

Ecological Transition as a Mechanism for Environmental Planning and the Move Toward Sustainable Cities

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Abstract

There is no doubt that environmental issues have become one of the foremost concerns of the international community today, owing to the gravity of the problems that threaten it. The seriousness of these environmental problems lies in their many facets and dimensions — climate change, the loss of biodiversity, the depletion of natural resources, and extreme environmental events, among others — all of which have brought about a tremendous shift in the components and balance of the ecosystem, placing the future of humanity itself at stake.

Moreover, these problems are global and all-encompassing: they draw no distinction between the developed and the developing world, nor between rich and poor nations, and are indivisible in nature. They are also interrelated, in the sense that they exert a reciprocal influence upon one another. Faced with these challenges, the international community — states, organizations, and researchers alike — has come to recognize the necessity of adopting measures to protect and preserve the environment as a shared heritage of humanity and of future generations, and has likewise come to understand that any delay in taking such measures will produce consequences that may be difficult, if not impossible, to remedy.

In response to these concerns, international and regional reactions have multiplied through the adoption of numerous international instruments that laid the early foundations of international environmental law. Taken together, these instruments embody mechanisms aimed at environmental preservation as a general objective, and, more specifically, at mitigating and adapting to climate change. These mechanisms are strongly oriented toward establishing and consolidating the rules of ecological transition, one of the fundamental pillars for achieving sustainable development. Ecological transition rests on a range of concepts — environmental justice, values and ethics, participation and environmental citizenship, and, finally, the cost of externalities — and its dimensions encompass challenges such as climate change, the loss of biodiversity, the management of natural resources, and environmental health risks.

Keywords: environmental protection, ecological transition, green planning, sustainable cities.

Introduction

The protection of the environment is today one of the greatest preoccupations of the international community, a concern rooted in the gravity of the problems that threaten it. This gravity stems from the fact that environmental problems present multiple facets and dimensions — pollution, climate change, the loss of biodiversity, the extinction of species, and extreme environmental events. They are, moreover, global, all-encompassing, and indivisible, drawing no

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distinction between the developed world and countries still on the path to development, nor between rich and poor states; and they are, in addition, interrelated in the sense that they exert a reciprocal influence upon one another.

According to *Alexandre Charles Kiss*, the environmental problems of our time represent one of the symptoms of a crisis of civilization and mark the onset of a new period in the history of the environment.³

It is clear that the world today is living through a period in which the environment is exerting its influence upon humankind, and that all of these changes are the product of an intensifying interaction between human beings and their surroundings, driven by the pursuit of the quantitative value of eliminating poverty.

It soon became apparent, however — particularly to the industrialized nations — that this quantitative value was itself relative and open to debate, and that it ought to give way to another value: one concerned with the quality of life that can be secured for individuals and for societies as a whole.

This realization led states, organizations, and researchers alike to focus on the need for a policy grounded in a reconciliatory vision that brings together economic development and environmental protection — one that seeks to achieve general welfare while giving due regard to the imperatives of preserving the environment and containing its crises.

Overcoming environmental crises in general, and the climate crisis in particular, is an urgent matter that demands sustained and coordinated attention and a high degree of planning, calling in turn for carefully considered responses and ambitious, effective strategies.

The responses undertaken in answer to this concern have been translated into numerous international and regional efforts that have laid the early foundations of international environmental law, running from the Rio Conference of 1972 to the most recent Conference of the Parties. These endeavors have charted the broad outlines of environmental protection policy, aimed collectively at curbing every form of degradation and harm.

The Brundtland Report stands as the most prominent international achievement to have laid the groundwork for the United Nations Sustainable Development Goals (SDGs).⁴ A closer examination of this principle shows that it aims to reduce inequality and poverty while giving priority to the essential needs of the poorest groups.

It likewise focuses on protecting the environment and natural resources, emphasizing the need to safeguard fragile ecosystems and to manage natural resources sustainably so as to ensure their availability for future generations. Finally, it seeks to promote equitable economic growth — growth that is compatible with environmental sustainability.

Yet thirty-eight years after the concept of sustainable development first emerged, *Dominique Bourg* argues that it is necessary to move beyond a concept that continues to feed the desire for growth without regard for the global challenges confronting us and future generations. Here, the philosopher offers one of his most radical critiques of sustainable development, which, in his view, has been emptied of its true substance in what is termed “strong” sustainability.⁵

More than this, the author raises the notion of ecological transition, which he considers alone capable of grounding a form of development built on the acceptance of limits, insofar as it calls for relinquishing excess and practicing self-restraint.

³Alexandre Kiss, *Introduction au droit international de l'environnement* (Geneva: UNITAR, 2006), 12.

⁴World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 14.

⁵Dominique Bourg, “Transition écologique, plutôt que développement durable,” Institut de politiques territoriales et d'environnement humain, Université de Lausanne, 77.

There is no doubt that the question of ecological transition in the twenty-first century has become one of the principal challenges of our time. Combating global warming, preserving biodiversity, improving energy efficiency, and enhancing the management of water and waste have all become central to the work of public authorities and to the mobilization of citizens, and are closely bound up with ecological transition.

