

**Joint Master in EU Trade and  
Climate Diplomacy**

***The Nature Restoration Law***

***The impact and evolution of European Green  
Cities following the Proposal for the  
Nature Restoration Law as a key element  
of the European Green Deal***

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**2023**

## Statutory declaration

I hereby declare that I have composed the present thesis autonomously and without the use of any other than the cited sources or means. I have indicated parts that were taken out of published or unpublished work correctly and in a verifiable manner through a quotation. I further assure that I have not presented this thesis to any other institute or university for evaluation and that it has not been published before.

7<sup>th</sup> of June 2023,

Marie Müller



## Abstract

The Nature Restoration Law has been proposed in 2022 by the European Commission and sets legally binding targets and obligations to Member States to restore their ecosystems. The proposal, contributing to Europe's internal framework the Green Deal, aims to protect Europe's fast-paced biodiversity loss.

Scientific reports provide alarming evidence about climate change and biodiversity loss. Impact assessments of previous measures set by the European Union and their conclusions will be analyzed. The opportunities, challenges, and limits of the new law will be here studied, applied in two European Green Capitals, Copenhagen and Grenoble. Based on their previous and present urban management, assets, and localities, a first glimpse into future implementation scenarios of the Nature Restoration Law will be analyzed.

The main challenge of this proposal is to apply the same legal framework to different heterogenic cities across Europe and to find a balance between establishing significant policies for the restoration of nature and realistic targets, due to limited possibilities of each municipality, and to be different from previous failed measures of the European Union to halt biodiversity loss.

## Table of Contents

INTRODUCTION .....	5
LITERATURE REVIEW .....	8
METHODOLOGY .....	10
1. CLIMATE CHANGE AND BIODIVERSITY LOSS .....	11
a. Human-caused Climate Change .....	11
b. Biodiversity .....	13
c. Ecosystems .....	13
d. Monitoring biodiversity .....	14
e. Why to protect biodiversity? .....	14
2. THE ACTUAL POLITICAL/ENVIRONMENTAL CONTEXT .....	15
a. Atmospheric pollution .....	15
b. Soil pollution .....	16
c. Pollution of the oceans .....	17
d. Consequences .....	18
e. European political context .....	20
3. GREEN DEAL .....	22
a. The European Green Deal .....	22
b. Biodiversity Strategy by 2030 .....	23
c. EU's Funding Programmes .....	25
4. THE NATURE RESTORATION LAW .....	26
a. Content and aim .....	26
b. Definition of Restoration .....	28
c. Legal framework .....	29
d. National Restoration Plans .....	31
i. Economic impact .....	34
j. Criticism and opinions .....	35
5. THE APPLICATION OF THE NATURE RESTORATION LAW IN CITIES .....	39
a. Nature Restoration in Cities .....	39
b. Cities nowadays .....	40
c. Urban Ecosystems .....	40
d. Benefits of trees for nature and Biodiversity .....	42

6. CASE STUDIES.....	43
a. Copenhagen .....	43
b. Grenoble.....	47
CONCLUSION.....	52
LIST OF ACRONYMS.....	55
LIST OF FIGURES .....	56
BIBLIOGRAPHY .....	57

## Introduction

This Paper aims to analyze the Proposal for the Nature Restoration Law launched by the European Commission in 2022. The European Union's internal policy, pursuing continent-wide climate neutrality by 2050, involves many projects around a more environmental-friendly and therefore more sustainable future. The importance of biodiversity has for a long time been neglected in the world as well as in Europe, and with the ongoing climate crisis, significant measures and policies based on scientific evidence and not based on economic benefits have to be taken. The new Law, once fully ratified, could be one missing piece of the puzzle contributing to the mitigation and adaptation of climate change, biodiversity loss, desertification, and many other issues. This puzzle in its entirety represents the European Green Deal. The ensemble of many different projects altogether has been launched by the European Commission in 2019, announced as a shifting moment for Europe's internal policy framework. The idea behind this Paper is to first understand, what the Nature Restoration Law implies, why the European Union goes the first time one step further, making nature restoration legally binding, how this law could have far-reaching consequences for the future, and in a second step which difficulties the law will have to overcome if, and once successfully adopted as proposed.

