. A good illustration of this is the practice of “forest bathing” or *shinrin-yoku*. This Japanese tradition of taking a short, peaceful walk in the forest for relaxation, recreation and meditation has a number of health benefits, such as lowering blood pressure, heart rate and stress hormone levels (cortisol or noradrenaline). *Shinrin-yoku* also helps to reduce anxiety, depression, anger and fatigue, while increasing the activity of certain immune cells, in particular NK cells (natural killer cells) [14]. These positive effects are thought to be partly linked to breathing in phytoncides, the molecules that trees release into the air. In Japan, forest bathing is recommended as part of a healthy lifestyle since 1982.

Courses of action – both individual and collective – and sources of hope are constantly emerging and are consistent with the concept of “Planetary Health”, which sees the health of humanity as dependent on the state of natural systems and respect for planetary limits. ■

1. Inordinate desire for power. (Editor's note.)

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# Towards dialogue in urban planning to benefit health and biodiversity

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## KEY POINTS

► Restoring nature to cities as a deliberate health promotion strategy requires pro-biodiversity actions that take public health strategies into account – and vice-versa. There are synergies between these two fields that would help multiply the health benefits for the whole urban ecosystem, including humans. Tools are currently under development to help local authorities combine their commitment to health with environmental action.

Public policies on health and the environment often take the approach of reducing risk factors (air pollution, noise, urban heat islands, etc.). Yet urban nature spaces and the ecosystem services they provide can be part of a more ambitious disease prevention and health promotion strategy [1]. A review of the scientific literature carried out in 2021 by the non-profit organisation Plante & Cité (Plant & City) identified 300 publications that demonstrated the benefits of natural spaces on physical and mental health [2]. Restoring nature to urban areas is an effective way to improve the living environment and well-being of city dwellers, especially as biodiversity loss in cities has accelerated in recent decades [3].

However, the compartmentalisation of different policies and the lack of cross-departmental working within local authorities appear to be an obstacle to dealing effectively with social, health and environmental issues. Since the early 2000s, “Nature in the City” plans have influenced the practices of many French local authorities<sup>1</sup> (differentiated management<sup>2</sup>, use of plant protection products, greening). The public health benefits of these initiatives have yet to be fully assessed. Regarding biodiversity, strategies for greening public spaces to improve the well-being of city dwellers can prove superficial, focusing on decorative green spaces and overlooking the essential requirements for living creatures (soil quality, diversity of strata and habitats, ecological connectivity<sup>3</sup>) [4]. Health policies suffer from a lack of crossover between ecological and health issues, which can favour a medical approach to prevention, with local authorities sometimes reducing this to a question of sanitation.

Developing synergies between health and biodiversity policies would multiply the health benefits for the ecosystem as a whole, including humans, as recommended by the “One Health” approach [5]. So how can we reconcile the objectives of preserving biodiversity and protecting human health?

## Non-allergenic plants: A crucial choice

One area that clearly demonstrates the difficulty of finding such synergies is the management of plants in cities. There are a number of guides available to help local authorities

with their nature and greening projects [6-8]. Public health professionals often want to restrict allergenic plants, instead favouring cultivated varieties or exotic species that are unsuited to local conditions. Ecology professionals defend using flora that grows spontaneously because it is adapted to the local climate and soils, plus it is wildlife-friendly (host plants for larvae and caterpillars, flowers that attract adult insects, fruit for birds and mammals, etc.). Certain practices, such as the creation of urban grasslands to replace lawns, can increase the risk of grass allergies. Local authorities therefore have to make trade-offs to reconcile different uses or choose to maximise one service over another for local residents. When aiming to tackle pollinosis<sup>4</sup>, decisions should be made in consultation with the various stakeholders.

An example of this approach is the Paris Biodiversity Plan [9], which sets out to “*make biodiversity an asset for the health of Parisians*”. It aims to improve consideration of the health issues linked to allergenic pollens in the management of existing parks and gardens and future urban projects. The plan was set up by the Department for Green Spaces and Environment with input from the local Environmental Health department, which must check that the living environment does not present any health risks for residents. With the goal of reducing plants that cause allergies, developers and managers of green spaces were given recommendations to apply in the medium term (choice of plants, species banned in schools and nurseries) and the long term (strategy for gradually replacing allergenic species



with substitute species). In addition, the city has created the Sentinel Pollinarium®, a garden that contains the main allergenic species of the region, identified by a group of allergy doctors and botanists. This site provides healthcare professionals and allergy sufferers with real-time information on when pollination begins and ends. It also has an educational role to play by informing those who suffer from allergies about specific risks and raising awareness of biodiversity among residents.

### **Nature that works for ecology and health**

Developing nature in cities means integrating several functions (ecology, social, health, etc.) while taking into account the thoughts and perceptions of residents. Failure to do so can be an obstacle to the success of a project and can even reinforce social inequalities. The green and blue networks<sup>5</sup> initiated following the 2007 Grenelle Environment forums illustrate this complex balance: some interpret their purpose as simple greenways, obscuring their primary function as an ecological network for the movement of species; or, on the contrary, others view them as ecological corridors, overlooking the recreational needs of residents (sport, gentle mobility). Mapping software and geographic information systems (GIS) can be used to reconcile these objectives by combining ecological data (regional ecological coherence plans, landscape graph modelling<sup>6</sup>) with social data (accessibility of green spaces, income and resident surveys) [10].

The case of urban brownfield sites is another example of these parallel visions. The public can easily judge areas of untended wild biodiversity as abandoned or neglected wasteland, contributing to a feeling of insecurity; yet certain studies highlight the social role of such areas as places to spend time, pass through or create art<sup>7</sup>. A number of ecological studies have shown that brownfield sites are home to a greater variety of birds and plants than well-tended green spaces. They also contribute to ecological connectivity in urban areas. As a result of the No Net Land Take (NNLT) target,

these brownfield sites are coveted for urban housing projects, despite the fact that they enhance nature in the city and contribute to better quality of life and health.

A study carried out in Paris [12] showed that ecosystem services provided by the spontaneous vegetation that grows in places like brownfield sites, e.g. surface run-off and temperature regulation, are generally inversely proportional to the income of residents. In the centre and west of Paris, which are densely built-up and financially well-off, the benefits are low, whereas the opposite is true in the east of the city and its outskirts, where working-class households live in less dense or more varied neighbourhoods, often with brownfield sites. In these areas, dialogue can reveal solutions that are compatible with biodiversity management and social issues. Gaining an awareness of the value and richness of nature is not a theoretical or abstract exercise, it is an understanding largely passed on through experience and education. This work is an essential part of the Green Plan for the Île-de-France region [13], where 935 municipalities have been found to lack green spaces.

### **Cooperation between services at local level**

In 2019, the North-East Béarn group of municipalities decided to take action towards preserving biodiversity that would also improve the health of its residents [14]. Equipped with a health impact assessment (HIA) of the natural heritage – an innovative decision-making tool for health-promoting policies and projects to reduce health inequalities – they brought together the various parties involved and started breaking down the barriers between issues. The outcome was several concrete recommendations based on an environmental and health analysis of the area, a study of the initiatives envisaged and a consultation with local stakeholders. For example, be it planting hedgerows in private and public spaces (supported by maps showing the lines of identified hedgerows), integrating a biotope area factor<sup>8</sup> in the inter-municipal urban planning regulations (PLUi)

or restoring wetlands (supported by maps), all of these actions take health determinants into account in order to maximise the beneficial effects on people's well-being and minimise their negative impacts. The East Béarn local health contract, the North-East Béarn Regional Climate, Air and Energy Plan, the Strategy and Action Plan for Natural Heritage and the inter-municipal urban planning documents are all committed to the same goal: preserving the health of the natural environment and its inhabitants. For local authorities to adopt an ecosystems approach to health<sup>9</sup>, they need to rethink their working practices by involving all concerned departments and stakeholders.

### **Seeing the potential of nature**

Cities are full of areas that are unnecessarily covered with asphalt or concrete. Although at present poorly quantified, these sites could be a resource for the expansion and linking of natural areas, the reopening of urban rivers and the restoration of wetlands. Local authorities and their public and private partners need technological support. As part of the European Regreen project, which aims to promote nature-based solutions to support the ecological transition of cities together with residents [15], the Île-de-France Regional Biodiversity Agency (ARB) has developed a method for identifying urban areas with a high potential for renaturing projects that would benefit biodiversity, support adaptation to climate change and improve population health. The Regaining Biodiversity strand targets areas that are lacking biodiversity by studying the size of areas of vegetation, the percentage of vegetation cover and the presence of rare habitats (old trees, wetlands). The Adapting to Climate Change component looks at areas exposed to flooding, run-off and urban heat islands (UHIs). The Improving Health and Quality of Life strand identifies areas that are vulnerable due to a lack of green spaces, air pollution and health problems linked to UHIs.

The analysis produced using the Regreen method is made available to stakeholders through an interactive





The greenway in the town of Ris-Orangis.

© Ville de Ris-Orangis

mapping application entitled “Où renaturer en Île-de-France ?” (“Sites for renaturing in Île-de-France”)<sup>10</sup>. Local authorities can use this tool to achieve the NNLT objective or define zones for renaturing in their urban planning documents, such as their local consistency plan or inter-municipal local urban development plan. Looking beyond one-off initiatives (e.g. greening school grounds), this method can encourage local authorities to adopt more coherent renaturing strategies in their areas, in conjunction with public health.

At a time when a large number of local authorities are working to expand nature in their cities, there is a need to pool expertise and bring together ecological and health strategies. The One Health approach comes into its own here: it demands that we move beyond compartmentalised operations to act for the benefit of all living beings, both human and non-human. ■

1. See the Territoires Engagés pour la Nature (Communities Invested in Nature) scheme run by the French Office for Biodiversity (<https://engag-espourlanature.ofb.fr/territoires>) and the Capitales Françaises de la Biodiversité (French capitals of biodiversity) project (<https://www.capitale-biodiversite.fr/>).

2. The principle of differentiated management involves a compromise between the relatively strict and constrained management of communal areas and the naturalistic management of reserves, aimed at protecting the natural environment. Online: <https://www.arb-idf.fr/article/gestion-ecologique/>

3. Ecological connectivity reflects the physical relationships between elements of the landscape (including the marine landscape) that promote a full range of natural processes, such as species migration or simply interaction between sub-populations. Connectivity is a parameter that measures the processes by which sub-populations of organisms are interconnected within a functional demographic unit.

4. Name given to the various allergies caused by pollen from trees, herbaceous plants and grasses. (Editor's note.)

5. The green and blue networks are a measure to support the inclusion of biodiversity and ecosystems in land-use planning, particularly in urban areas. These networks aim to “reduce the fragmentation and vulnerability of natural habitats” and “identify, preserve and link important areas for the preservation of biodiversity through ecological corridors”.

6. Landscape graphs are one of the most widely used approaches for modelling ecological networks

and measuring landscape connectivity from an operational standpoint. A landscape graph is made up of a set of nodes (the habitat spots for a species or group of species) connected by links representing potential movement paths. Online: [https://www.trameverteetbleue.fr/sites/default/files/fiche1\\_graphab\\_introduction.pdf](https://www.trameverteetbleue.fr/sites/default/files/fiche1_graphab_introduction.pdf)

7. Project Wasteland, a study of the diversity of plants, birds, butterflies, people and their tracks in the urban brownfield sites of Seine-Saint-Denis, carried out with ecologists, anthropologists and artists. Online: <https://www.arb-idf.fr/nos-travaux/publications/terrains-vagues-en-seine-saint-denis/>

8. The biotope area factor (BAF) is an equation that describes the proportion of surfaces favourable to biodiversity (ecologically effective surface area) in relation to the total surface area of a plot. By calculating the BAF, it is possible to assess the environmental quality of a plot or block of land, a neighbourhood or a larger area. Online: <https://multimedia.ademe.fr/catalogues/CTecosystemes/fiches/outil11p6364.pdf>

9. The ecosystems approach to health recognises that there are close links between humans and their biophysical, social and economic environment, and that these links have repercussions for the health of individuals. (Editor's note.)

10. [cartoviz2.institutparisregion.fr/?id\\_appli=re-green](https://cartoviz2.institutparisregion.fr/?id_appli=re-green)





The new Saint-Martin-du-Touch district in the Toulouse metropolitan area.

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## *“Delivering green space for all within a 10-minute walk”*

**Interview with Guillaume Laval,**  
Trees and Biodiversity Officer,  
Plant Heritage and Environment  
Department,  
City of Albi (Tarn).

### KEY POINTS

► To monitor the progress of greening in a number of neighbourhoods, the local authority in Albi (Tarn) has set up a digital monitoring tool. This measure includes a well-being index, based on the distance residents have to travel to enjoy a green space or access a cycle path. However, some local residents see the development of nature in the city as an inconvenience. Outreach and education are needed to help people discover and reclaim the local flora and fauna.