Transformation, in general, refers to a change in the fundamental features of natural and human systems, whereas transition denotes the shift from one state to another, or from one condition to another, over a given period of time; it may occur at the level of individuals, firms, cities, regions, or countries, and may arise from a gradual or evolutionary process of change.⁶

This scholarly contribution offers a comprehensive overview of global environmental changes and their full range of implications, and seeks to shed light on the mechanisms and consequences of global warming and biodiversity erosion and their relationship to patterns of life and consumption. Finally, it sets out a framework for reflecting on ecological transition — an opportunity to reconsider our modes of production, work, consumption, and mobility, in pursuit of social and environmental justice, so as to secure a life that is dignified, sustainable, and equitable.⁷

I. The Conceptual Framework of Ecological Transition

Examining the conceptual framework of ecological transition requires, as a first step, defining the concept itself, its rationale, and the sound foundations on which it rests. It likewise requires understanding the dimensions it seeks to achieve and, finally, clarifying the mechanisms through which ecological transition is given concrete expression.

1. The Concept of Ecological Transition and Its Rationale

The idea of ecological transition first emerged in 1990 through the work of research and reflection groups affiliated with universities, non-governmental organizations, political parties, and civil-society movements. The idea was likewise raised in the 2015 Paris Climate Agreement, itself derived from the United Nations Framework Convention on Climate Change.

The notion of a just ecological transition was also invoked by the Intergovernmental Panel on Climate Change (IPCC).⁸

At the European level, ecological transition was raised in the European Commission communication of 11 December 2019 entitled the European Green Deal, which forms part of an investment plan for a sustainable European continent. That plan called for dedicated funding for mechanisms of just ecological transition within the framework of cohesion policy, aimed at addressing the social, economic, and environmental costs of the shift toward a climate-neutral circular economy, whereby residual greenhouse-gas emissions are offset through equivalent removals.

This communication was followed by the adoption of Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund.⁹

On the occasion of the publication of the European Union's Eighth Environment Action Programme, Frans Timmermans, Executive Vice-President for the European Green Deal, declared that “we have extremely ambitious environmental and climate objectives that will help us achieve the just ecological transition that Europe and the world need.”¹⁰

In the absence of a single, agreed definition of ecological transition, we propose to define it as “a process grounded in sound and equitable foundations, aimed at moving toward a low-carbon

⁶IPCC Working Group I Technical Support Unit, *Special Report on the Ocean and Cryosphere in a Changing Climate*, 92 (2019).

⁷Lydie Laigle, “Une mise en mouvement de la transition écologique par la société civile ? Approches, enjeux et perspectives” (CSTB–Université Paris-Est).

⁸The IPCC is an intergovernmental body established in 1988 by the United Nations Environment Programme and the World Meteorological Organization; it is responsible for providing an objective assessment of the scientific research relating to climate change.

⁹Official Journal of the European Union, L 231, 30 June 2021, Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund, pp. 1–20, <https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:32021R1056>

¹⁰European Commission, Eighth Environment Action Programme, Brussels, 26 July 2022.

society and an adaptable, sustainable development.” This definition holds equally at the international and the national level, and applies just as well to a given sector of activity or to the various stakeholders genuinely seeking to build the transformations that take into account the economic, social, and environmental dimensions of sustainable development.

Turning to the rationale behind ecological transition leads us to the idea of the *Anthropocene*, first advanced in the year 2000 by the Nobel laureate chemist *Paul Crutzen* and the biologist *Eugene Störmér*. The term designates the geological epoch during which human beings have become established on planet Earth, and one in which humanity has emerged as the principal driver of the planet’s geological transformation.¹¹

This is the first time in the planet’s history that human activity has been shown to exert a profound influence on its evolution, altering its climate and its major natural balances to the point of threatening, in the long term, the very survival of the human species.

But how did we arrive at this point? Since the Industrial Revolution at the close of the eighteenth century, the world has witnessed remarkable economic development in the countries of the East, China, India, and Brazil in particular — development that has undoubtedly brought about a general improvement in living conditions. Yet this same trajectory has also produced, especially from the 1950s onward, an excessive consumption of fossil fuels, an intensive exploitation of marine resources, deforestation, the concreting-over of agricultural land, and the spread of soil-depleting, water-intensive farming practices.

The IPCC’s 2007 report further confirmed a strong correlation between the growth curve of gross domestic product (GDP), the curve of energy consumption, and the curve of greenhouse-gas emissions. It is true that the growth of economic activity has enabled the development of institutions and lifted millions of people out of poverty and hardship; yet at the same time this same activity has placed severe pressure on the consumption of natural resources and has disrupted the balance of ecosystems, placing the future of humanity itself at stake.

In reality, industrial and agricultural activity, together with the combustion of fossil fuels — oil, gas, and coal — releases enormous quantities of greenhouse gases (GHGs) into the atmosphere: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The release of these gases has been rising steadily since before the Industrial Revolution, driven by evolving patterns of production and consumption as well as by demographic growth, given that the world’s population rose from three billion in 1960 to more than 7.8 billion in 2021.

Roughly half of these emitted gases are naturally absorbed by the oceans and forests, which act as carbon sinks, while the remainder accumulates in the atmosphere — a space that also naturally contains greenhouse gases essential to sustaining life on the planet. Without these gases, which help maintain the planet’s temperature, the average temperature would stand at –18 °C, compared with the natural 15 °C.

Greenhouse gases produced by human activity, however, accumulate intensively in the atmosphere, producing as their principal effect global warming — that is, a rise in the planet’s average temperature by roughly one degree Celsius. The difficulty is that even were all necessary corrective measures to be adopted, this situation could not be reversed: in other words, even a reduction in greenhouse-gas emissions cannot restore matters to their former state.