Europe's ecosystems are dramatically declining. Biodiversity needs space, so-called habitats to be able to flourish. But unfortunately, even if scientists provide clear and alarming scientific evidence to politicians warning against the dramatic consequences of political non-action, until today no Regulation has been put in place, strong enough to solve the dramatic decline of life's diversity. All previous attempts of the European Union to reverse or even halt biodiversity loss have failed.

The way people are living nowadays has significantly changed throughout the last few years. Cities are growing and once started as villages, can be today megacities of multiple millions of citizens. With the growing number of people, so does the diversity and heterogeneity in cities increase. Living in a city provides multiple opportunities for jobs, freedom, and inspiration. But as every coin has two sides, living surrounded by many

people does also have many inconveniences. Cities are often loud, polluted, and more expensive than rural areas and this can carry on health problems, poverty, and injustice. For animals and plants, cities represent a barrier. Ecosystems inside dense urban areas are often almost completely banned or very modified. Harmonization between civilization and nature as well as mitigating climate change in the same scope, is one of the targets set by the Proposal.

As the Proposal for the Nature Restoration Law has only been made public on the 22<sup>nd</sup> of June 2022, the existing literature is quite limited. The focus on how the Nature Restoration Law could impact European Cities and its population has rarely been studied before and possible obstacles can only be guessed. The restoration in urban areas is specially mentioned in the Proposal and will obtain the main focus of this Paper. As the Law incorporates many different restoration measures, adapted and corresponding to the wide range of ecosystems throughout the entire continent, a clear limit had to be made to disrupt the complexity and countless ranges of dimensions brought by this Proposal. Consequently, the application of the Law will only focus on the restoration in urban areas.

The biodiversity in cities could be ameliorated due to more green urban spaces and due to a higher percentage of tree canopy in each city. Within these measures, diverse positive effects could occur, as the expansion of nature in cities shown previously in many different studies and research projects. Based on this evidence, the paper will provide a broad overview of possible challenges and difficulties during the possible realization process.

Following the fact that this Law would introduce legally binding targets, all cities inside the borders of the European Union would be obligated to implement those in a determined timeframe, and concerns are being raised regarding its feasibility. The main difficulty of the Law will be to find a balance between ambitious targets, allowing measures that are deep enough to accomplish their aim, and the complexity of the reality, mainly based on different assets across Europe's different municipalities and governments. This balancing act will be illustrated through the introduction and comparison of two different case studies: Copenhagen and Grenoble.

The general plan for this Paper will therefore start with an introduction to the scientific evidence of climate change and biodiversity, as well as basic knowledge about how the monitoring of biodiversity works.

A deeper understanding will be reached in the next chapter, while the consequences of climate change, illustrate the importance of biodiversity for the global environment and human health. This chapter is one of the most important ones, even if at this point the main topic of this paper is not introduced yet. Only if the connection between the climate crisis, biodiversity loss, and the deterioration of nature is clear and comprehensible, corresponding policies and measures can be made.

The next chapter will be dedicated to the Green Deal and to the previous attempts to help preserving biodiversity and reducing its loss. This chapter should provide an overview of the current policy framework established by the Green Deal and provide an idea about the reasons, why this law has been proposed. In that way, the learning process inside the European Union, the starting point for the Nature Restoration Law, and which gap the law should close will be better clarified.

Finally, the Proposal for the Nature Restoration Law will be introduced. The Chapter 4 resumes the content and aim of the proposal. The term restoration will be defined, followed by the legal framework of the Proposal. Then the National Restoration Plans, as one of the main innovations presented in the proposal of the EU, will be described as well as the post-implementation processes of these. In the last step the financial benefits and economic impact in general, as well as criticisms and difficulties, opposing the law will be presented.