*La Santé en action: Why does Albi want to be recognised as a capital of biodiversity?*

*Guillaume Laval:* The municipality has participated in the Capitales Françaises de la Biodiversité (French Capitals of Biodiversity) competition<sup>1</sup> for around ten years now because we want to showcase our actions and inspire other local authorities. In 2016, we won the title of best medium-sized city. In 2024, we want to promote a new “nature-based solutions” project, focusing in particular on bats. Since bats feed on mosquitoes, we aim to measure the impact of their presence in terms of regulating this population. Rather than setting up CO<sub>2</sub> traps to kill mosquitoes, a costly and energy-intensive solution, we chose to turn

to an ecological engineering solution. Around a hundred bat nesting boxes will be installed in various test sites around the city. For tiger mosquitoes, we are counting on swallows and swifts to control them.

*S.A.: How is the city encouraging the residents of Albi to reconnect with nature?*

*G.L.:* Albi is a town with a population of 51,000 inhabitants and the ambition of their elected representatives is that by 2026 every resident of Albi will have access to a green space within a 10-minute walk of their home. The digital tool to monitor the city’s vegetation programme was launched in 2022. This mapping work will enable us to create a well-being index for the various neighbourhoods based on the distance residents need to travel to find a natural area or cycle path. The municipality is therefore buying up land to provide areas for development and biodiversity conservation. The areas acquired along the Tarn are intended to preserve secure sites for beavers, while others could be transformed into squares or green spaces. This system, which uses satellite photos, will be in place for several years so that we can assess how much vegetation has increased through our initiatives. For example, we have planted over 3,000 trees over the last ten years, but they are still young and not always visible on the maps. In a few years, we should have a developed canopy.

*S.A.: How did you identify that residents felt a need for more nature?*

*G.L.:* We took a somewhat empirical approach. We realised that people spontaneously go to places

where nature is better preserved. For example, in 2007 we laid out a large, modern park, the Parc de La Renaudie, over several hectares; right next to it, in a field that had been somewhat abandoned, we planted fruit trees, ash trees and wild cherry trees, while preserving spontaneous vegetation as part of a differentiated management approach<sup>2</sup>. Residents prefer to stroll around this rural and natural setting, following the paths between grasses and wildflowers, rather than walk through the regularly mown, more sterile park. The same goes for the outdoor leisure areas where we have begun using sustainable management techniques. Here again, people appreciate small natural areas of 6 to 7 m<sup>2</sup> surrounded by trees and vegetation, even when the grass is 50 cm high.

*S.A.: Have you worked with the local authority’s health department on these initiatives?*

*G.L.:* We certainly need to achieve a joint effort, the question being: How can we involve the health department in this ecological approach? We are already seeing closer tangible links. We have a local gardener working with a nurse from the ASALEE<sup>3</sup> network and together they support patients to grow vegetables on land provided by the municipality. A number of initiatives are improving social ties. A good example is the project that introduced conservation grazing to a 3-hectare site previously used as a floodplain. An agreement was signed with a farmer: we provide the land, water and hay; he manages the sheep and goats. The area attracts local residents who come to bottle-feed the lambs or have a go at shearing; local childminders bring toddlers in pushchairs here; children

play in this protected space. A walkway has been laid out around the pond, so that elderly people can take their dogs for a stroll without any problems.

**S.A.: Do local residents appreciate seeing nature restored to these urban areas?**

G.L.: If there's one thing we're careful about it's that residents mustn't get the impression that green spaces are being abandoned. Pavements must remain clear enough to use. There can't be any areas where you would get wet up to your knees just walking through. However, we do have to deal with disapproval, of course. A dirt track with stones is certainly less easy to navigate as you get older. Some people like nature in the city... except when it's near their homes; they call us to report a noisy blackbird under their window and ask us to clear the undergrowth. Everyone wants to have access to biodiversity, without really knowing what that means. People don't always make the connection between the insect in the uncut grass and the bird that will feed on it. We need to do some educational work to explain food chains and food webs<sup>4</sup>. However, feedback from local residents and tourists is generally positive.

**S.A.: Are the people of Albi involved in these projects?**

G.L.: A local biodiversity council has been set up, bringing together the area's institutional partners and stakeholders in the local ecology, including associations and local residents. We organise meetings to keep everyone informed and we offer them the opportunity to participate in projects such as planting hedges or building dry stone walls. Educational guides – such as *Amphibians and Reptiles of Albi* or *Explore Albi's Remarkable Flora* – have been published to provide people with another way to explore nature. In addition, each local authority has a participatory budget, for which residents are invited to submit bids. One example was a suggestion to plant fruit trees. Many of the participatory budget proposals put forward by the people of Albi concern green spaces.

The staff responsible for maintaining the green spaces are fully involved in the process. They can be trained in differentiated management and biodiversity preservation. Many of them appreciate this change of direction, as long as we don't question the value of their work on landscaping and ornamental species. One gardener was upset by the disappearance of the town's orchids, which were regularly being cut down, and suggested that we put up explanatory signs and markers to help avoid this. As a result, 24 different species of orchid now flourish in our area.

**S.A.: Which partners do you rely on to support your initiatives?**

G.L.: We work with a number of partners, including non-profit associations such as the Office for Insects and their Environment, the French League for the Protection of Birds, the French Society of Natural Sciences and the Federation of Hunters, as well as institutions such as the French Ministry of Education, the Regional Biodiversity Agency, the French Office for Biodiversity, the chambers of agriculture and the Departmental Land Management Divisions. We also call on the services of research consultancies for specific problems. These partners offer us their time and expertise in a mutually beneficial partnership, as we give them access to areas for analysis. We have little financial support, other than from the French Office for Biodiversity for the creation of an atlas of biodiversity in the municipality. Most of our projects are self-financed by the local authority, and we don't expect any grants to advance our objectives.

**S.A.: Is the city's budget for biodiversity and arboriculture sustainable?**

G.L.: There is a biodiversity budget, which is protected and balanced, with sums set aside for events, studies, acquisition of equipment and field work. In addition, nature restoration is a theme that runs through our other projects, such as the €3 million renovation of a school, which includes a biodiversity component.

**S.A.: What is your assessment of the current situation?**

G.L.: We've done a lot in ten years, but we're not the only ones. Although we're often cited as an example, we are no more deserving than others. That said, the municipality has decided to set up a delegation with an elected representative dedicated to biodiversity. We are fortunate to be able to experiment without being held back, especially as we have an area that is conducive to the return of biodiversity. Outreach work remains essential. We have to be careful not to go overboard and insist that residents embrace natural areas, at the risk of depleting the nature in these sites and losing the biodiversity that has been reintroduced. When people appreciate a particular space, they end up asking if they can put on a circus or organise a festival or concert there. ■

Interview by Joëlle Maraschin, journalist.

1. For the past ten years, the French Capitals of Biodiversity competition has been identifying and promoting the municipalities and areas with the best nature-friendly practices. It is organised by the French Office for Biodiversity, the non-profit Plante & Cité and the Île-de-France Regional Biodiversity Agency.

2. Differentiated management involves maintaining green spaces in a way that is suited to their characteristics and uses, so pesticides can be avoided.

3. Association between general practitioners and public health nurses to manage patients suffering from chronic illnesses and offer therapeutic education.

4. A food web represents all the feeding relationships between living beings in an ecosystem.

# “Soil is heritage: it must be preserved and passed on”

**Interview with**  
**Raphaël Dormoy,**  
Ecological Transition Officer,  
Ris-Orangis Town Council (Essonne).

## KEY POINTS

► To provide high-quality natural spaces for its residents, the district of Ris-Orangis (Essonne) is implementing a number of projects, from the No Net Land Take experiment to the allotment gardens provided to individuals for pesticide-free vegetable growing. This working-class district in the greater Paris suburbs has an ace up its sleeve: large industrial and agricultural brownfield areas. The pressure to build housing is strong but there is still an opportunity to create a modern town connected to the living world.

*La Santé en action: Why has Ris-Orangis joined the programme “Territoires engagés pour la nature” (Communities Invested in Nature)?*

*Raphaël Dormoy:* The town is committed to the ecological transition in a number of ways and this programme from the French Office for Biodiversity (OFB) is one of them. Ris-Orangis was the only Île-de-France district selected in 2021 in the call for bids launched by the French Agency for Ecological Transition (ADEME) for the No Net Land Take experiment, which aims to preserve natural, agricultural and forestry land. For a working-class area with a population of 30,000 in the outer suburbs of Paris, winning was a real boost. As part of this three-year project, we are mapping urban soils in order to understand their content and assess their ecological functions. This approach is set to revolutionise the way in which the local urban development plan (PLU) is implemented: the soil is no longer seen simply as a surface area on which to build but as heritage that must be

preserved and passed on. However, the situation is rather complex: some land belongs to the municipality and some to private owners, while other areas belong to the state-owned developer Grand Paris Aménagement or to social-housing landlords. The Grand Paris Sud conurbation, to which Essonne belongs, decided to integrate our project which had the effect of amplifying the results across the broader inter-municipal planning policy, known as the Territorial Coherence Scheme (SCoT).

*S.A.: How can land takes be reconciled with projects to reconnect residents with nature?*

*R.D.:* In parallel, we are producing an atlas of local biodiversity to make an inventory of our natural spaces and identify the species living there. The aim is to draw up a PLU that safeguards high-quality soils and habitats conducive to biodiversity. One feature specific to Ris-Orangis is that brownfield sites still account for a third of its surface area. However, the pressure to use this land for new houses remains strong because the district has good public transport links and is bordered by two major roads. The challenge is to deliver an ecological transition while still developing the town. For example, we have just completed a participatory project on the Pré-aux-Vaches brownfield site, which we carried out with around thirty students from the Versailles School of Agriculture. They suggested that the site’s future development should be based on its history, its ecology and the perceptions expressed by local residents. Through this educational, inclusive, site-specific project, local residents reclaimed a space of around

4 hectares. Using landscaping created from natural materials collected and processed on site, pedestrians are guided through the area creating new urban connections. Another 11-hectare brownfield site, originally intended for a housing development, has been converted into the Aunette urban farm. This site, opened in 2023, hosts two organic market gardens set up on 6 hectares that sell their produce directly to customers.

*S.A.: Are local residents involved in these initiatives?*

*R.D.:* It’s important for everyone to be involved, like with the example of the participatory project on the Pré-aux-Vaches brownfield site. Another experiment in participatory democracy, conducted over the course of a year, helped to define the future of a run-down 3.7-hectare urban park, La Theuillerie. Every stage of the assessment included all of the park’s potential users – residents, the nearby college and business centre, local associations – alongside those involved in managing the site: the Green Spaces Department, Maintenance Department and local police. Through this process, comprising around 70 active stakeholders, the project management teams saved time on defining the area’s rehabilitation objectives and development plan. To create our atlas of biodiversity, we are working with the Muséum national d’Histoire naturelle (MNHN) using citizen science protocols. One group of residents has been working to identify and list the town’s heritage trees. Another group has been looking at the spontaneous flora that grows in the cracks under walls: to do this, we asked the Green Spaces Department to stop cutting



back this vegetation. This new practice needs to be explained to people for them to understand the changes they see, particularly local residents who may complain that the streets look unkempt.

**S.A.: Have you set up any initiatives aimed at children?**

R.D.: Following a request from the local children's council, a school composting project was launched. The Environment Centre of Grand Paris Sud supported us in this trial project, which brought together local authority services and staff from the French Education Ministry. Food waste was weighed in the canteens of eight primary schools and composters were installed in three of them, with the aim of equipping five schools by the end of the year. The coordinators at each site were given training that led to certification. The children are fully involved in the scheme, which is also connected to the educational gardens in their schools. In a separate project, a school playground will be completely stripped of artificial covering to make way for facilities that promote children's well-being and biodiversity (trees, an educational pond, etc.). Since the start of the 2023 school year, we have also been trialling a training course in a class of 8–9 year-olds: *Voyage au pays des arbres* ("Journey to the land of trees") is an initiative that has been awarded the Cité Educative (Educational City) label<sup>1</sup>. Throughout the seasons, children follow practical workshops in class and in the forest school to explore the world of trees, their roles, their cycles and their needs, fostering a sense of wonder at the living things that surround them. Still under the Cité Educative umbrella, all pupils aged 9 to 11 have access to a 20-hour course to learn how to ride a bike safely in the city. Nearly 1,000 children were trained this year.

**S.A.: Was it the local authority that identified this need for contact with nature?**

R.D.: This need is implicit. The people of Ris-Orangis have taken full advantage of the high-quality green spaces that have been developed, whether this is the greenway created

in 2015 or the 2 km of pedestrian walkways along the banks of the Seine in 2020. People come here for active walking, running and Sunday strolls. This 2 km walkway includes 11 natural habitats, where 50 bird species and numerous bat species, including three on endangered red lists, have been identified. It's fabulous! In addition, residents have access to allotments provided by the local authority. They grow vegetables there to cook at home, in line with a charter that stipulates pesticide-free growing. To date, 256 families have each been allocated a 100 m<sup>2</sup> plot, with a further 200 families on the waiting list. Despite its proximity to the A6 motorway, this leafy and peaceful site is a communal green space where everyone can take a stroll along the shared paths. This is yet another way to bring nature closer to home, almost to our doorsteps!