The effects of these developments on ecosystems are numerous and severe: rising ocean temperatures and acidification, rising sea levels, the melting of ice and permafrost, and an increase in extreme environmental events — heatwaves, wildfires, and drought, the flooding of coastal areas and the disappearance of island states, the die-off of animal populations and the extinction of plant species, and desertification — to the point that millions of people have become climate refugees,

¹¹Camille Dorival, *Transition écologique ici et maintenant* (Paris: Les Petits Matins, 2021), 18.

forced to abandon areas threatened by desertification or flooding in search of habitable ground. Their numbers are almost certain to rise in the coming years given the growing dangers of water scarcity, food insecurity, and land degradation in different regions of the world; scientists likewise fear the spread of zoonotic infectious diseases, as occurred recently with the COVID-19 pandemic.¹²

2. The Foundations of a Sound Ecological Transition

In order to conceive of a properly grounded ecological transition, it is essential first to recall the rules of justice and equity that such a vision necessarily entails. Justice guarantees the rights of individuals, drawing on the foundations of ethics, law, and the values of society; by the same logic, environmental justice in general, and climate justice in particular, are themselves inseparable from this vision.

These dimensions of justice and equity likewise find their basis in international instruments and conventions concerning biodiversity, in the reports of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) on questions of biodiversity and ecosystem services, and in the official pronouncements of citizens who demand their right to interact with, benefit from, and preserve nature on an equitable footing relative to other stakeholders.

We shall also demonstrate, through this discussion, the need to reduce the risks associated with climate change; the participatory dimension that governance in environmental policy must embrace; and the importance of drawing on legal mechanisms to correct and limit the negative impacts on the environment linked to property law, freedom of contract, and freedom of trade and industry.

We shall likewise show how questions of ethics, social justice, and equity can genuinely contribute to ecological transition, taking as examples strategies for adapting to and mitigating climate change and for managing biodiversity, and highlighting in particular the following elements for clarification:

- What do we mean by environmental justice from the standpoint of ecological transition?
- What forms of inequality can environmental policies produce?
- What are the overarching principles for achieving a sound ecological transition?
- What mechanisms and solutions allow justice and equality to be achieved in the implementation of ecological transition?

What do we mean by environmental justice from the standpoint of ecological transition?

Development is bound up with human rights in such a way that climate-related policies come to be framed from the standpoint of rights vulnerable to being affected by the rules of justice and impartiality — rules that are, in turn, divided into responsibilities, efforts, and privileges.

In the field of climate change, this means that activities aimed at reducing greenhouse-gas emissions, as well as activities of adaptation to climate change, are bound up with the question of loss and damage.

Justice truly presupposes a distribution that is fair, impartial, and equitable — that is, one free of discrimination or bias — with regard to the measures and efforts undertaken to confront climate change, exactly as with those relating to the preservation of biodiversity. This requires a prior analysis of how the costs, impacts, and privileges of the envisaged measures are distributed within society, whether among social groups, between generations, or according to gender.

A number of levels within society can likewise be identified as requiring attention to the rules of justice and impartiality in the design of environmental strategies and policies. At the level of the individual, for instance, there are poor households alongside wealthy ones; at the level of the

¹²OECD, *Adaptation aux changements climatiques et coopération pour le développement* (2009), 37.

community, different groups must be treated fairly and equitably, without forgetting the rights of future generations, which must be taken into account and given priority.

At the same time, economic actors may demand that they not bear any excessive cost in implementing ecological transition; and even at the international level, we return to the idea of justice and equity as between states and different regions of the world. In truth, the term justice carries many meanings depending on context, and the justice demanded will differ for every actor concerned.

By its very nature, the conception of justice in the environmental field is multidisciplinary and can be classified in a variety of ways. From an economic standpoint, it concerns the fair distribution of impacts, risks, responsibilities, and benefits; from a political standpoint, environmental justice is bound up with the participation of stakeholders in decision-making; and from a social and cultural standpoint, it concerns justice in the recognition of the values, concerns, and preferences specific to each individual.

Inequality in the Fair Distribution of Negative and Positive Externalities¹³

The sources of inequality that undermine environmental justice are numerous, and include responsibility for greenhouse-gas emissions, the impact and consequences of climate change, efforts undertaken to preserve the components of the ecosystem (climate, biodiversity, and ecosystem services), and, finally, the benefits derived from the functioning of ecosystems.

The question of inequality in greenhouse-gas emissions can be examined at every level — internationally, according to each country, and domestically, according to each individual. There is no doubt that the first sector contributing to global warming and disrupting the Earth's radiative balance is the energy sector, as a result of fossil-fuel combustion and the resulting greenhouse-gas emissions; emissions also arise from land use for food production, with a marked impact on biodiversity.

Since the beginning of the industrial era, the list of countries most responsible for CO₂ emissions arising from the use of fossil fuels and from cement production, for instance, has evolved: in 1950, responsibility for total emissions rested chiefly with the United States and Europe, but in recent years this has shifted somewhat, with China taking their place, its emission levels having risen well beyond those of other Asian countries such as Japan and South Korea.

These data prompt us to reflect on the question of shared responsibility, given the cumulative impact of CO₂ emissions on climate change; they also show that expectations differ according to the weight given to historical responsibility as against present-day responsibility.

It should be noted that China, the United States, the European Union, India, Russia, and Japan are the six largest contributors to greenhouse-gas emissions, alongside international aviation, ranked seventh in terms of its contribution to emissions. Together, they are responsible for 65 percent of global CO₂ emissions, while the G20 — comprising the world's twenty leading economies — contributes more than 80 percent of these emissions.¹⁴

At the individual level, the picture is entirely different: China generally appears as the country emitting the largest volume of greenhouse gases owing to the sheer size of its population, since the average level of per-capita emissions reflects, first and foremost, each country's standard of living and energy profile — as does per-capita CO₂ emission, particularly in North America, Australia, the Gulf states, and Russia.