All the knowledge acquired in the previous chapters will then be applied in the last chapter on urban ecosystems within two different case studies. Grenoble and Copenhagen are both European cities with an already green and environmental-friendly engaged background and will be used to illustrate and analyze the main difficulties for the realization of the Law, based on differences across the European Union and the capability of their municipalities to be in line with the Nature Restoration Law once successfully adopted.



## Literature Review

The Nature Restoration Law drafted by the European Commission has been proposed on the 22<sup>nd</sup> of June 2022. Regarding already existing literature about this law, time is clearly a limiting factor. If the Proposal for the Nature Restoration Law will be approved or not, can't be predicted yet and will have to be closely followed during the end of the year and probably even later on. The next significant event defining the future of the Proposal inside the European Institutions will take place on the 10<sup>th</sup> of July 2023 in a plenary sitting.

Since the Proposal is the first draft of a possible continent-wide Law about the restoration of nature and is not even one year old, the literature is quite limited. The analysis about similar previous and already implemented laws, regarding conservation and biodiversity specifically, doesn't exist as the Law will for the first time be EU-wide legally binding.

Within my research and the actual writing phase of this thesis, more literature mostly in the form of articles on EURACTIV, Politico, or other European-centered newspapers appeared. I therefore gradually widened up and actualized my research to recent events, statements, and opinions, which allowed me to better anticipate future challenges for the Law.

Regarding the scientific evidence behind the Proposal, literature, and different research projects have been undertaken regarding the science and benefits of conservation, restoration, and biodiversity. These papers are mostly published in scientific journals like the Nature Journal. A wide literature around climate change exists due to the IPCC reports and other institutions, specializing in the recent development of the anthropogenic impact of climate trends, biodiversity, and the planet in general.

As climate change has become central in the eye of society, many books, websites, channels, and podcast deal with recent updates around the climate crisis. Greta Thunberg is a famous actor part of the climate change discourse and published 'The Climate Book' in October 2022 (Thunberg, 2022), incorporating different small insides of recent research undertaken around climate change. Using sources like these is helpful to

understand the complexity and interlinkage between rising temperatures, biodiversity loss, and failed policymaking until today, emphasizing the need for better regulations and implementation of significant measures within a limited timeframe, set by nature herself. As the literature about climate change is very wide, I focused on the newest IPCC report from 2021 and other recent evidence. This is crucial as science is moving fast and can easily be outdated, forcing it to be reconsidered.

Further on, different previous projects of the EU as parts of the Green Deal and even beforehand, counting the Natura 2000 network or other LIFE-funded projects, have been studied and evaluated since their implementation. The Nature Restoration Law could be one puzzle piece inside the strategy of the EU fighting for climate neutrality by 2050. Therefore, different sources and analyses on the work undertaken by the EU until today are widely represented, including possible explanations for previous failures. I used these to anticipate the effects of the Law, which gap should be closed, and which challenges remained after the implementation of previous strategies.

The most recent developments of the Proposal can be found on the official websites of the European Union. The latest updates, recent key events, and imminent steps are publicly available as reports, working documents, and other sources.

The literature for the case studies was mainly in the websites from both municipalities and reports based on recent city development. As the application of the Nature Restoration Law in Grenoble and Copenhagen is quite specific, there is no existing literature on these, nor about the possible practical application of this law in European cities. To close this gap, I had to study the context of both cities, their history, localization, limiting factors, political history, social and environmental engagement, past challenges, future climate change scenarios, and other relevant aspects.

Further on, I used the data made available by the European Environmental Agency (EEA) to get an inside into the state of nature, the tree canopy per city, and other facts. These data have been created by satellites in cooperation with Copernicus Land Monitoring Services and were very relevant for me as this allowed me to get an idea of the starting point for nature restoration. As the data are renewed and adapted every 3 years, the latest available ones are from 2021.