**S.A.: Do these facilities strengthen social ties and enhance the well-being of the people of Ris-Orangis?**

R.D.: At the allotments, that's something that really shows. These areas have a real ecological and social purpose. Young people go there to meet up in a beautiful, peaceful setting. There are people from fourteen different nationalities growing vegetables linked to their culinary cultures; they are proud of producing their own food, which provides them with both sustenance and economic well-being. We also have a citizens' project to plant fruit trees in the town, based on the principle of a productive urban space, connected to the living world. Taking care of others and of the living things around us gives us a beacon of hope that we must hold on to in the face of anxiety-provoking predictions of climate change and biodiversity loss. The fundamental link between the ecological transition and health should be a main focus of our actions from the start of the school year in September 2024. Ris-Orangis has just successfully completed the *Bienfaits de l'Environnement sur la Santé* ("Environmental Benefits for Health") scheme run by the Île-de-France Nature and Environment Information

and Events Group (GRAINE). This is a four-day course, funded by the Regional Health Agency (ARS) and the Interdepartmental Environment, Development and Transport Department (DRIEAT). The aim is to give local authority staff working with different sections of the public (young people, retired people, leisure users, urban health workshop scheme, etc.) the knowledge and tools they need to incorporate aspects of well-being, the environment and health into their activities.

**S.A.: Which partners support your initiatives?**

R.D.: ADEME is providing us with financial support to structure the No Net Land Take initiative. We are also working on this programme with the Centre for Studies on Risk, Environment, Mobility and Development (CEREMA), the bank Caisse des Dépôts et Consignations and the Sol Paysage consultancy in Essonne. For our other projects, we work with a number of institutional partners: we receive funding from the Regional Biodiversity Agency and the Conservation of Natural Spaces association for the department of Essonne, for example. For a town of 30,000 inhabitants, with the current constraints linked to rising energy costs and the tax reform concerning second homes, the budget cannot support this type of project without external funding. That said, by positioning the district as an experimental laboratory for the ecological transition, we are at the heart of a network that makes it easier to identify new partners. ■

Interview by Joëlle Maraschin, journalist.

1. Launched in September 2019, the Cités Educatives programme aims to revitalise deprived urban neighbourhoods by involving people through an educational challenge, coordinated by the prefecture, academic services and local authorities.

## How Lahti is using biodiversity to improve the living environment

**Riitta-Maija Hämäläinen,**  
*Sustainable Development Lead,  
Health and Social Services,  
Päijät-Häme county.*

### KEY POINTS

► **The Nature Step to Health programme, implemented in the Finnish city of Lahti and its surrounding county, brings together local authorities, researchers, businesses and schools. It is a great example of a multi-year strategy and plan to promote healthy, sustainable eating, physical activity, active mobility and contact with nature.**

Since 2022, the city and university of Lahti, together with the social, health and emergency services of Päijät-Häme county (population 220,000), have been following a 10-year regional programme to address the complexity of environmental and health issues: Nature Step to Health. The strategy of these three institutions aligns with the national policy to reflect an awareness of interconnected challenges, such as fighting climate change, biodiversity loss and chronic non-communicable diseases with a commitment to Planetary Health. Created in partnership with the national institutes of health, the environment and natural resources, the Nature Step to Health programme brings together a range of stakeholders: public authorities, higher education and research institutions (the University of Helsinki, Lahti-Lappeenranta University of Technology, etc.), businesses (particularly in the agrifood sector) and local communities. The programme requires coordination and collaboration between these stakeholders, and focuses on four major objectives: promoting healthy and sustainable eating, increasing physical activity and active mobility, improving the living environment, including biodiversity, and encouraging contact with nature. Cooperation is now happening

on an international scale, with support from the European branch of the Planetary Health Alliance<sup>1, 2</sup>; the People and Planet conference<sup>3</sup>, organised by the Lahti campus of Helsinki University, brought together 200 participants from several countries.

### A “forest for health”

A wide range of actions and initiatives are designed to deliver the objectives of Nature Step to Health for different population groups. A number of day nurseries in Lahti offer activities in nature, particularly in the nearby forests and parks. Kaisla, a “mobile nature school”, is helping schools to take their classes outdoors. Situated next to the hospital in Lahti, a “forest for health” offers patients, employees and local residents the chance to experience nature – the public can also visit on guided tours.

The general idea is to infuse the four themes as widely as possible into everyone's daily lives. Secondary school pupils and students can take summer courses. The programme supports Masters students working in this field, improving results and developing the aspirations of young people. Nursery school teachers can follow a course on diet and growth. Another example is the professional training given to managers of green spaces, which includes specific modules on renaturing and landscaping.

A wide campaign to share these initiatives and resources has helped to secure funding in the four areas of Nature Step to Health. The various projects, each involving around thirty participants, are being supported by European Union funds earmarked for the Climate Neutral and Smart Cities mission, as part of the Horizon 2020 programme. Lahti is one of six Urban Well-being Labs (like Versailles in France) supported by the €10.5 million European project GoGreenRoutes<sup>4</sup>, which aims to strengthen links with nature. It is in this context that the forest for health near the central hospital has been developed. This is part of a continuum, with GoGreenNext<sup>5</sup> being the current step, providing €6 million

to fund pilot projects that create ecosystems conducive to health and well-being, founded in nature-based solutions.

Meanwhile, in the Lahti region, active mobility is making progress thanks to the Systemic Change Towards Sustainable Commuting (SYCLA) project, delivering bicycle parking, changing rooms and more cycle routes. In schools, a variety of initiatives are driving forward the Planetary Health diet, which is based on national recommendations for the composition of children's meals. Finally, food technology and nutrition courses are being given to secondary school pupils. ■

1. Planetary Health is the health of human civilisation and the state of the systems on which it depends. (Editor's note.)

2. Consortium of 420 universities, NGOs, research institutes and government bodies from over 70 countries. (Editor's note.)

3. <https://use.metropolis.org/people-and-planet-from-theory-to-solutions>

4. <https://gogreenroutes.eu>

5. <https://cordis.europa.eu/project/id/101137209/fr>

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# Delivering access to natural spaces for all city residents

**Ashby Lavelle Sachs,**  
Post-doctoral fellow at the Barcelona,  
Institute for Global Health (ISGlobal).

A growing body of research highlights the benefits of contact with nature, which promotes physical, mental, cognitive and social health [1]. However, research also shows that humans are becoming increasingly disconnected from the natural world. There are many reasons for this, ranging from urbanisation to technology use, changing lifestyles, the difficulty of accessing green and blue spaces due to cost or lack of transport, low awareness of the benefits associated with spending time in nature and the risks associated with climate change [2].

Vulnerable groups have even less contact with nature than privileged groups, due to the lack of natural and recreational areas, as well as safety concerns in their neighbourhoods [3]. This means that environmental inequalities go hand in hand with social inequalities. Typically, people living in wealthier neighbourhoods enjoy more abundant and better-maintained parks, denser tree cover and greater access to nature than those living in lower-income areas [4]. It has been proven that contact with nature in an urban environment contributes to health and well-being; this imbalance therefore plays a role in widening health disparities between different socio-economic groups. This intersection of social, environmental and health inequalities raises the question of what action cities can take. What can they do to reduce the gap and promote access to nature for all? Examples of successful approaches

are presented in this article, together with some relevant urban planning strategies.

## Community gardens deliver psychological and social well-being

Disadvantaged socio-economic groups are more likely to experience health problems or face barriers to accessing healthcare and other essential services. Different approaches to help them reconnect with nature can be beneficial. One useful strategy is community gardens. These are communal green spaces where people from one or more households garden together or side by side [5]. They represent grassroots efforts to bring about positive change at a local level and contribute to broader movements for social and environmental justice.

Community gardens tend to improve the physical health of residents, who have the opportunity to engage in physical activity through gardening and gain access to fresh food. They are increasingly seen as socially active environments, promoting cohesion and a sense of belonging by bringing members together in sharing tasks, practices, seeds, tools, produce and recipes. These interactions are a key element in delivering the potential psychological and social benefits of community gardens. However, studies show that community gardens can also contribute to gentrification and the displacement of vulnerable individuals [6]. Implementing fair greening policies will help to counter this risk.

Several cities in the United States have set up nature programmes designed specifically for disadvantaged groups, such as Baltimore in Maryland

## KEY POINTS

■ **Environmental inequalities go hand in hand with social inequalities: those in poorer social categories have less opportunity for contact with natural environments than more affluent people. The challenge for cities is to remedy the unequal distribution of urban green spaces to promote equity in health and well-being. This issue can be approached in a number of ways. Involving residents in the projects is an essential first step.**

and Philadelphia in Pennsylvania. They provide access to green spaces, facilitate community engagement and promote environmental stewardship. The citizen-driven initiative Backyard Basecamp in Baltimore aims to (re) connect people from diverse backgrounds to the land and to nature [7]. It was created by Atiya Wells, a paediatric nurse who wanted to encourage families, particularly people of colour, to discover and enjoy nearby outdoor spaces. Reconnecting with the natural environment begins with walks in the green spaces of their neighbourhood, followed by nature walks around Baltimore. Atiya and her team have also acquired an abandoned plot of land, which they have named Bliss Meadows. They have turned it into a real urban oasis, with a farm, a pollinator meadow, ponds, woods and orchards [8]. It is now a meeting place and a natural retreat for residents of all ages and social backgrounds.





© Ville de Ris-Orangis

Allotment gardens in the town of Ris-Orangis.

### Counterproductive effects of urban greening projects

Making nature accessible to marginalised communities remains a major challenge, not least because cultural factors play an important role in the effectiveness of interventions.

### PHILADELPHIA COMBINES URBAN NATURE AND JOBS

In Philadelphia, the *Pennsylvania Horticultural Society* offers training and support to residents with employment difficulties who are looking for opportunities in the horticulture and landscaping sectors [9]. In addition to training in horticulture, the upkeep of green spaces and management roles, this programme offers job preparation workshops, as well as links with social services and job placements. Since 2010, 250 people have participated, 90% of whom have completed the programme. Of the graduates, 97% found employment with local minority-owned companies. Many of them work for organisations that clean up empty lots in Philadelphia and green them. These people are helping to make the city a healthier, more welcoming environment for everyone.

For example, data show that people who identify as Latin American largely prefer to spend time outdoors with their immediate or extended family, and are more socially motivated by leisure activities than other ethnic groups [10]. However, studies carried out to date to identify preferences for outdoor activities and social nature-based prescribing have focused mainly on individual rather than family participation. It is essential to consider cultural preferences, beliefs and traditions when designing and implementing nature programmes to ensure they resonate with the target audience.

What's more, actions taken by local authorities can have counterproductive effects. This can happen when the approach focuses only on health, overlooking the equity and social justice implications of greening urban spaces [11; 12]. It is critical to consider the concept of "green gentrification" in any urban renaturing project. This term refers to new, more affluent residents arriving in previously low-income neighbourhoods, where investments are being made to develop parks and greenways, plant trees and improve the environment [13]. This is a major challenge for many municipalities [14], where private sector economic stakeholders

are involved in restoring neighbourhoods that have suffered decades of under-investment. Rising house prices resulting from gentrification are displacing former residents who can no longer afford to live there. The solutions for avoiding this phenomenon are complex and require coordinated action [15]. By bringing together those involved in housing and green space management, towns and cities can give themselves the means to invest in greening programmes that improve the urban living environment for all.

### Strategies to combat these inequalities

It is crucial to promote social equity alongside urban greening initiatives to ensure that the health benefits associated with natural spaces are accessible to the entire population. Different strategies can be put in place to achieve this.

### Community engagement and participation

Particular efforts should be made to engage those living in marginalised or poorly served areas in developing and implementing greening and rewilding projects, bearing in mind the possible effects on health (allergies, injuries, vector-borne diseases,

sheltered or cool-down areas to protect against the heat, etc.). Local residents should be encouraged to contribute, their needs and preferences should be heard, they should be empowered to take ownership of the natural spaces in their neighbourhood.

### *Equitable distribution of green and blue spaces between neighbourhoods in public planning policy*

Prioritising investment in underserved populations helps to remedy historical disparities in access to nature, while ensuring that sites are of high quality and safe.

### *Accessibility*

When designing natural spaces, it is important to ensure that they are inclusive and welcoming to people of all ages, abilities and backgrounds. This means incorporating features such as wheelchair-accessible paths, places to sit and sufficient shade for all users to enjoy the space.

### *Cultural events*

Offer activities within the green spaces that reflect the cultural diversity of the residents, while protecting the natural environment. This might involve celebrating traditions, organising events and offering educational activities in conjunction with the local population. All these actions help to cultivate a sense of belonging and attachment to the neighbourhood.