¹³Externality theory in economics explains how the activity of an economic agent — whether production or consumption — can produce positive or negative effects on other agents, without any financial compensation between the parties. Such effects may include pollution (negative) or benefits such as those created by a landowner who plants trees (positive). To address these problems, governments seek to internalize the cost of externalities, for example by taxing polluters so as to incorporate the social cost into their economic calculations. Externality theory is essential to understanding market failures and to designing effective economic and environmental policies.

¹⁴Lydie Laigle, "Une mise en mouvement de la transition écologique par la société civile ? Approches, enjeux et perspectives," paper presented at the international colloquium "Les chemins politiques de la transition écologique," Lyon, France, October 2014, 7.

Under the Paris Climate Agreement, various states committed to reducing their emissions; yet five of the G20 countries failed to meet their commitments, among them some of the world's strongest economies, such as Australia, Brazil, Canada, South Korea, and the United States.

France's situation is different, as it seeks to become the first and foremost green nation, spurring on other European and world states, in keeping with a reindustrialization project aimed at strengthening its sovereignty in the fields of energy, industry, and food, as well as through an energy transition oriented toward decarbonizing electricity and replacing it with hydroelectric and nuclear power.

The sectors generating the largest share of greenhouse-gas emissions in France are transport, at 30 percent, and housing, at 20 percent, followed by agriculture, industry, and other sectors.¹⁵ Everything connected with individual lifestyles — private vehicles and home heating — accounts for half of the emissions generated by the transport sector, a pattern found in every country in the world.

Internationally, France appears comparatively disciplined when its carbon footprint is examined: this stands at between 6 and 6.6 tonnes per person per year, a figure that reflects emissions produced solely on national territory and that has declined since 1990, stabilizing in recent years as a result of pandemic-related lockdown measures.¹⁶

This figure does not take into account the effects of climate change or land use, such as deforestation, and estimating these remains a difficult task; according to a recent analysis by the French High Council on Climate, there is a considerable difference in individual carbon footprints between wealthy and poor households.

Inequality thus appears at the level of individuals just as it does between states, and greenhouse-gas emissions are, in reality, closely tied to lifestyle and standard of living.

II. The Dimensions of Ecological Transition

The Impact of Climate Change and Its Repercussions

The impact of climate change on our daily lives continues to grow and has become palpable, with an accelerating rise in the global average temperature likely to exceed the 1.5 °C warming threshold between 2021 and 2040. Every year we witness increasingly severe extreme weather events affecting natural ecosystems: the loss of biodiversity, more intense heatwaves, the melting of Arctic ice leading to rising sea levels with severe consequences for island states and coastal regions, and even flooding in numerous areas — all of which affects human security, water security, and the world's leading regions of food production and grain reserves.

It is important also to bear in mind that the dangers of climate change are sudden and irreversible, and carry serious external effects and repercussions for ecological balance.

The problem runs deeper still, in that regions and populations are affected unequally by climate and environmental challenges, and disparities are likewise observed in the depletion of natural resources — whether biodiversity, water, or minerals. All of this calls for urgent management and long-term planning.

The dangers are not confined to the situations already mentioned, nor merely to the likelihood of their occurrence; the matter also concerns the conditions of exposure to these situations and the vulnerability of ecosystems, individuals, and communities in confronting them. Risk-management strategies accordingly differ from one region to another, and the capacity to adapt to climate change depends on individual resources and structural activities that are, in general, difficult to carry out in the poorest countries — for example, the capacity to undertake construction works for protection and for managing the risks of flooding and coastal submersion.

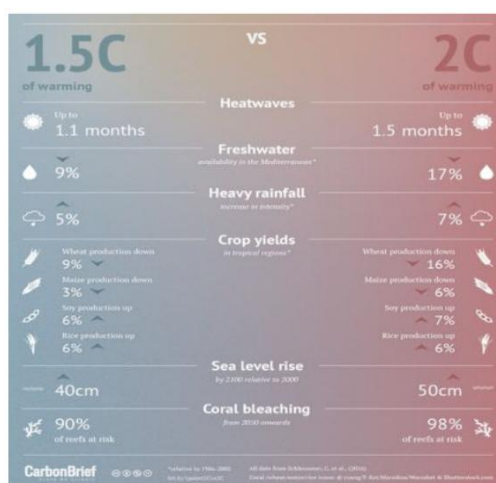
¹⁵Janez Potočnik, "Économie circulaire : les enjeux économiques d'une transition écologique," *Annales des Mines – Responsabilité et environnement*, no. 76 (2014/4): 7.

¹⁶V. Masson-Delmotte, A. Vallet, S. Szopa, and J.-M. Lourtioz, *Aller vers une transition écologique juste* (Université Paris-Saclay, 2021), 356.

The cascading effects that may arise from climate change can produce physical and geochemical impacts that naturally affect ecosystems: some communities will be exposed to a very high degree, while others will experience effects of lesser magnitude and lower cascading risk. This confirms that there is genuine disparity and inequality in exposure to the effects of climate change.