I didn't focus on or incorporated the newest, individual projects like green buildings, vertical gardening designs or energy efficient buildings, for two main reasons. The first one is because these are individual, single projects that will possibly be built one day, but this is not relevant to me, as my research focuses on the wider realistic application of legally binding targets inside European cities but not on individual architectural innovations, even if these could contribute in the future while implementing the Nature Restoration Law. The second reason is that this paper is limited, and even if green buildings will be necessary one day for their contribution to implement the law, a wider research about them doesn't benefit enough to be taken into account for this research.

## Methodology

To adequately address the research question, I will first do empirical research, based on publications, papers, and literature as my main data collection source, to gather background information about the thematic context of the Proposal for the Nature Restoration Law. The idea is to make the reader understand what issues the law will try to close, why these issues even appeared in the first place, and what has to be done to tackle them.

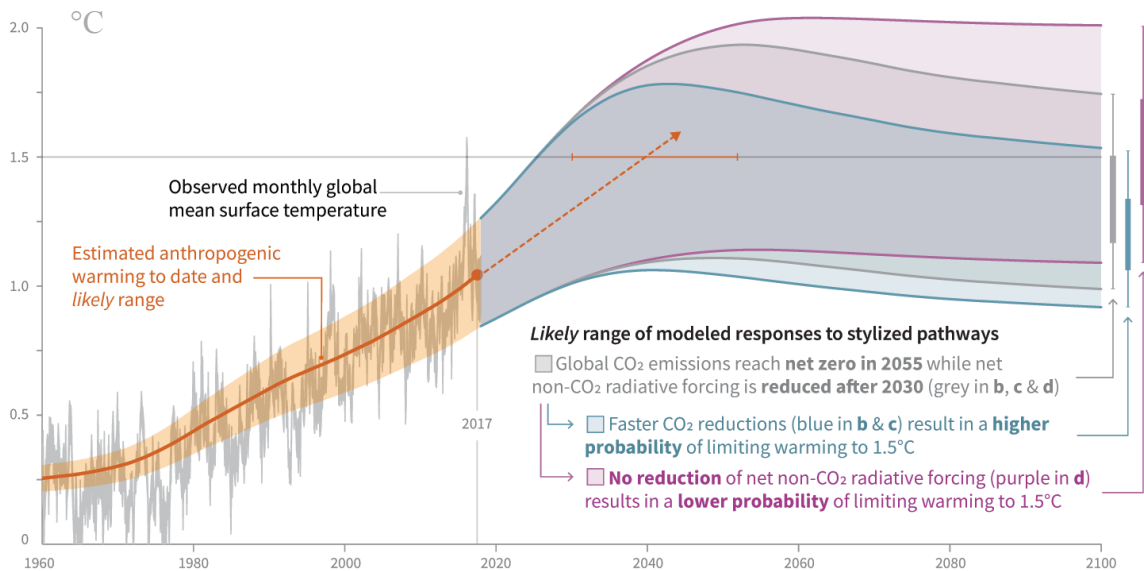
Starting with scientific facts resulting from recent research about the correlation between climate change and biodiversity loss to assess the new proposal for the Nature Restoration Law, especially in green urban areas, I will then compare two different case studies. I will do theoretical research in order to create and then analyze new connections for future scenarios if the law is adopted. Different approaches in each municipality will have to come together to implement the targets set by the law, to be in line with the possible new coming legislation. This will be based on the departing point of each case study, predicted challenges by experts and politicians, and finally my perception.