### *Combating gentrification and exclusion of people on lower incomes*

It is essential to work with all stakeholders to develop strategies to mitigate the impacts of renaturing projects, such as an affordable housing policy or community land trusts.

### *Training and job opportunities*

Alongside urban greening projects, it is worth setting up career pathways that lead to serious employment and economic stability by offering training in landscaping, horticulture, conservation and other related sectors.

### *Data collection and assessment*

Prior to any intervention, it is crucial to gather knowledge about the demographic profile of users of green spaces, as well as their habits and preferences, in order to inform decision-makers and make sure that these places meet the needs of all residents.

In conclusion, addressing the inequitable distribution of urban green spaces is critical for promoting health equity and well-being among vulnerable populations. Further research is needed to better understand the barriers to access and the effectiveness of nature interventions in diverse communities. Policy makers, urban planners and local stakeholders must work together to implement greening and housing strategies that ensure access to nature for all. ■

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# “The working classes derive fewer benefits from urban greening initiatives”

## Interview with

**Isabelle Anguelovski,**

Professor at the Institute of Environmental Sciences and Technologies,  
Universitat Autònoma de Barcelona,  
Director of the Barcelona Lab for Urban Environmental Justice and Sustainability.

## KEY POINTS

► The European research project **Green Locally Unwanted Land Uses (GreenLULUs)** is analysing the social impact of urban greening projects on the neighbourhoods in which they take place. In the European and North American cities studied, the creation of parks and greenways generally led to middle and lower-income households having to leave regenerated areas. However, there are tools available to prevent this phenomenon.

*La Santé en action:* **What are the objectives of the Green Locally Unwanted Land Uses (GreenLULUs) research project that you coordinated?**

*Isabelle Anguelovski:* We studied the effects of renaturing or greening programmes carried out in 30 cities in North America and Europe. We indexed and geolocated the new green spaces and nature restoration initiatives implemented between 1990 and 2017, whether these were community gardens, urban forests, small recreation or play areas, and so on. In parallel, we created a gentrification index<sup>1</sup> to characterise the social exclusion, displacement or eviction of disadvantaged populations. This index takes into account the level of education and income

of residents, as well as their ethnicity. Our research aims to measure how the creation of green spaces contributes to the gentrification of a city's neighbourhoods. We wanted to find out if it was possible to isolate a “green variable”, independent of other variables such as a neighbourhood's proximity to the city centre, public transport provision or property development. In the majority of medium-sized towns studied, we show that urban greening explains gentrification. In some cities, it is the main driving force, as in Nantes in France, Seattle and Atlanta in the United States and Vancouver in Canada. In others, such as Barcelona, property development and greening have together played a role in gentrification.

*S.A.: How is green gentrification flourishing?*

*I.A.:* In the case of Barcelona, for example, the development of tourism has been an accelerating factor. The city's greening projects have seen several phases, including the “super-blocks”, formally and strategically launched during Ada Colau's<sup>2</sup> first term in office. These are residential blocks where public spaces, mobility and vegetation have been conceived to provide residents with green spaces, pedestrianised streets and cycle paths. However, these islets have been taken over by hotel and rental property developments and appropriated by tourists. It's a phenomenon that has been observed in southern European cities that are popular with visitors, such as Barcelona, Lisbon, Florence and Venice: tourist

accommodation, such as Airbnb-type flats (mostly owned by large international landlords), is concentrated in leafy districts, where residents no longer have the financial means to stay or move in. Since 2010, Nantes has been striving to become a high quality of life (HQL) urban community by cultivating an image that is both culturally and environmentally attractive. This positioning has attracted the working population of Paris and foreign tourists, leading to a surge in property prices. In Boston, in response to climate change, the East Boston coastline has been redeveloped with the creation of parks and the restoration of wetlands. However, luxury property developments have cropped up along this seafront, built on an elevated section. Behind them, homes for less well-off households remain in flood-prone areas.

*S.A.: Does urban greening necessarily lead to exclusion of middle-income or disadvantaged populations?*

*I.A.:* Not always, but it's happening more and more in large cities because of the magnetic attraction of greenery. Today, we are seeing competition between cities, competitive urban planning to determine which will be the greenest and most attractive in terms of quality of life. Being positioned as a green town offering a high quality of life leads to speculation in the property market for luxury housing. Middle or low-income residents are forced to move to the outskirts, to neighbourhoods with more concrete and greater exposure to pollution. And the green spaces





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The Jardin Extrordinaire, a new public park in the city of Nantes, installed in a former quarry.

there are of poorer quality, as they are run-down or unsafe. This means that the working and lower middle classes derive fewer benefits from urban greening projects. What's more, they generally don't have the option of remote working or flexible working hours that would allow them to move away from the city to work in a more rural area. They often have to live near to their place of employment but in neighbourhoods that are less expensive, perhaps because they are close to a source of industrial pollution, for example. These areas are also more unpleasant to live in during heatwaves, as there is less vegetation so fewer cool areas. We have also observed that this social exclusion is coupled with cultural exclusion, meaning people feel like the new green spaces are not for them. In Boston, the seafront has now been taken over by the white population for jogging; the young people of the neighbourhood do not feel welcome to play different sports there. In the greened pedestrian zones, trendy cafés are springing up, serving vegetarian food and brunch, which are not part of the cultural habits of the long-standing residents. These are examples of "disruptive landscapes", as my colleague Margarita Triguero-Mas calls them, in which the original inhabitants no longer fit in and feel disconnected. In Barcelona, in the refurbished neighbourhood of Santa Caterina i Sant Pere, a survey we conducted among families at a

primary school showed that over 65% of people expressed dissatisfaction with public green spaces and play areas, or a feeling of not being welcome.

**S.A.: *How can cities be both green and fair?***

**J.A.:** The Barcelona Lab for Urban Environmental Justice and Sustainability has published a practical guide offering 50 urban planning tools to prevent green gentrification. In order to avoid exclusion, urban nature projects must be considered in conjunction with social and housing policies. Many of these tools are compatible with initiatives that promote access to affordable, quality housing, such as increasing public housing stock or the funds allocated to social landlords for building or improving the energy efficiency and landscaping of homes. Programmes to encourage the construction of housing accessible to low-income households are needed: developers should be allowed to increase housing density in a given area as long as they commit to setting aside part of it for social housing. Regulations could also require them to invest in public green spaces, which would help ensure sufficient budgets to finance new green spaces elsewhere in the city. The guide also highlights the housing transformation policies and cooperative housing models used in Germany and the Netherlands. We should also mention the most assertive policies

for a right to return aimed at Black populations who have been displaced from regenerated neighbourhoods; one example is in Portland, with the adoption of the North/Northeast Preference Policy, based on the construction or renovation of housing at affordable prices and reserved as a priority for people with generational ties to these areas. Rent controls are another option; these are used in Berlin and Washington. Fairness means avoiding gentrification, but also investing in the quality of life in more working-class and peripheral neighbourhoods. A public budget must be set aside for various greening projects. Green gentrification, driven by new infrastructure to combat climate change, is not irreversible. ■

Interview by Joëlle Maraschin, journalist.

1. The process by which the population of a working-class neighbourhood gives way to a more affluent social stratum. (Editor's note.)

2. Mayor of Barcelona between 2015 and 2023. (Editor's note.)

**For more information**

- E. Oscilowicz, I. Anguelovski, H. Cole, A. Cañizares (coordinators and editors.) *Policy and Planning Tools for Urban Green Justice*. Barcelona: Barcelona Lab for Urban Environmental Justice and Sustainability, 2021: 251 p. Online: <https://www.bcneuj.org/wp-content/uploads/2021/04/Toolkit-Urban-Green-Justice.pdf>
- 'Right to return' policy in Portland. Online: <https://habitatportlandregion.org/a-right-to-return/>

# *“A symbolic barrier can make places inaccessible, even though they are open to all”*

**Interview with Lucie Cattaneo,**  
Social health psychologist,  
Medical Assessment Service,  
Marseilles Public Hospitals (AP-HM).

## KEY POINTS

► Hiking along the coast in the Calanques National Park, taking a boat trip to explore the Frioul islands, compiling a herbarium and visiting the natural history museum are some of the small group activities offered to people in financial hardship as part of a study carried out in Marseilles. They meet once a week for ten weeks, accompanied by two group leaders. The RECETAS project, which was launched in the summer of 2023, aims to assess the effectiveness of nature-based social prescriptions to counter social isolation in urban areas. The project is running simultaneously in several cities, including Barcelona (Spain), Helsinki (Finland) and Melbourne (Australia).

### *La Santé en action: What is the RECETAS project?*

Lucie Cattaneo: Launched in 2021 and supported by the Barcelona Institute for Global Health (ISGlobal), the RECETAS project aims to study the effects of nature-based social-emotional interventions on certain populations at particular risk due to loneliness. Funded by the European Union as part of the Horizon 2020 programme's innovation component to the tune of €5 million over five years, it brings together twelve multidisciplinary international research teams. Six of them are running field studies in different sites around the world: at Marseilles Public Hospitals (AP-HM) in France, Barcelona (Spain), Prague (Czech Republic), Helsinki (Finland), Melbourne (Australia) and Cuenca

(Ecuador). In these cities, the aim is to test group activities that include access to nature with different target populations experiencing social isolation. In Marseilles, the individuals involved are impacted by multiple types of vulnerability: financial, social, health-related, etc.; in Melbourne, the project is aimed at refugees and LGBTQI+ people; in Helsinki and Prague, the elderly, and so on.

These initiatives are based on a group facilitation methodology that has been used in Finland for ten years, known as the Circle of Friends. Isolated elderly people are invited to take part in activities together, supervised by group leaders trained in understanding and dealing with social isolation, on a weekly basis for ten to twelve weeks. This initiative, which 16,000 people in Finland have already taken part in, has produced good results in terms of reducing psychological suffering and loneliness, as well as cutting healthcare costs.

### **S.A.: What are nature-based social prescriptions?**

L.C.: Social prescriptions are commonly used in Canada and Northern Europe, but are still little known in France. It involves professionals in the medical and social work sector – doctors, nurses, educators, youth workers or psychologists – being able to “prescribe” group cultural and sporting activities. The aim of RECETAS is to assess if this approach can be applied to nature activities to effectively counteract loneliness within urban areas among the most exposed populations, and to improve their quality of life. In fact, there have been no

previous scientific assessments of nature-based social prescribing, so there is currently no conclusive data on its effectiveness. Nevertheless, the project is based on hypotheses from numerous studies and previous action research projects that have demonstrated the beneficial effects of nature on overall well-being, as well as on building social connections.

In Marseilles, we have co-developed a wide range of “nature” activities with local partners involved in urban nature and environmental awareness projects. These include outings to the town's Parc Pastré, picking herbs and plants to make a herbarium during semi-urban walks or in places where picking is permitted, visiting an educational farm or the natural history museum, hiking along the coast in the Calanques National Park, taking a boat trip to the Frioul Islands, gardening or greening the outdoor spaces where participants live, writing and painting workshops using natural inks, and more. The protocol involves offering between six and ten sessions of nature-related activities, held once a week in small groups.

### **S.A.: How do you recruit the people who benefit from these activities?**

L.C.: We have approached a number of organisations, including community centres, homelessness shelters, emergency accommodation and social reintegration centres, reception centres for asylum seekers and various other associations. We began by presenting the project to the professionals to discuss how relevant it would be to the users of their facility and we also discussed the possibility of





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organisations that support these people. Many associations already offer this type of social activity in natural spaces so it's important to build on what already exists.

**S.A.: *How is the study being evaluated and do you have any initial data?***

**L.C.:** To determine the effect of nature-based social prescriptions, we interview participants before they enter the study and again at the end of the ten sessions. The plan is to see people again one year after the end of the intervention to assess their longer-term benefits. The questionnaires cover quality of life, loneliness, reconnecting with nature, physical activity and mental well-being. The six pilot teams in the different cities are implementing this intervention simultaneously. In time, we should be able to collect data from between 1,300 and 1,500 participants to assess the programme's impact on feelings of loneliness and quality of life. The consortium plans to organise an event in Marseilles in 2026 to present the results of the RECETAS project. Local public bodies (such as departmental or regional administrations, regional health agencies) will be invited to attend, with the aim of encouraging the introduction of nature-based social prescriptions in care and social-emotional support pathways. In Marseilles, we have not yet analysed the initial data from the questionnaires. However, the initial feedback is pretty encouraging and positive. People say how good it feels to be in a group and in nature. Firstly, they feel part of a community and can talk about their problems. In addition, activities linked to nature have a calming and anxiety-reducing effect, allowing them to escape from the struggles of everyday life. In a way, the objective has already been achieved, although we'll know more as we analyse the data. We also hope to be able to take more concrete action, in partnership with local organisations, addressing the social determinants of health that are hampering the well-being of these people. ■

Interview by Joëlle Maraschin, journalist.

creating a group. Secondly, we meet the potential study participants and talk to them at length, meeting a number of times, to build a relationship of trust that will make the volunteers feel safe. This process can take time, and it's not easy to build up a community of people who are prepared to make a commitment over several months. What's more, we are only a small part-time team working on this project: the head of the AP-HM medical assessment department, two psychologists and a group leader who is a former eco warden and facilitator at the Calanques National Park. The experiment began in spring 2023, with three groups of around ten people in each. Two others have been set up for winter 2024.