Numerous regions of the world have been classified as areas of intense risk, notably tropical zones, particularly in Southeast Asia, West Africa, and the Mediterranean basin. All of these regions will face problems related to water resources and extreme heatwaves; in West Africa and the Sahel region in particular, such heatwaves will have severe consequences for agricultural yields and livestock productivity, with implications for food security in general. Tropical regions will also face problems linked to the depletion of resources arising from marine fishing. Small island states, for their part, will be threatened by rising sea levels and the degradation of coral reefs.¹⁷

Under the mandate entrusted to it by the 2015 Paris Agreement concerning the monitoring of the effects of climate change, the IPCC's *Special Report on Global Warming of 1.5°C* (SR1.5)¹⁸ found that the risks to human and natural systems at 1.5 °C are lower than at 2 °C. The report adds that poor and vulnerable groups will be the most severely affected; the Intergovernmental Panel on Climate Change describes these losses and damages as unprecedented and concludes that achieving the 1.5 °C target is possible, but requires immediate and unprecedented changes.¹⁹



Source: Intergovernmental Panel on Climate Change report, 2018.

The data presented in this chart, drawn from the Intergovernmental Panel on Climate Change, show the extent to which climate change and global warming affect a range of indicators at the 1.5 °C threshold compared with the 2 °C threshold — in particular heatwaves, freshwater availability, rainfall patterns, crop yields across various species, rising sea levels, and the loss of coral reefs.

All of these challenges make it imperative to adopt the necessary measures without delay, and they direct both individual and collective action toward a comprehensive shift in patterns of consumption, production, and living in general; this analysis makes it essential to accelerate the transformation of the most polluting sectors and of our lifestyles.

It is certain that some actors and regions will be affected more severely than others and will require special support, since the challenges of making the planet more habitable — by improving air and water quality and preserving nature — are manifold.

Efforts to Protect Biodiversity and Preserve Ecosystem Services

¹⁷V. Masson-Delmotte, A. Vallet, S. Szopa, and J.-M. Lourtioz, *Aller vers une transition écologique juste* (Université Paris-Saclay, 2021), 360.

¹⁸IPCC, *Global Warming of 1.5°C: Summary for Policymakers* (Geneva: World Meteorological Organization, 2018), <https://www.ipcc.ch/sr15/chapter/spm/>.

¹⁹Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report* (Geneva: IPCC, 2014), 6.

In order to assess the unequal distribution of the efforts made by states to protect biodiversity and ecosystems worldwide, biodiversity is measured using an indicator known as species richness, which describes the number of species present in a given environment over a specific period of time (birds, mammals, amphibians, and reptiles, among others).

Biodiversity is affected by numerous threats stemming chiefly from human activity, identified and set out in a 2019 assessment report published by IPBES; these threats concern, for instance, changes in land use, deforestation, the intensive and irrational exploitation of resources, pollution, invasive species, and climate change.²⁰

Some regions of the world possess an exceptional species richness, yet are at the same time subject to intense threats; these are considered biodiversity hotspots.²¹ North Africa is among these hotspots. Such areas may be terrestrial or marine, and their distribution across regions follows both the distribution of species richness and the degree of exposure to threats.

As for the three groups — birds, mammals, and amphibians — these are well correlated in their spatial distribution, compared with those found in dense forests such as the Amazon rainforest, the forests of Central Africa (chiefly in the Congo Basin), and the forests of Southeast Asia.

Species density is generally a good indicator when confronting threats, bearing in mind that these threats are distributed unevenly and heterogeneously: in the Amazon basin, for instance, threats are relatively few given the density of species present, which explains why the Amazon is not itself classified as a hotspot, even though it remains very much a focus of protection and conservation efforts.

Biodiversity hotspots are found chiefly in Latin America, Southeast Asia, the Mediterranean basin, and all along the borders of coastal Africa. As a result, these countries are called upon to make a greater effort than others to preserve biodiversity.

If we focus instead on large animal species, or what is termed megafauna, and take into account the spaces and habitats in which they find refuge as well as the expenditure associated with their conservation, we find that they do not correspond neatly to the concept of biodiversity hotspots. Brazil, for instance, which possesses an exceptional species richness, occupies only a middling position when it comes to the efforts made to preserve its wealth of large animal species.

The Andean countries²² are likewise designated as biodiversity hotspots, yet they are among the countries that devote comparatively modest efforts to this field. The Sahel region of Africa, by contrast, has undertaken numerous conservation efforts. North America, though it contains only a small hotspot area, pursues considerable efforts to preserve its large animal species.

The disparities between one country or region and another can be explained by the extent of the efforts devoted to preserving biodiversity, as well as by the cost these efforts impose, understood in terms of the political choices made by the country and/or region concerned with respect to protection. Brazil, for example, has pursued a clear policy of promoting the food industry, which has led to an approach openly at odds with conservation and protection — an approach that the international diplomatic community has strongly condemned, viewing its stated commitment to biodiversity protection as inconsistent with its actual national policy.

4. The Overarching Principles of a Sound Ecological Transition and the Mechanisms for Achieving It

A sound ecological transition encompasses numerous facets that must be taken into account when managing climate problems and biodiversity loss, bearing in mind that a substantial share of

²⁰V. Masson-Delmotte, A. Vallet, S. Szopa, and J.-M. Lourtioz, *Aller vers une transition écologique juste* (Université Paris-Saclay, 2021), 364.

²¹A biodiversity hotspot, or critical biodiversity zone, is a terrestrial or marine biogeographical region that is home to a great abundance of endemic species (unique to that region) and is subject to intense human pressure.