# 1. Climate Change and Biodiversity Loss

## a. Human-caused Climate Change

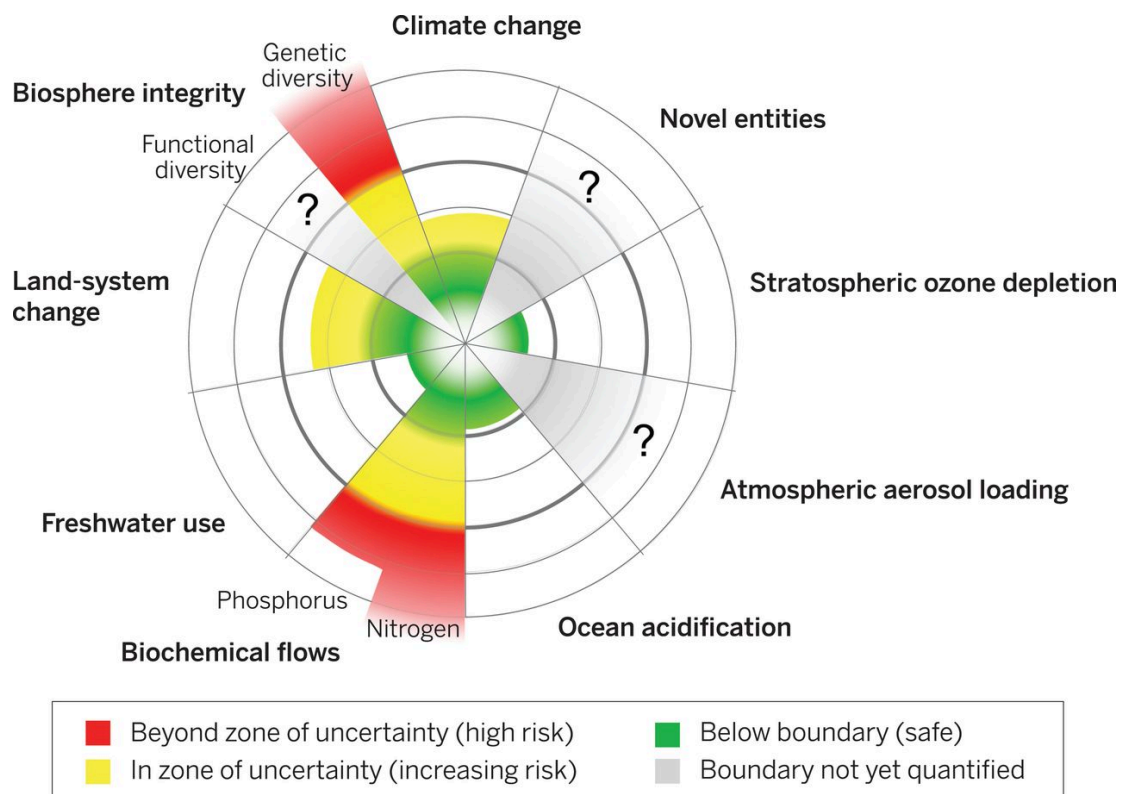
Climate change is evidently linked to human activities (Blicharska *et al.*, 2016). Our European way of life, until now thought of as modern and front leading, especially in gentrified areas is not as sustainable as it might look, concerning nature, animals, and climate.

Since 1850-1900, human activities have shown an impact on climate change (IPCC, 2019b). This period refers to the pre-industrial period when fossil fuels started to be used in an extensive way as energy sources. The greenhouse gasses emitted while burning oil, gas, or coal create until today a supplementary atmospheric barrier, restricting a certain additional amount of thermal infrared radiant energy to leave the atmosphere (NASA, 2010). This radiation is therefore caught inside the atmosphere and is consequently causing global warming (Figure 1). From 1850-1900 until 2006-2015 the air temperature on Earth has risen by 0.87 °C already (IPCC, 2019a). The consequences are increasingly severe and repetitive dry seasons, a higher frequency of extreme weather events like floods, cyclones, and long rainfall periods (United Nations, 2023a).



**Figure 1:** Evolution of global warming from 1960 until 2017 and the expected temperature scenarios depending on the probability of the reduction of carbon emissions. Source: IPCC (2021). *Technical Summary. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.*

Since the evolution and industrialization of Europe's society, today's success is measured by rising GDPs (Wandana *et al.*, 2020). Growing population rates demands higher production rates and with time passing by, natural resources made available by nature are getting smaller due to overexploitation. The main results are deforestation, pollution, biodiversity loss, and many other damages. Some can be reversed and some are or will be lost forever. Since a long time already, these symptoms show that this model isn't sustainable. The health of the planet is in a dramatic state and action needs to be taken. The planetary boundary concept (Steffen *et al.*, 2015) is a model trying to visualize the impact of overexploitation while crossing the planet's boundaries. The idea is to visualize the human impact on natural resources and which limits exist, while at the same time, the actual level of human activity is visualized inside the model (Figure 2). Further on this allows us to determine and communicate the need to take action, specifically as some resources are more strained than others.