**S.A.: *Have you encountered any difficulties putting this project into action?***

**L.C.:** We are faced with a number of obstacles when it comes to recruiting participants and getting them involved. The people targeted in the Marseilles study are living in complex circumstances, in precarious employment or looking for work, often

with young children. These men and women are generally from a migrant background and they are dealing with physical and mental health problems, especially anxiety and depressive disorders. We have to proceed slowly to build a bond of trust, gradually helping them to leave their homes. These people are stigmatised and discriminated against at every level and it remains very complicated for them to access their rights. They feel like they aren't allowed to go out and explore other areas, go to the beach, to a park or to a museum, so they don't go. A symbolic barrier can make these places inaccessible, even though they are open to all. Some people have been in Marseilles for years, or even their whole lives, and have never seen the Calanques.

We can't just drop them after ten sessions – that wouldn't make any sense. We continue to offer them outings and events, while keeping the group alive outside the study. In Marseilles, we're looking to establish the project over the long term. We are trying to keep up momentum locally to create long-term partnerships with the professionals and



# “You have to experience the positive effects of nature for yourself to be convinced”

## Interview with Claudel Pétrin-Desrosier,

Family doctor,  
Planetary Health lead at the Department  
of Family Medicine and Emergency  
Medicine at the University  
of Montreal Faculty of Medicine,  
Chair of the Quebec Association  
of Physicians for the Environment.

## KEY POINTS

► In Quebec, the Prescri-Nature programme promotes spending time immersed in a natural environment. Free entry to major Canadian parks can be offered by participating health and social care professionals but a walk in the wilderness isn't the only way to improve well-being. Looking at plant life while sitting on a park bench or digging soil in a community garden also does the trick.

## *La Santé en action: How did Prescri-Nature come into being in Quebec?*

*Claudé Pétrin-Desrosier:* We started to become aware of the issue in 2020, during the COVID-19 pandemic and lockdowns, when people were forced to stay at home. Health professionals, including several members of the Quebec Association of Physicians for the Environment, started encouraging their patients to get out and about in nature to preserve their mental health. Then, in November 2020, the British Columbia Parks Foundation launched Canada's first nature prescription programme, called PaRx, which allows doctors, nurses and other health specialists to prescribe free admission to the province's parks. The programme then expanded in other parts of the country,

such as Manitoba and Saskatchewan. Prescri-Nature is the French language version, adapted for the people of Quebec.

## *S.A.: What does it actually involve?*

*C.P.-D.:* In Quebec, we champion a programme promoting the health benefits of exposure to nature. We have chosen not to highlight free admission to the parks, although professionals who register on the Prescri-Nature website can prescribe this for their patients. We want to make the programme universally accessible and avoid sending the message that you have to see a doctor to get access to a nature prescription. The aim is to raise awareness among the general public and the health community about the benefits of nature for physical and mental health, as supported by the scientific literature. This information needs to be spread widely in mass media for the general public. Professionals need training to take on board this knowledge and incorporate it into their day-to-day practice. This is all the more important as the subject is not covered in the medical school curriculum. From the very start, it was essential for us to look for partners and now the programme is recognised and supported by a number of professional bodies, including the Quebec College of Physicians, the Quebec Order of Nurses, the Order of Midwives, the Order of Social Workers, the Psychiatric Association, the Association of Preventive Medicine Specialists, and the faculties of medicine at Laval, Sherbrooke and Montreal universities. We use the word “prescription” in a very broad sense, because some of these

professions cannot legally prescribe: they are more like recommendations. However, talking about nature as a prescription is easier for everyone to understand. The idea is to incorporate it into an arsenal of advice that different professionals can offer in line with their practice, from psychologists to social workers.

## *S.A.: What might these nature recommendations be?*

*C.P.-D.:* It might be sitting on a park bench and contemplating, walking by the water, putting a bird feeder by your window, having a picnic in the countryside or gardening. The idea often comes as a surprise, because people aren't used to it. However, when this suggestion is accompanied by a documented presentation, curiosity takes over. People instinctively feel that nature is good for them. When you ask someone to close their eyes and imagine themselves in a soothing place, they often picture themselves in nature and rarely in a dense, noisy urban environment! Natural prescribing is not treatment, even though it may form part of a care strategy. The data shows that exposure to a natural environment can be beneficial in the management of chronic pain, depression or anxiety disorders. It can be used in addition to medication, psychological treatment, mindfulness meditation, etc. We need to adapt to patients, to their needs, but also to their values.

## *S.A.: Is the Prescri-Nature programme based on firm evidence?*

*C.P.-D.:* There have been two major studies whose results we can cite. The first study [1], which looks at the physiological effects of natural

therapies, was carried out in Japan on a sample of 280 participants with an average age of 21 and no health problems. Half the group spent the first day in the forest, walking or contemplating; the other half did the same thing for the same length of time in an urban area. Then, on the second day, the groups were reversed as a control. The results showed that forest “bathing” reduced levels of cortisol (often called a stress hormone) in the saliva, both systolic and diastolic blood pressure and heart rate. The second study [2], conducted in the UK among 20,000 individuals, concluded that people who had at least 120 minutes of “recreational contact with nature” over the previous seven days reported better perceived health or a higher index of well-being than those who had not had any connection with a natural environment. Positive effects are seen even in the 0 to 60 minutes bracket, reaching their highest score in the 120 to 180 minutes bracket. That’s why we recommend a universal prescription of 15 to 20 minutes per session for a total of two to three hours a week. Of course, it’s not realistic for everyone; for some people – those who don’t leave their homes, or those who have mobility problems – it’s too big a step to take. We need to take things slowly. However, you don’t have to be physically active to enjoy the benefits of nature, although it is a plus. If the idea of physical activity is seen as a barrier, a more sedentary form of immersion in nature, geared towards observing plants and wildlife, can be an alternative.

**S.A.: What obstacles do you see people facing?**

C.P.-D.: The first is undoubtedly accessibility, in particular the obstacle of geography. However, it is possible to work on the perception of what a natural area is. We need to make people understand that they can enjoy the benefits of nature without necessarily going to a remote wilderness but also by going to an urban park, a community garden or a courtyard planted with trees and flowers. The literature shows us that “the impression of being in nature” is an important factor. Obviously,

if a neighbourhood’s infrastructure doesn’t measure up, that will be an obstacle: residents don’t want to go to an urban park that isn’t safe, where the benches are broken, and so on. Lack of time can seem like a problem, as does changing a lifestyle habit. The same dynamics are at work as for stopping smoking or starting exercising: you have to enjoy yourself and experience the positive effects of nature for yourself to be convinced. Guidance and support from professionals, having a social network to rely on or the support of a community group, are all facilitating factors.

**S.A.: What are the findings of the literature review you carried out for your dissertation on the effectiveness of nature prescribing programmes?**

C.P.-D.: Firstly, structured programmes such as PaRx or Prescri-Nature are still rare and have only come about recently internationally. This means that has been no scientific assessment of their direct beneficial effects. While data exists on the link between immersion in nature and improved physical and mental health, there are still areas we don’t understand. For example, if forest “bathing” leads to a drop in blood pressure, does this drop last? And if so, for how long? Nevertheless, the body of knowledge is sufficiently convincing for us to include exposure to nature in our recommendations. In addition, no harmful effects have been documented. The only possible contraindications are for people suffering from seasonal allergies, but we can point them in the direction of natural environments where they will be less exposed. People are also worried about Lyme disease, which is on the rise in Quebec as a result of global warming. However, it is entirely possible to protect yourself by wearing long sleeves and trousers to avoid picking up ticks and/or inspecting your body when you return from a walk. It just means adopting a set of good practices to make sure that you only benefit from being immersed in nature. That’s why it’s a good idea for professionals to support this approach by issuing a “prescription”. Along these lines, a structured

programme promoting exposure to nature, deployed on a large scale and taking into account social inequalities in health, could prove to be an innovative measure in primary and secondary prevention. This has even more potential if it is accompanied by intensive greening measures in the most depleted urban areas. ■

Interview by Nathalie Quéruel,  
Editor-in-Chief.

**For more information**

- Prescri-Nature programme.  
Online: <https://www.prescri-nature.ca>
- Introductory training in Prescri-Nature for healthcare professionals.  
Online: [https://www.youtube.com/watch?v=BFBn1slirVQ&t=2s&ab\\_channel=BCParksFoundation](https://www.youtube.com/watch?v=BFBn1slirVQ&t=2s&ab_channel=BCParksFoundation)

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# “A vegetable garden is a wonderful way of awakening the senses in young children”

**Interview with**  
**Stéphanie Lubrano,**  
Director of the Mil'mouch nursery,  
at Bray-sur-Seine (Seine-et-Marne),  
**Claire Grolleau,**  
Chair of the association Label Vie.

## KEY POINTS

► **Genuine contact with nature is essential for the emotional and social development of young children. This notion is one of the ten principles of the French national charter for preschool childcare, created by ministerial decree on 23 September 2021. A number of facilities have already embarked on this path, supported by the association Label Vie, including the non-profit Mil'mouch nursery in Seine-et-Marne. The crops growing in the garden, along with the plants and small animals in the green space, are all proving to be a solid foundation for learning. Best practices, particularly concerning sustainable food, are catching on among families, who get involved in the project through workshops.**

### *La Santé en action: What is different about the Mil'mouch nursery?*

*Stéphanie Lubrano:* Located in a semi-rural area of Seine-et-Marne, our nursery has 32 places and employs a dozen childcare professionals. This staff ratio is higher than average and means that children aged between 3 months and 3 years are better cared for, as well as improving the quality of life at work. The non-profit nursery is part of a family services centre within the First 1,000 Days project<sup>1</sup>. We found out about Label Vie through the Family Benefits Service (CAF).

They awarded us a grant to build our facility, which was awarded the Ecolo crèche® (“Green Childcare”) label in 2020.

### *S.A.: What does the Label Vie association offer?*

*Claire Grolleau:* Since 2009, we have been supporting structures that cater for vulnerable groups (nurseries, leisure centres) in their ecological and social transition by promoting new practices through the Ecolo crèche® label. We have helped almost 1,600 organisations since that date, impacting almost 50,000 children. We focus on different aspects such as water, energy and waste management; our global environmental approach allows us to explore the fields of sustainable food, gardening and biodiversity, along with the well-being and health of children and staff alike. We champion a holistic view of health that includes all living beings, through multifaceted and participatory approaches, in order to restore the power of agency to everyone. Our association has become a benchmark for institutions such as the National Family Benefits Service (CNAF) and the Department for Social Cohesion (DGCS), who have been members of our strategic committee for several years and with whom we work to develop public policy. This is a substantial partnership to support the ecological transition in the early childhood sector. Our actions are evaluated by a third party as part of the impact contract with the French Agency for Ecological Transition (ADEME), which is monitoring our project.

### *S.A.: What role does nature play for the children at Mil'mouch?*

*S.L.:* We have an outdoor area of 800 m<sup>2</sup>, including a courtyard of 250 m<sup>2</sup>, a vegetable garden of 300 m<sup>2</sup> and a “wild” area of 250 m<sup>2</sup> with a small pond, shrubs, grass, etc. In the garden, there’s a “seeds for artists” corner where we sow plants that we use to produce natural paint with the children. There are fruit bushes (raspberries, mulberries, redcurrants, etc.) and we grow a wide variety of vegetables: no potatoes as they take up too much space, but we do have lettuces, cabbages, carrots, chard, spinach, onions, radishes and even tomatoes. These crops provide 80% of the vegetables needed for meals. We do as many activities as possible outside, in the garden or on the banks of the Seine. Working in the vegetable garden, whether preparing the soil at the end of winter, planting, tending or harvesting, is a wonderful way of awakening the senses in young children. You should see them discovering earthworms or snails! For those who can’t walk or crawl yet, we have sensory containers that we fill with earth, leaves, moss, small pieces of wood and so on. Contact with nature stimulates children’s creativity.

*C.G.:* For staff in the childcare sector, it’s no longer a matter of course to take young children outdoors and provide early-learning activities linked to nature. The semantic change in the French term for the profession is also interesting: it used to reference gardens, calling nursery school teachers “jardinières d’enfants” (“child gardeners”), before evolving into “early years educators”. Over



have produced a bibliographic summary of scientific work for members of our network, focusing on the way in which nature can positively shape microbiota, which are mediators of health, particularly in the early stages of life. We have also seen a 34% drop in absenteeism among staff at nurseries involved in this type of approach. This is undoubtedly because these participatory management projects mean that they can get involved to a greater extent, giving them a greater sense of job satisfaction by looking after children in better conditions.