²²The Andean countries, within the Andes region of South America, consist principally of Bolivia, Colombia, Ecuador, and Peru; the region also encompasses parts of Chile and Argentina.

justice lies both in responsibility for greenhouse-gas emissions and in the impact of climate change. It is likewise important that the benefits derived from ecosystem services be fairly distributed, as should the efforts undertaken to preserve biodiversity.

The effective and robust participation of every stakeholder in decision-making and in the design of legal mechanisms is likewise one of the key elements in this endeavor; yet new forms of intervention and activity must also be created, engaging every individual.²³

The overarching principles of a sound ecological transition likewise rest on ensuring access to primary resources and achieving the greatest possible degree of development, while paying particular attention to the work of public authorities in taking account of the social disparities affecting vulnerable groups and sensitive situations.

To this end, our values must without doubt be reconsidered so as to move toward more rational patterns of consumption and production, and toward interacting with nature with the greatest possible degree of responsibility and sustainability.

At the national level, measures and actions of real scale must be adopted, extending down to the local level for the benefit of individuals; and beyond this, action must extend from the national level to a comprehensive, global level, so as to avoid causing harm to peoples and nations far removed from one another.

Another matter deserving attention concerns the consequences of the measures and actions undertaken to contain the problem of global warming and to preserve biodiversity. Abandoning carbon-based fossil fuels will undoubtedly help curb greenhouse-gas emissions and will have a positive effect on air and water quality, and hence on public health as a whole; yet it may also conflict with the interests of certain groups that have invested their capital in related activities. In such cases, financial transfers and government subsidies must be provided to support economic actors in keeping pace with the requirements of a sound ecological transition.

It is therefore essential and fundamental to be able to analyze all of these aspects in order to make an informed decision, and no actor or dimension should be exempted from the framework of ecological transition.

Mechanisms for Achieving Ecological Transition

Ecological transition in practice entails a systemic transformation and a major evolution in the economic, social, and environmental model, oriented toward sustainable development. It depends on sustaining and changing the habits and behaviors of stakeholders and citizens alike, and constitutes a radical change within society.²⁴ Achieving it requires laying out a clear path grounded in environmental planning, implemented within the framework of a national project involving all stakeholders — government ministries, the private sector, associations, and individuals alike.

The priorities of ecological transition consist in accelerating the decarbonization of the principal polluting strategic sectors — transport, industry, agriculture, housing, and energy. This likewise requires devising a strategy specific to each sector, carried out through rigorous environmental planning with periodic reviews to evaluate the results achieved. At its core, this future national strategy must aim to reduce carbon emissions and to achieve the greatest possible degree of energy efficiency.²⁵

Giving concrete expression to ecological transition likewise requires implementing a strategy specific to each region, with objectives set in partnership with local stakeholders — local authorities, businesses, citizens, and others — which will make ecological transition genuinely achievable.

²³Jean-Luc Gaffard, “La transition écologique : incertitude, irréversibilité et modèle institutionnel,” GREDEG Working Paper No. 2021-04 (Université Côte d’Azur, OFCE Sciences Po, Institut Universitaire de France, 2021), 70, <https://ideas.repec.org/p/gre/wpaper/2021-04.html>

²⁴M. Bruno Duchemin, rapporteur, “La transition écologique et solidaire à l’échelon local,” Avis du Conseil économique, social et environnemental, France, November 2017, 10.

²⁵European Parliamentary Research Service, *Le principe de protection de l’environnement : une perspective de droit comparé* (France, April 2025), 5.

Ecological transition likewise calls for the establishment of simplified support mechanisms to assist the most disadvantaged groups and help them engage in this endeavor.

Ecological transformation likewise rests on the establishment of a new national strategy for protecting biodiversity and natural resources such as water, forests, and soil, and on strengthening the preservation of ecosystems and working toward their restoration.

The process of ecological transition likewise requires raising awareness among all citizens so that they may participate effectively in developing new training programs for public administration, as well as engagement programs designed to strengthen citizens' commitment and activate environmental citizenship.

The choices and measures adopted during the current decade will have consequences, both immediate and lasting, for thousands of years to come; and in the absence of swift, effective, and equitable measures for mitigation and adaptation, climate change increasingly threatens ecosystems and biodiversity alike, as well as the livelihoods, health, and well-being of both present and future generations.

Technical, political, and societal solutions already exist across every sector, and are clearly identified. Now is the time to adopt the necessary measures, without delay.²⁶

III. Ecological Transition as a Driver of Territorial Cohesion for Cities and Regions²⁷

Starting from the maxim “think globally, act locally,” a regional approach is essential for bringing about the great, rapid, and unprecedented transformations required to achieve carbon neutrality, and likewise calls for considerable effort in adapting to climate change and its consequences.

The concept of ecological transition has recently entered the vocabulary of public policy, referring to the radical and gradual transformation of a region's functioning, carried out by the various stakeholders responsible for its implementation — public authorities, citizens, associations, businesses, and others — with a view to reducing the impact of human activity on the environment and achieving sustainable development.

From the standpoint of the regional approach, environmental transition seeks to preserve a given territory and to make it fit for the life of both present and future generations, thereby reflecting the principle of intergenerational equality, which guarantees to every human being the right to live in a healthy environment, irrespective of the era or the place in which they live.