**Figure 2:** Planetary boundary concept visualized as a model, incorporating the boundaries and risks based on scientific evidence. The more boundaries are crossed, visualized within the circle moving away from the center to the outside, the greater the risks for the system to collapse. Taken from Steffen *et al.*, 2015.

Experts are often referring to tipping points while speaking about excessive overexploitation and human-caused climate impacts. The IPCC defines tipping points as a critical threshold beyond which until today known system changes and is then ruled differently and with no possibility of return (IPCC, 2021a). It can be seen as jumping off a cliff into the unknown. The limit of 1.5°C, determined inside the Paris Agreement, doesn't guarantee that a tipping point isn't crossed, even if the probability to do so is significantly lowered (OECD, 2022).

### *b. Biodiversity*

To further discuss the aim and importance of biodiversity, some definitions have to be cleared beforehand like what biodiversity is and what ecosystems are on a scientific scale. Biodiversity is defined as the variety of all living organisms on our planet. Living organisms are animals and plants, the best-known ones, but also include fungi and microorganisms like bacteria or archaea (Benn, 2010).

Since 2015 and within the creation of the sustainable development goals (SDG) by the United Nations (UN) following the Paris Agreement in 2015, the halt of biodiversity loss is specially mentioned under SDG 15 (United Nations, 2023c). The SDG named 'Life on Land', aims to 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.' (United Nations, 2023b).

### *c. Ecosystems*

Ecosystems are defined as areas containing biotic, living parts like plants, animals, or microorganisms and abiotic factors, like temperature, humidity, and geographical conditions including rocks, rivers, and others (National Geographic, 2022). Applying pressure on one species can cause its loss, which can then result in the threat of another species, which was dependent on or influenced by the extinct species. Different animals and plants are influencing each other in complex interactions due to their coevolution and living forms like parasitism or symbiosis based on competition or cooperation between them. In order to stop biodiversity loss not only the pressure has to be removed, but also

an equilibrium between different living forms and their environment inside an ecosystem has to be re-established.

*d. Monitoring biodiversity*

To be able to provide adequate measures to protect and benefit biodiversity with the best efficiency, the starting point has to be determined precisely. Only if experts can predict the needs and necessary measures to reduce pressure on biodiversity, then their implementation can be argued and brought forward. Monitoring biodiversity has been ameliorated constantly since its first practice around 50 years ago. The analysis of a short DNA fragment, leading to its identification as a species is called DNA barcoding (DeSalle *et al.*, 2019). The most used method nowadays is done by using so-called ‘environmental DNA’ (eDNA) (Thomsen *et al.*, 2015). This specific type of DNA gathers all DNA together from many different species and organisms, even potentially already degraded DNA. While taking a sample coming from every possible source in nature like water, soil, or in the air, the origin of the sample is not known and therefore not specified yet. The idea is to take a sample that is randomly composed of many different DNAs from different organisms, to then analyze it using metagenomics. This way scientists hope to discover new species, based on the rapid and cost-effective analysis of a greater amount of genetic material, which doesn’t require the full genetical information of the discovered species (Bohmann *et al.*, 2014). One of the major problems before using eDNA, was the difficulty of first finding the new species, as biodiversity includes all living forms, involving very small microorganisms, which mostly can’t be observed with the bare eye. Nowadays eDNA allows the monitoring of all these species, earlier neglected, partially due to their size.

*e. Why to protect biodiversity?*

The health of the planet is directly linked to human health. Biodiversity has to be protected for many reasons and the more the consequences appear, the more global governance recognizes its importance.