### A PROJECT TO HELP ALL AGES (RE)CONNECT WITH NATURE

How can we encourage young children and the parents or professionals who look after them to be more in touch with the natural environment? This is the objective of the Experiences of Nature project, run by the association Label Vie in conjunction with partners from the children's, education and environment sectors. It aims to provide practical support for adults through educational tools listing activities in nature to "take the first step" and through a community on social media for exchanging ideas and practices.

In early 2025, an online citizen-science platform will be launched, in part to record children's various experiences of nature. "Sensory interaction with natural elements, encountering living things" can take the form of games, walks, sensory experiments, artistic creations and so on. This project is the subject of a research programme based on data collected by the collaborative platform and qualitative interviews. Its aim is to define the effects on the development of young children, but also on the well-being of those around them, and on the quality of the child-adult relationship. This work is supervised by the Centre for Ecology and Conservation Sciences (CESCO laboratory) at the Muséum national d'Histoire naturelle and the Centre for Research into Social Connections (CERLIS laboratory), a mixed research unit of the French National Centre for Scientific Research (CNRS), attached to the Paris Cité and Sorbonne Nouvelle universities. It has received funding from the French National Research Agency (ANR).



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the last few decades, concerns about safety and hygiene have meant that we have replaced natural areas with petroleum-based soft floors; all toys are now made of plastic that can be disinfected. And the children have fallen out of touch with the earth. But is it better for their development to be in contact with polymers or living organisms? The association offers training in leading educational gardening and sustainable food production. For young children, growing the food that will end up on their plates is a learning process that combines curiosity, patience and effort.

S.L.: At Mil'mouch, the food is cooked on the premises, using ingredients from the kitchen garden, supplemented by locally sourced produce. We have changed our menus to offer a more plant-based diet, while maintaining an intake of animal protein in line with the guidelines from the Mothers and Early Years Service (PMI). Children are less reluctant to taste unfamiliar foods or foods that don't look like their meals at home – for example, carrot sticks instead of breaded fish – because they will have seen these vegetables growing in the garden, and will have picked and cleaned them.

S.A.: ***What does this kind of contact with the natural elements offer young children?***

S.L.: Nature is an everyday laboratory where children experiment with many things, where fundamental learning takes place. It's a space that stimulates motor skills, creativity, relationships with others and independence. I find that the children are more composed, more attentive. They also fall ill less often and generally sleep better.

C.G.: Nature encourages free play and exploration, something that educators and child psychologists have been recommending for a long time. We have also observed that the rate of child absence due to illness is falling in nurseries that have adopted eco-friendly practices, according to the figures we monitor each year. However, it remains difficult to isolate the "nature factor" from other factors such as reducing the use of polluting cleaning products that are harmful to the respiratory tract. Nevertheless, contact with the natural environment plays a role, as children are exposed to a wide variety of micro-organisms, the vast majority of which are non-pathogenic, which boosts their microbiota and strengthens their immune system. We

Feature

Preserving Nature to Protect Human Health



**S.A.: Do you see any obstacles to this immersion in nature?**

C.G.: Some families don't want their children to get their clothes dirty. Educational gardens can also be seen as generating extra work for staff, whether childcare assistants, educators or cleaners. That's why it's important to share the project with the whole team. Parents also fear exposure to potentially toxic plants, or contamination of green spaces by animal droppings. Education is needed to counter the fear of nature and its supposed dangers, and to show that there are more benefits than risks for their children. Informing them of existing practices in other childcare facilities where everything is going well helps to remove these obstacles.

S.L.: When parents come to enrol their children, we tell them about the Mil'mouch project. We ask them to dress their children appropriately for

the garden, explaining that the activities take place in small groups and that digging in the soil does not put their child in danger. We post photos at different points during the nursery day, which allows us to convey our vision of childcare. We also organise workshops for families. Some already have vegetable gardens but don't know how they can involve their children. We show them how to get children gardening, preparing meals, making compost and so on. These discussions help to ensure that messages about environmental protection, which goes hand in hand with health protection, are better received and understood. We want everything we do in our organisation to catch on among the families, so they can use the ideas and put them into practice at home, on a day-to-day basis. At the same time, care must be taken to recruit staff who, on top of qualifications and experience, must also

share these values: a relationship with nature, a home-made focus in activities, etc. Otherwise, it's not going to work as it should.

**S.A.: Can the cost of an educational garden represent another issue?**

S.L.: I don't notice any additional costs, as we use produce from the garden in the kitchen. Admittedly, this requires more creativity. We appeal for donations of seeds and plants, which means we have to keep traceability records to comply with health regulations. To our delight, this approach gave us a wide variety of tomato plants, all of different shapes and colours that really interested the children. We also use permaculture: to build our "lasagne garden", we asked parents to bring in small pieces of wood, which encouraged them to get out into the countryside with their children.

C.G.: There can be an additional cost to creating a green space in a concrete nursery. Through its fund for the modernisation of childcare facilities, which has been allocated 242 million euros for 2023–2027, the CAF provides funding to carry out work such as removing artificial impermeable coverings, creating a garden or installing a planted pergola to provide shade, coolness and biodiversity. In this way, the institutions are supporting the efforts of childcare professionals to restore nature, which is synonymous with a general improvement in well-being in our facilities. ■

**Interview by Nathalie Quéruel,  
Editor-in-Chief.**

1. The "Maison des 1000 premiers jours" ("Family Centres for the First 1,000 Days") project was recommended in the report submitted in September 2020 by the Cyrulnik Commission. Online: <https://www.1000-premiers-jours.fr/fr>

**For more information**

Order of 23 September 2021 creating a national charter for early-years childcare. Online: <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000044126586>; <https://solidarites.gouv.fr/charte-nationale-pour-laccueil-du-jeune-enfant>



# *“In nature, students help each other and cooperate more than in the classroom”*

## **Interview with Élise Sergeant,**

School teacher in Mancenans (Doubs),

## **Sarah Wauquiez,**

Psychologist, author.

### *La Santé en action: What is “outdoor schooling”?*

*Élise Sergeant:* Outdoor schooling has been growing over the past 20 years in various countries, including Denmark, Germany and Switzerland, whereas in France it is a recent phenomenon. The idea is to give lessons in nature, one half-day a week, during which we work on all the skills and fundamentals of the school curriculum: maths, literacy, etc. And what better way to learn about the natural sciences than in the living world? I’ve always been convinced that it’s difficult to teach children who are cooped up between four walls, sitting for six hours a day. How can we teach our pupils if we prevent them from using their bodies and senses? Along with four other school teachers, I took part in the action research project *Grandir avec la nature* (“Growing Up with Nature”)¹, launched in 2018 in the Burgundy-Franche-Comté region. Around 20 more teachers joined the project in subsequent years, despite the COVID-19 health crisis. Today, there are almost 200 of us practising outdoor schooling in the region, which means that approximately 4,000 pupils benefit from it.

### *S.A.: What are the benefits of teaching in nature?*

*Sarah Wauquiez:* The report “Outdoor teaching in Burgundy-Franche-Comté”, which I coordinated, describes this project. It explains how this kind of practice can be delivered through state education in France and what it offers for children and school teachers. First and foremost, it has an impact on pupils’ physical and mental health. They learn with their bodies, they gain stamina, they assess their capabilities and their limits by moving, climbing, walking on uneven ground. Motor skills are crucial in childhood, and also play a part in mental health. Children also develop self-esteem, self-confidence and self-knowledge. This observation work also highlighted an improvement in the classroom atmosphere. In nature, the students help each other and cooperate more than in the classroom. They don’t necessarily stay with their usual friends. Other friendships are made, other leaders emerge: the children who are leaders in the classroom are not always the most comfortable outside.

*E.S.:* I started the outdoor school convinced that the children needed to be taken out into the nearby forest, but participatory research helped me to understand that the importance of this went beyond what I had imagined. The pupils love to learn by moving and playing, by being confronted with the natural elements; they show interest and curiosity. The rain, cold and snow don’t stop us from going out in the forest, only the wind does because there’s a risk of falling trees and

## **KEY POINTS**

■ **Teaching lessons outside the classroom is not yet a widespread practice in France, although it has recently grown in popularity as a result of the COVID-19 health crisis. At a primary school in Mancenans (Doubs), several teachers spend one half-day a week giving lessons in the nearby forest, even in winter. According to the teachers and the parents questioned, this provides countless benefits for the children: improvements in well-being at school, self-esteem, independence, and in their ability to create and communicate. The teachers also benefit: they feel that their job has a new meaning.**

branches. The outdoor classroom means that pupils gain a full awareness of climate change; they see the state of the forest, the dryness of the land. We planted trees, three of which died in the summer due to lack of water. Being in contact with nature is what makes children want to take care of it. Taking the class outside also has the advantage of compensating for children’s lack of physical activity, because even in our country village, they are often cooped up at home in front of their screens.

### *S.A.: Do all children benefit from this practice?*

*E.S.:* The pupils who use skills other than those considered to be highly academic procure the greatest



benefit. When we work on the concepts of perimeter or area in nature, with a stick in our hands, they feel more at ease. Their practical spirit is a source of good ideas that their friends don't necessarily have – and when we praise their contributions they regain their self-confidence. One of my pupils remembered the session where we worked on fractions with pieces of wood in the forest as soon as we broached the same subject in the classroom; he had understood something that day. Another child, who has autism, was able to speak in front of others for the first time; in the forest, he felt he had space and freedom to speak.

S.W.: There are no contraindications to outdoor schooling. However, as in all places of learning, some students love it, others enjoy it less. Some people don't like walking, they're not motivated because there's a long path to follow, they're scared, they don't feel at ease in nature. While some children feel better in the classroom, the opposite is true for others. It is important to change the learning environment to meet the needs of all children.

**S.A.: Do you encounter any obstacles to teaching class in the forest?**

E.S.: In our school, we ask parents to donate clothes that their children no longer use. We have a large stock of boots, ski trousers, gloves and anoraks that we can lend to students from less well-off families. Other schools use money from school fundraising to buy suitable clothing. Compared with other school projects, teaching a class in nature costs nothing. A number of our colleagues have a problem with support staff. It's not easy to find available parents every week. In our school, we have extended the invitation to grandparents. Now retired, they are delighted to go into the forest with their grandchildren to share their knowledge.

S.W.: In Switzerland, it's not mandatory to bring chaperones with you on class trips. In France, it is more complicated. And sometimes the teacher doesn't feel very comfortable teaching while someone from outside the school is present.

**S.A.: Are parents in favour of this way of teaching classes?**

E.S.: Over the last six years, I've seen nothing but convinced parents who have become partners in the project. However, we are doing a great deal of work to inform them and explain the process. We can now present them with the results of the action research project. While some may be reluctant at the outset, their reservations fade away when their child's academic results improve over the year and they see their child is happy to go to school.

S.W.: We sent out a questionnaire to all the parents as part of the action research. Their feedback has been very positive. More than 60% of them noticed their children progressing in terms of concentration, communication, cooperation, self-confidence, motor skills, independence, creativity and, of course, their connection with the environment; progress that they attribute to the forest school.

**S.A.: Does the French Education Ministry support teachers who want to deliver outdoor schooling?**

E.S.: It's a complicated subject. If we want to take training courses that interest us and meet our needs, it's often on our own time. During the action research, we had the support of environmental educators from the Burgundy-Franche-Comté Group for Support and Initiation in Nature and the Environment (GRAINE). A number of regional education departments, including Besançon, are now offering training courses backed by the National Education Department. It's a first step. The situation has changed since the COVID-19 crisis, which introduced many teachers to the experience of teaching outside the four walls of the classroom. In May 2023, the first international conference on outdoor classrooms was held in Poitiers, bringing together teachers and educational advisors.

S.W.: Beyond Burgundy-Franche-Comté, participatory research has been carried out in other regions including Brittany, Ardèche and Lozère. The idea is to draw up a meta-analysis of the data collected and publish a national report for the public authorities.

**S.A.: Do the teachers benefit as much as the pupils?**

E.S.: Teaching outdoors is a breath of fresh air for many people. The colleagues I have met say that this educational approach, which involves thinking outside the box, gives new meaning to their work. Drowning in administrative pressures, we tend to lose sight of the objective: to teach our pupils to grow up, to think critically and to be a part of society. This way of teaching brings us back to the core relationship with our pupils. On top of this, spending three hours outside in nature, walking, breathing in the fresh air, feeling the rays of sunshine or drops of rain, seeing the first anemones grow and hearing the birds sing, does us as much good as it does them. ■

Interview by Joëlle Maraschin, journalist.