A study by the Organisation for Economic Co-operation and Development (OECD) has shown that cities are home not only to half of the world's population but are also responsible for the majority of greenhouse-gas emissions. Globally, cities account for more than 70 percent of energy-related CO₂ emissions and two-thirds of energy demand; these proportions are expected to rise significantly in the coming decades in the absence of meaningful climate action, given that the urban population is projected to grow from 3.5 billion to 5 billion between 2015 and 2050.²⁸ More importantly still, cities also face the most acute challenges in terms of exposure and vulnerability to climate impacts and shocks, including heatwaves, drought, and flooding.

Despite these challenges, cities are, on the other hand, at the forefront of climate action, since local authorities bear responsibility for a range of domains — urban planning, transport, waste management, energy production and distribution, water and sanitation management, and green spaces — all of which bear directly on mitigating or adapting to climate change. They are accordingly bound to adopt the necessary measures to this end and to promote ecological transition.

²⁶IPCC, *AR6 Synthesis Report: Climate Change 2023* (Geneva: IPCC, March 2023), 25.

²⁷Agence Nationale de la Cohésion des Territoires, *Comprendre – Transition écologique et cohésion des territoires : quatre défis à relever* (France, October 2020), 3, <https://agence-cohesion-territoires.gouv.fr/transition-ecologique-cohesion-territoires>

²⁸Law No. 2015-992 of 17 August 2015 on Energy Transition for Green Growth, <https://www.legifrance.gouv.fr>

As a result, local authorities are presumed to have the direct capacity to reduce greenhouse-gas emissions in their cities by as much as one-third. Moreover, up to 90 percent of urban emissions could be cut using existing technologies, while creating additional employment opportunities by 2050.²⁹

Many cities have set climate-adaptation and mitigation targets that go beyond those of their national governments; yet if national governments were to act alone, their capacity to respond to climate change would remain limited. Coordination among the different levels of government is therefore of critical importance.

It is certain that all regions are affected by environmental issues, though to varying degrees depending on particular criteria such as geographic location, economic specialization, and available resources. For environmental transformation to become a tangible reality for everyone, a number of challenges must be confronted: taking living organisms into account in regional urban-planning policies; changing patterns of production, consumption, and lifestyle; addressing questions of regional and social justice; and creating new mechanisms of cooperation and solidarity among regions.

These challenges call for a profound reconsideration of the public activity of regions and of its underlying mechanisms, given that local authorities' action on climate change should align with national and global objectives in a way that can also generate immediate social benefits, such as reduced pollution and traffic congestion. Ensuring inclusiveness in this respect depends on the responsiveness of stakeholders at the regional level, on the state of natural environments and geographic areas, and on infrastructure.³⁰

1. Integrating Living Organisms into Urban-Planning and Land-Use Policies

This challenge rests on systematically integrating questions of biodiversity into development projects and urban-planning processes, including within cities and in dedicated spaces such as parks, commercial districts, and industrial zones.

Rural and forested areas are likewise essential to confronting global environmental challenges, including climate change, biodiversity loss, and food security, and require concerted efforts in fields such as land use, infrastructure, and economic transformation.

Local and regional authorities possess strategic rural and forested locations that place them in a favorable position to lead such action, financing, on average, 63 percent of climate-related public spending and 69 percent of climate-related public investment. They likewise bear extensive responsibilities in the fields of education, housing, transport, waste, water, energy, and land use.³¹

There is no doubt that human activity places pressure on natural habitats and disrupts ecosystems: climate change, soil compaction, the depletion of non-renewable natural resources, and the pollution of air, water, and soil, among other effects.

Intensive agricultural practices and land appropriation — particularly where they lead to soil compaction and urban sprawl — likewise play a major role in the erosion of biodiversity, a process now advancing at an alarming pace.

These findings call for moving beyond the mere definition of protected areas, giving due regard instead to the reciprocal services provided by human communities and natural environments throughout a given region. This, in turn, requires cooperation between planning specialists and nature-conservation experts.

2. Transforming Patterns of Production, Consumption, and Lifestyle in Local Areas

²⁹Coalition for Urban Transitions, *Climate Emergency, Urban Opportunity* (2019), <https://urbantransitions.global/en/publication/climate-emergency-urban-opportunity/>

³⁰Agence Nationale de la Cohésion des Territoires, *Comprendre – Transition écologique et cohésion des territoires : quatre défis à relever*, 4.

³¹Christian de Perthuis, "Économie circulaire et transition écologique," *Annales des Mines – Responsabilité et environnement*, no. 76 (2014/4): 23, <https://doi.org/10.3917/re.076.0023>

Ecological transition rests on a radical transformation of models of production and consumption. It is clear that the models of production and consumption that prevailed throughout the twentieth century have been accompanied by negative effects on local regions: greenhouse-gas emissions contributing to climate change; the pollution of air, water, and soil; the production of ever-increasing quantities of waste; a worrying decline in the stock of certain resources; and the loss of regional and cultural diversity.³²

In this context, energy transition stands as one of the most important axes bound up with ecological transition — indeed, forming part of it — representing a qualitative shift in how energy is produced, distributed, and consumed, and aiming to move away from fossil fuels toward the use of renewable energy.

This shift in the energy field is essential to curbing the climate crisis, given that fossil fuels still account for 80 percent of the global energy mix.

Accelerating the energy transition requires increasing the production and storage of renewable energy, decarbonizing sectors dependent on fossil fuels, and strengthening energy-efficiency measures.

Certain manufacturing activities face particularly significant challenges from the standpoint of ecological transition, encountering severe difficulties in moving toward carbon neutrality, given that they generate as much as 50 percent of solid waste and 70 percent of greenhouse-gas emissions — a situation that calls for radical restructuring.