1. The *Grandir avec la Nature* participatory action research, coordinated by the French Network for Nature and Environment Education (FRENE), looks at the effects of nature-based education on children's development. It was carried out in around 50 nursery and primary schools in mainland France. Online: <https://www.openscience.fr/La-RAP-Grandir-avec-la-nature-vers-un-partenariat-apprenant-d-education-et-de>

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# "Really committing to observation brings about a beneficial sense of wonder"

**Interview with Anne Dozières,**  
Director of the programme Vigie-Nature.

## *La Santé en action: What is Vigie-Nature?*

Anne Dozières: Vigie-Nature is a participatory science programme that brings researchers and non-scientists together to monitor biodiversity. By observing biodiversity, everyone involved contributes to research to understand the impact of human activities on it. These programmes are aimed at a wide range of people including experienced naturalists, schoolchildren and teachers, farmers and managers of green or natural areas, and members of the public who have no specific knowledge but wish to get involved. The observatories are run by around twenty Vigie-Nature facilitators and partner associations. Our oldest observatory, STOC (*Surveillance temporelle des oiseaux communs*) monitors common birds over time; it was launched just over thirty years ago. We now have around twenty programmes, covering birds, bats, plants, pollinating insects, soil fauna and the coastline. In 2023, almost 49,000 people, including 11,000 schoolchildren, contributed towards these observatories.

## **S.A.: Why does this programme involve research in the humanities and social sciences?**

A.D.: Alongside ecological research, we want to explore the issues of reconnecting with nature, environmental education and the scientific approach. A number of themes are

being explored: How can participation in Vigie-Nature change people's relationship with nature and science? How does it encourage learning and the development of professional practices? For example, a study [1] showed that people taking part in the butterfly observation project sharply reduced their use of pesticides, especially in private gardens. We also want to find out what motivates participants [2] in order to better understand the factors that can mobilise citizens around biodiversity, such as working for the common good or being part of a collective project.

## **S.A.: Do these studies show an improvement in social connections and well-being?**

A.D.: A number of studies have shown that a community of participants has emerged. For example, a sociology researcher studied thousands of comments posted on the data collection platform by those participating in SPIPOLL, a project to monitor pollinating insects through photos [3]. In addition to questions and exchanges on biology and ecology, there were a large number of friendly chats, building social ties and structuring mutual support. We have also received a great deal of informal feedback on the benefits of participating in Vigie-Nature. One participant recently told me that it was a breath of fresh air in his daily life<sup>1</sup>. Another suggested that the French social security system<sup>2</sup> should support participation for its therapeutic value. Numerous studies have shown that a relationship with nature is important for human well-being:

## **KEY POINTS**

■ **The Vigie-Nature programme, run by the Muséum national d'Histoire naturelle (MNHN) and the French Biodiversity Office (OFB), puts scientific observation of biodiversity within everyone's reach: pupils and teachers, budding or experienced naturalists, farmers and municipal gardeners. Training the eye to see microcosms, helping others, working for the common good, taking time away from our fast-paced lives: there are significant benefits for both the general public and the professionals who take part.**

if people are getting out and really committing to observation, this brings a beneficial sense of wonder.

## **S.A.: What do the observatories offer for professionals in the sector?**

A.D.: Two studies [4; 5] have been carried out on the Agricultural Biodiversity Observatory. They show that involving farmers in an active approach to biodiversity, by building an understanding that it is an ally in agricultural production, helps to change their relationship with their work. Those who are often accused of destroying biodiversity can regain a sense of peace by feeling more involved in its conservation. For staff taking care of green spaces, who carry out repetitive and physically demanding work, monitoring and observation practices mean they can shake up their daily routine and interact differently with their colleagues. This activity also gives meaning to

the development of their professional practices and to their work. Take the example of municipal gardeners [6; 7]: an end to using plant protection products in urban areas, the switch to sustainable management of green spaces and restrictions on mowing have been imposed on them with little support. What's more, these changes have not always been well received by local residents, who are unhappy with the appearance of certain areas. By taking part in Vigie-Nature, the gardeners become fully involved in the new measures to promote biodiversity and they have the knowledge to explain them to residents.

**S.A.: Isn't the time investment a barrier to involvement?**

A.D.: It's true that involvement in this type of programme is a time commitment. Observation protocols are demanding. There is also a learning curve to train the eye to see other worlds, particularly the microcosm. Among the general public, retired people are the keenest participants. Among professionals, the feedback varies. Farmers who choose to get involved can manage their time, even if it is limited. The situation is more complicated when it comes to municipal green spaces. Gardeners in public spaces are answerable to a hierarchy; they do not control their own work schedule. The policy of the local authority that employs them will impact how much leeway they have for observation. Some of them have told us how difficult it is to get started. On the flip side, some local authorities are keen to get involved in Vigie-Nature. To overcome these obstacles, we have tools available (training courses, guides) and we organise meetings with local elected representatives and professionals.

**S.A.: How are your activities funded?**

A.D.: The budgets are mainly from public sources, with a large part provided by the French Office for Biodiversity (OFB) and the Muséum national d'Histoire naturelle, along with contributions from the ministries for Education and Youth, Agriculture and Food Sovereignty, the Ecological Transition and the Regions.

Our other sources of funding are the French National Research Agency (ANR), European projects, the private sector and sponsorship. Participatory research has a cost: you have to run the communities of observers, organise time for meetings and exchanges, and develop the tools needed to collect the data. We're working on long-term projects, so it's complicated. For now, we're trying to keep existing observatories up and running rather than create new ones. That said, participatory science is increasingly recognised as a tool for innovative research.

**S.A.: Are these programmes evaluated by an outside body?**

A.D.: Vigie-Nature's results are examined every five years. As part of the Centre for Ecology and Conservation Sciences (CESCO), it adheres to the five-year schedule of the High Council for Evaluation, Research and Higher Education (HCERES). Financial backers such as the ANR and EU need reports of outcomes. We publish articles in peer-reviewed journals that are evaluated by the scientific community. However, the indicators used are very traditional, such as scientific output and number of programme participants. We are

working with the network *Science Ensemble* ("Science Together")<sup>3</sup> to define new indicators, such as knowledge acquisition among participants or data use (e.g. in public policies to monitor biodiversity). ■

Interview by Joëlle Maraschin, journalist.

1. Read the interview with this participant in the *Sauvages de ma rue* ("Wild Plants On My Street") project. Online: <https://www.vigienature.fr/fr/actualites/florent-sortir-rang-retrouver-elan-prendre-tourant-3805>

2. SPIPOLL participant who, in 2013 at the programme's national meeting, suggested that "on presentation of a medical certificate, [...] the social security system should reimburse all costs relating to this condition". Online: <https://spipoll.forumactif.org/t1193-leres-rencontres-nationales-a-bois-le-roi-2013?highlight=rencontres+nationales>

3. *Science Ensemble* is supported by the institutions of the Sorbonne University Alliance. Online: <https://www.science-ensemble.org/>

**For more information**

- <https://www.vigienature.fr/>
- Publications based on data obtained from Vigie-Nature projects are listed at <https://mnhn.hal.science/VIGIE-NATURE>
- Proceedings of the conference on the evaluation of participatory sciences, July 2021: <https://www.science-ensemble.org/ressources/whldx-2021-evaluation-des-sciences-et-recherches-participatives-actes>

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## ***“Drôles d’oiseaux! A project bringing the generations together to preserve biodiversity”***

**Interview with**  
**Aurélie Delaval,**  
*Deputy director of the French League*  
*for the Protection of Birds (LPO) Hauts-de-France,*  
**Jihane Hafa,**  
*Environmental education project lead at LPO France.*

*La Santé en action: How did the Drôles d’oiseaux! project come about?*

**Aurélie Delaval:** The work of the organisers and volunteers at the French League for the Protection of Birds (LPO) is generally aimed at young people and families. Together with an activist from the association, who is a medical coordinator at a nursing home in the Pas-de-Calais region, we wanted to do more work with a somewhat overlooked group, the elderly. Many elderly people had a more rural lifestyle and are familiar with birds, including those that are seen less and less in the wild. We thought it would be interesting to build a bridge between them and the children, who are not at all alarmed about the lack of swallows perched on power lines. That’s how this educational project came about in 2018. *Drôles d’oiseaux !* brings the generations together to preserve local biodiversity. It places great emphasis on knowledge transfer, particularly concerning the local natural heritage that older people were able to observe in their youth.

**S.A.: How does it work?**

**Jihane Hafa:** The project is based on fostering a partnership between a primary school and a care home in the same area, with the aim of creating an LPO “refuge”, which means protecting a green space in accordance with a charter drawn up by the association. After the first six trial projects carried out in the Pas-de-Calais region in 2018 and 2019, LPO decided to roll out this initiative across mainland France, following the positive feedback from teachers and care home teams. The national network of environmental education coordinators and the LPO’s Board of Directors also considered the project to be of educational value. Teaching aids have been created to help future participants adopt the project. Either we approach the facilities or they come to us because they’ve heard about this

initiative. Four support sessions are planned with a nature coordinator who is employed by the association and volunteers from the local LPO branch: the first session takes place in the classroom to introduce pupils aged 7–11 to the world of birds; session two takes place in the care home to create a link with the residents and revive their knowledge of the different species that inhabit parks and gardens; session three brings the pupils and elderly people together for workshops (building nesting boxes and feeders, making anti-collision stickers, etc.), games and songs; the final session invites everyone on an outing to the care home’s garden to observe the birds and install the equipment they have made. Based on the experience gained, we feel that this period of support forges sufficiently strong links between the two facilities for them to continue managing the refuge together without further interventions.

**S.A.: What are the benefits for children and the elderly?**

**A.D.:** The primary aim of the programme is to promote biodiversity but feedback shows that it has other benefits, particularly social ones. For pupils, it encourages openness towards others, acceptance of difference and learning to live together, as well as teamwork. These sessions are also an opportunity for children to explore and develop their sense of observation. For residents of care homes, *Drôles d’oiseaux !* is a welcome break from their daily routine. Making nesting boxes and other objects is a great way to work on their motor skills and concentration. Interacting with the children and recalling memories keeps this skill in use. Going outside also provides extra physical activity. A psychologist at one care home told us that this type of activity makes it easier to break the isolation of some elderly people. Each generation enjoys helping the other to achieve the common goal of protecting nature, with one bringing their experience and the other their enthusiasm. And this work to raise awareness of biodiversity is also catching on among the families of both the children and the elderly people.

### **KEY POINTS**

■ **The French League for the Protection of Birds (LPO) launched Drôles d’oiseaux! (Funny Birds) in 2018. With the support of a nature coordinator and volunteers, the residents of a care home for elderly people and pupils from a nearby school are learning more about birds and creating an appropriate environment for them to survive and thrive. This ecological programme also has social benefits for young and old alike.**

**S.A.: What difficulties have you encountered?**

**J.H.:** The COVID-19 pandemic delayed the national roll-out of the project, which was planned for 2020. In the first half of 2024, we counted 35 pairs of participating schools and care homes, supervising a total of 45 LPO bird refuges. Funding for the four-session module, which costs around €4,000, has not been a major obstacle: the regional, departmental and/or local authority, or even local businesses, can make a contribution; care homes can use part of their activities budget and some insurance companies also contribute. However, for *Drôles d’oiseaux !* to work, there needs to be committed representatives within the schools and care homes, as well as volunteers from the association. For a class of twenty-five pupils to turn up in a home for the elderly, who are often dependent or disabled, highly structured support is required. And commitment is the key to ensuring that the project lasts beyond the four “springboard” sessions. ■

**Interview by Nathalie Quéruel, Editor-in-Chief.**

### **For more information**

Website for the *Drôles d’oiseaux !* programme :  
<https://www.lpo.fr/pages-annexes/contenus-silpo/footer/lpo-in-english>

## *“Market gardens, managed by women, have improved dietary diversity”*

**Interview with Priscilla Duboz,**  
Anthropologist, research engineer  
at the French National Centre  
for Scientific Research (CNRS),  
Institute for Ecology and Environment  
(INEE),  
Co-director of the Tèssékéré International  
Observatory on Humans  
and the Environment.

### KEY POINTS

► **The Great Green Wall of Africa is a project that aims to restore a strip of land stretching from Senegal to Djibouti in order to boost food security and improve the health and living standards of local communities. The work of the Tèssékéré International Observatory on Humans and the Environment documents the patchwork of actions carried out in the interest of the environment but also the local people. In Senegal, the Fulani population of the Ferlo region is a case in point.**

*La Santé en action: What is the Great Green Wall project, launched in 2007 under the aegis of the eleven African countries bordering the Sahara?*

*Priscilla Duboz:* This project consists of a reforestation, soil protection and environmental revitalisation component aimed at slowing down the process of desertification in the Saharan strip, which is damaging the natural environment and the living conditions of local populations. The aim is to replant where there are no trees left, or to fence off areas where nature can regenerate without human intervention. It also includes a local development component aimed at stimulating new socio-economic

activities. The task of the Tèssékéré International Observatory – which I co-direct with Papa Ibnou Ndiaye, professor of animal biology at the Cheikh Anta Diop University in Dakar (Senegal) – is to study the impacts of the Great Green Wall (GGW) on ecosystems and societies, i.e. on human, animal and plant populations and on the biotope. We began our observation work in 2009 in Senegal, in the Ferlo region. Along the GGW route in Senegal, almost 50,000 hectares were reforested with eight tree species planted between 2008 and 2019, and almost 20,000 hectares of land have been fenced off to restrict access, combining reforestation with natural regeneration. The nine nurseries produce more than a million plants per year. Between August and September every year, many national and international associations take part in reforestation campaigns during the rainy season.

*S.A.: How have interventions to revitalise the land had an impact on the health of the people?*

*P.D.:* Starting in 2010, multi-purpose market gardens were developed, managed by women's groups. For the inhabitants of the Ferlo, this has led to greater dietary diversity, which is good for their health. Fruit and vegetables that had not previously been grown or bought by families due to their low incomes (less than one euro a day) were introduced into the diet. Given the very low rainfall in the region, these crops are grown using drip irrigation systems that save water. In addition,

the women's activities have improved their standards of living, which has a number of benefits, including better access to healthcare. Today, another project is taking over from these gardens, which were crippled by the drought and the COVID-19 pandemic. This focuses on integrated community farms, featuring market gardens managed by women alongside feed production for livestock farmers.

*S.A.: Does action on biodiversity have an impact on people's living conditions?*

*P.D.:* The Senegal National Agency for the Great Green Wall created a nature reserve in 2012, which has also had an impact on the living standards and health of local residents. For example, reintroducing wildlife like the dorcas gazelle into this reserve required the installation of a water point, which the local population uses at times. The agency has also authorised local people to harvest some of the straw from this protected reserve; the fodder is used by livestock farmers to feed their herds during the lean season, a very difficult period just before the rainy season returns bringing fresh grass. As a result, there are greater opportunities for livestock rearing, with direct repercussions on feed for the herds. Farmers can also increase their financial resources through selling products from this activity. In addition, the plant species chosen by scientists for the GGW are not only capable of surviving with very low rainfall; they are also useful to the population for food, energy, construction, handicrafts and herbal



medicine. Herbal medicine is used extensively in the region as a first line of treatment and there are many traditional practitioners.

**S.A.: *Has your work revealed any unexpected benefits?***

**P.D.:** The Great Green Wall project has helped to open up the Ferlo region. Some of the staff in charge of implementing the project have moved there, while others flock to it during the rainy season to plant the trees. As people from different regions of Senegal and different socio-economic categories intermingle, ideas can circulate and this may have contributed to changes in how local people view their health. In particular, part of the remit of the Tèssékéré observatory involves collecting anthropometric, biological and social data from the population through surveys and free consultations provided by Senegalese doctors and epidemiologists. We have realised that these consultations help to improve the level of knowledge about health, particularly when it comes to hypertension. We discovered that the Fulani populations of the Ferlo have an extremely high prevalence of hypertension: in this dry region, the only water resource for three-quarters of the year consists of boreholes drawing water from a depth of 300 metres, and this underground water is very high in salt. We were able to show a link between the consumption of this very salty water and the high incidence

of hypertension. Of course, the men and women who have this condition don't always have the financial resources to buy anti-hypertensive treatments, so they turn instead to herbal medicine. However, if they are given information, they are more likely to visit the clinic very quickly if they experience symptoms associated with complications.

**S.A.: *How do you view the criticisms of this project, which have argued that it has little impact in terms of reforestation and benefits for the local population, given the funding?***

**P.D.:** Expectations were probably too high. This project can be seen as a patchwork of actions that take time to roll out. It makes no sense to measure their success solely by the number of hectares planted, as has been done in the past. It's not simply a question of restoring vegetation in a desert – we're talking about inhabited areas: you have to cross villages and places where it's complicated to operate because of conflicts or other factors. European and international auditors are far removed from the field and do not take into account the reality of initiatives that are carried out in the interest of both the people and the environment. The success of the GGW will depend on an in-depth reform of the way people live in the environment and the effects of this reform on future generations. While local people were initially wary of the

Great Green Wall, the local development aspect has won them over in terms of the benefits it has brought them. In Senegal, the government has invested heavily in this. There's a real energy here, with a wide range of initiatives and people doing an enormous amount of work to maintain the plantation plots. The results are positive in terms of improving human health through direct and indirect factors, but also in terms of scientific knowledge. We have built up a solid track record in understanding the complexity of the ecosystem. The major challenge today is understanding that health must be approached in a systemic way, with human health intimately linked to the health of the environment and animal health. These determinants interact with each other and our results apply to Africa as much as to any other continent or country. ■

Interview by Joëlle Maraschin, journalist.

**For more information**

- Read more about the work of the Tèssékéré observatory online: <https://ohmi-tessekere.in2p3.fr/>
- The report "Great Green Wall Implementation Status and Way Ahead to 2030" published in 2020, assesses what has been achieved and identifies the difficulties. Online: [https://www.unccd.int/sites/default/files/2024-08/1551\\_GGW\\_Report\\_ENG\\_Final\\_040920.pdf](https://www.unccd.int/sites/default/files/2024-08/1551_GGW_Report_ENG_Final_040920.pdf)



The following list of background documents, reports and books are provided to complement this special issue devoted to the impact of nature on health. This compilation also includes practical resources and tools for practitioners.

This issue intersects with other issues of the magazine:

- **Urban Planning Dedicated to health.** *La Santé en action*, no. 459, March 2022. Online: <https://www.santepubliquefrance.fr/docs/la-sante-en-action-december-2022-n-459-eng-urban-planning-dedicated-to-health>
- **Environnements favorables à une alimentation saine : une réponse aux inégalités sociales de santé ? (Environments conducive to healthy eating: a response to social health inequalities?)** [French only]. *La Santé en action*, no. 444, June 2018. Online: <https://www.santepubliquefrance.fr/docs/la-sante-en-action-juin-2018-n-444-environnements-favorables-a-une-alimentation-saine-une-reponse-aux-inegalites-sociales-de-sante>

The Internet links listed were consulted on 09/07/2024.

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## BACKGROUND DOCUMENTS

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- **Conseil économique, social et environnemental. Pour une politique publique de santé-environnement au cœur des territoires. Avis.** Paris: CESE, 2022: 102 p. Online: [https://www.lecese.fr/sites/default/files/pdf/Avis/2022/2022\\_08\\_sante\\_environnement.pdf](https://www.lecese.fr/sites/default/files/pdf/Avis/2022/2022_08_sante_environnement.pdf)
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- **World Health Organization. Nature, biodiversity and health: an overview of interconnections.** Copenhagen: WHO Regional Office for Europe, 2023: 42 p. Online: <https://iris.who.int/handle/10665/341376>
- **Sénat. Épidémie de Covid-19 : les liens de la crise avec les atteintes à la biodiversité et les impacts sur le secteur de l'eau et de l'assainissement. Pistes d'actions et recommandations.** Summary. Paris: Sénat, 2020: 11 p. Online: [https://www.senat.fr/fileadmin/import/files/fileadmin/Fichiers/Images/commission/Developpement\\_durable/Covid-19/2020-05-20\\_Recommandations\\_eau\\_biodiv.pdf](https://www.senat.fr/fileadmin/import/files/fileadmin/Fichiers/Images/commission/Developpement_durable/Covid-19/2020-05-20_Recommandations_eau_biodiv.pdf)
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- **WHO, Regional Office for Europe. Urban green spaces: a brief for action.** Copenhagen: WHO, 2017: 24 p. Online: <https://www.who.int/europe/publications/i/item/9789289052498>

- **United Nations. 17 Goals to Transform our World.** Online: <https://www.un.org/sustainabledevelopment/>

- **Ville de Paris. Le Plan Biodiversité de Paris 2018-2024.** Paris : Ville de Paris, 2018 : 130 p. Online: <https://cdn.paris.fr/paris/2021/02/17/fbb551749cd3dabdf2b730d5f4097629.pdf>

## GENERAL INFORMATION

- **Agence de la transition écologique. Aménager avec la nature en ville, des idées préconçues à la caractérisation des effets environnementaux, sanitaires et économiques.** ADEME, 2017 : 100 p. Online: <https://librairie.ademe.fr/urbanisme-et-batiment/1170-amenager-avec-la-nature-en-ville.html>
- **Artois M., Gardon S., Miallet S. Retour sur quelques crises sanitaires impliquant la flore ou la faune sauvage : Comprendre les jeux d'acteurs et analyser leurs positions.** Lyon : VetAgro Sup ENSV, 2017: 33 p. Online: [https://ensv-fvi.fr/wp-content/uploads/2021/05/Crises-sanitaires-impliquant-final\\_20171004.pdf](https://ensv-fvi.fr/wp-content/uploads/2021/05/Crises-sanitaires-impliquant-final_20171004.pdf)
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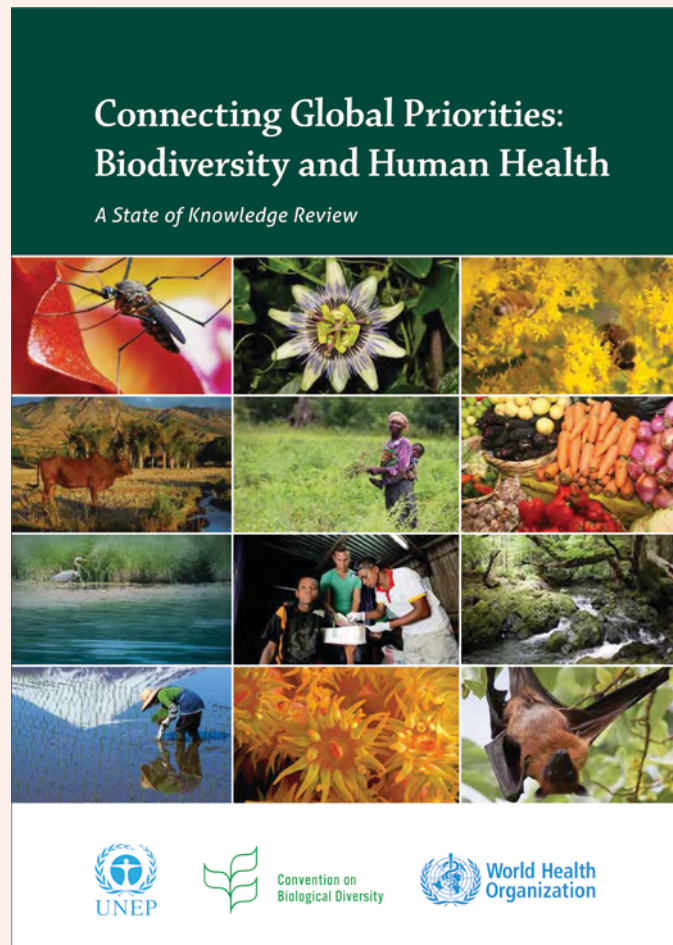
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Revue transversale, qui couvre toutes les disciplines convergentes entre l'environnement et la santé. *Online:* <https://www.jle.com/fr/revues/ers/revue.phtml>

## ORGANISATIONS OFFERING RESOURCES

• **The European Environment Agency (EEA)**

European Union agency that provides reliable and independent information on the environment. The EEA aims to support sustainable development by helping to make significant and measurable improvements to Europe's environment through providing timely, targeted, relevant and reliable information to policy-makers and the public. *Online:* <https://www.eea.europa.eu/fr/>

• **French Biodiversity Office and Regional Biodiversity Agencies (ARB)**

The aim of the ARBs is to optimise interventions and projects in the regions and to increase their impact by improving the efficiency of resources and parties involved.

*Online:* <https://www.ofb.gouv.fr/les-agences-regionales-de-la-biodiversite>

• **The Foundation for Research into Biodiversity (FRB)**

This is a platform for the various scientific institutions and societal stakeholders involved in biodiversity. It was created in 2008, following the Grenelle Environment Forum, on the initiative of the government ministries involved. Its remit is to support and work with research institutions to expand and share knowledge about biodiversity.

*Online:* <https://www.fondationbiodiversite.fr>

• **French Federation for Gardens, Nature and Health**

Set up in 2017–2018, its purpose is to bring together all those involved in creating, implementing, developing and using therapeutic gardens and/or delivering prevention, care and treatment through a relationship with nature or natural elements (including ecotherapy and horticultural therapy), to promote the development of these gardens and practices and to support professionals in these different fields.

*Online:* <https://f-f-jardins-nature-sante.org/>

• **Jardins & Santé (Association)**

Set up in 2004, its aim is to support the creation of gardens in hospital and medical-social units that care for people with brain disorders (autism spectrum disorders, Alzheimer's disease, epilepsy, major depressive disorder, etc.). Its initiatives include creating a "Jardins et Santé" quality label, organising symposia, distributing a newsletter and awarding grants to support the creation of gardens.

*Online:* <https://www.jardins-sante.org/index.php>



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