Yet adopting mechanisms of clean regional development and a circular economy already offers genuine ways of reducing the environmental impact of our lifestyles, while also enhancing the suitability of economic activities and creating local jobs.

Nevertheless, the emergence of these alternatives at the regional level does not by itself constitute an adequate response to the challenges of environmental transformation and territorial cohesion, since more far-reaching changes in the economic system and in social logic are necessary to steer patterns of production and consumption toward a sustainable model — one aimed at increasing collective well-being in harmony with natural ecosystems.

A sound understanding of these challenges, and of the degree to which they vary from one region to another, contributes significantly to laying the foundations of a just and equitable ecological transition.

3. Implementing a Just, Inclusive, and Democratic Environmental Transition

Environmental transition cannot succeed unless it is just and inclusive. Most regions today bear the legacy of decades of unsustainable development — pollution, abandoned older construction sites, and the like — carrying a heavy burden in some areas, while other areas remain especially exposed to climate risks. Certain regions specialize, moreover, in sectors highly vulnerable to the effects of climate change and biodiversity loss, such as winter sports and coastal or urban tourism; and it is, finally, widely agreed that pollution in all its forms is the principal cause of environmental harm and of social and economic hardship. Affected sites and environments must accordingly be identified so as to strengthen understanding of the environmental condition of each region.

Local authorities' climate action, and its effects, vary from one place to another, particularly in the most exposed regions, owing to differences in per-capita greenhouse-gas emissions within each region, and these differences likewise vary by sector.

There is no denying that cities differ considerably from one another in their potential and their conditions for achieving climate neutrality, just as the scale and source of greenhouse-gas emissions differ considerably from one region to another. In cities such as Boston (United States) and Madrid

³²European Parliamentary Research Service, *Le principe de protection de l'environnement : une perspective de droit comparé* (France, April 2025), 5.

(Spain), for example, the largest share of emissions comes from the transport sector, accounting for 29 percent and 31 percent of total emissions respectively. By contrast, emissions from the building sector reach their highest levels in cities such as Istanbul (Turkey) and Rome (Italy), where they represent 38 percent and 58 percent of total emissions respectively. These differences show that the pathways toward optimal emission levels will likewise differ from place to place.

4. Creating New Mechanisms of Cooperation and Solidarity among Regions

Environmental transformation raises questions concerning the sustainable management of resources, the reduction of pollution, energy production, the preservation of biodiversity, and the reduction of greenhouse-gas emissions — questions that all extend beyond administrative and sectoral boundaries. Moreover, environmental transformation is not the exclusive preserve of the state or of any single level of local governance; in this respect, a genuine challenge emerges in coordinating public action across the various levels of government — between the state and local authorities, among local authorities themselves, and also across different areas of expertise — so as to move from sector-specific measures toward a comprehensive policy that strengthens environmental transformation.³³

It may be said that environmental transformation has become a shared ambition, necessarily entailing a regional dimension that refers to the deep and gradual transformation of the functioning of regional communities, led by a range of different stakeholders, with the aim of reducing the impact of human activity on the environment and achieving sustainable development. Indeed, the environmental degradation caused by past and present human activity leads us to question the very habitability of the Earth.

Yet proactive action alone is capable of dispelling these doubts over the medium term. While all regions are affected, the challenges they face differ according to their geographic, demographic, economic, and social situation, their particular trajectory, and their own resources. To what extent, then, can environmental transformation contribute to territorial cohesion?

Conclusion

In light of the foregoing analysis, we have sought to show that humanity, since the beginning of the industrial era, has exerted a growing influence on the flow of natural resources, on living organisms, and on ecological balance as a whole — an influence that has, in turn, had negative repercussions for the survival of societies.

It is clear that a sound understanding of the mechanisms and consequences of climate change and biodiversity loss is essential to clarifying how these two great dimensions are interconnected, and the extent to which both remain closely bound up with the patterns of life and consumption we pursue.

If the complexity of both climate change and biodiversity loss poses a genuine threat to the future of societies, then we must, in turn, question our models of economic development and our relationship with the biosphere that surrounds us.

Combating the loss of biodiversity requires preserving both the entities that make up biodiversity and their evolutionary potential, within both dedicated spaces and our own human spaces alike. This requires reconsidering and revisiting patterns of land and sea ownership that have caused a decline in the number of species and, in some cases, their extinction, and that have altered the capacity of ecosystems to adapt to climate change. Careful attention must likewise be given to the duration and terms of hunting permits, which, when granted without due consideration, leave animal populations unable to renew themselves.

³³Sibylle Bui, “Pour une approche territoriale des transitions écologiques. Analyse de la transition vers l’agroécologie dans la Biovallée (1970–2015)” (PhD diss., AgroParisTech, 2015), 3, <https://theses.hal.science/tel-02116016>

Combating or mitigating climate change is achieved through preserving forest ecosystems and devising a new energy plan aimed at curbing depletion, improving energy efficiency, and fostering more responsible consumption behaviors.

New patterns of energy production must likewise be developed to counter the fossil-fuel-based schemes that continue to dominate the global and institutional landscape, while addressing the challenges of rationalization and resource use.

In closing, we would emphasize the fundamental role played by the diversity of initiatives gradually undertaken by stakeholders, and by new forms of coordination, in bringing about a sound ecological transition. The question is no longer simply one of reflecting on ecological transformations in themselves, but rather one of creating the conditions necessary to foster the coexistence of diverse initiatives, to drive social innovation, and to enable its interaction with the prevailing system so as to bring it into effect.

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