Due to genetic diversity, natural resources like water, food, medicine, and air are available (Byron-Cox, 2020). Preserving these is therefore a necessity for the functioning of our

society. Besides the fact that humans are dependent on natural resources made available for free in the nature, many people are economically dependent on these. Especially in developing countries, where poverty will strongly increase when these resources will disappear (Cairns *et al.*, 1992). The low productivity in the agricultural sector goes hand in hand with less money, and if marine ecosystems continue to degrade, fishers will have to reorient to other job possibilities.

Further on, the recent COVID crisis driven by a zoonotic virus has shown us the importance of healthy habitats for animals and how, if these are being degraded, the interaction between animals and humans becomes more intensified (Dean *et al.*, 2020). The closer animals and humans live to each other, the greater the probability of the mutation of a virus to a zoonotic virus. As biodiversity helps habitats to stay favorable for their habitants, protecting biodiversity will then reduce the risk of future pandemics and contribute to human health.

## 2. The actual political/environmental context

### *a. Atmospheric pollution*

The ongoing climate crisis is driven by a too-high concentration of carbon in the atmosphere. Following the IPCC, in comparison to the year 1750, the CO<sub>2</sub> concentration has increased by 47% to an annual concentration of 410 parts per million (ppm) by 2011. On the 6<sup>th</sup> of June 2023 the daily CO<sub>2</sub> average concentration already reaches 424.43 ppm (Global Monitoring Laboratory, 2023). Other significant greenhouse gases are methane with a concentration of 1866 ppm or nitrous oxide (332 ppm) triggering global warming likely to carbon emissions, by thickening the atmospheric layer, called the troposphere (IPCC, 2021b). One way to get away from polluting greenhouse gases would be, additionally to reduce new emissions, to create or protect already existing carbon sinks. These are natural or artificial reservoirs that have the capacity to bind and store carbon dioxide from the atmosphere (Ocean and climate Platform, 2023a).

Terrestrial carbon sequestration is therefore the storage of carbon by plants, soils, and other biomass. This way, around 13.74 PgC are sequestered worldwide annually (Sha *et al.*, 2022). This process will consequently increase the quantity of biological material of plants, trees, and others and will increase the Leaf Area Index (LAI). This LAI is a good



indicator of canopy health since this is the ratio between leaf area ( $\text{m}^2$ ) per unit ground area ( $\text{m}^2$ ).-There is a positive trend between the LAI and higher carbon concentrations, as carbon dioxide represents a “fertilization” factor needed for the photosynthesis (Boretti *et al.*, 2019). In this line, the LAI worldwide has increased 25 to 50% since 1981 (Chen *et al.*, 2019). Management defining the way green areas are being used today has an impact on the global LAI. Having more vegetation tendentially widens habitats for species. Consequently, biodiversity and carbon sequestration are equally benefitting from healthy ecosystems and soils and emphasize the need to correlate climate action and biodiversity protection.

Aerosols are small particles, contributing to air pollution. If dust, pollen, black carbon, water, or chemical residues, all types of aerosols together are called particulate matter (PM) (WHO, 2023b). The main causes for the release of these particles into the atmosphere are due to the combustion of fossil fuels in traffic, agriculture, or other sectors and further on from chemical reactions in-between gases. While the WHO sets a red line for the maximal outdoor PM concentration at  $2.5 \mu\text{g}/\text{m}^3$ , already 99% of the global population is today exposed to higher PM concentrations. This result is dramatic and shows the urgency to act for worldwide ameliorations, especially as air pollution is directly harming human health, as one prior long-term effect is cancer (WHO, 2023a).

#### *b. Soil pollution*

The anthropological impact of humans on Earth is well known and can even be seen from space. According to surface analysis from the IPBES, almost all terrestrial space on Earth is covered by infrastructure, causing the degradation of soil but further on, has big impacts on biodiversity (Leeprakton *et al.*, 2018). Species of flora and fauna need natural habitats in which they can establish niches, to be protected from predators and other threats (Levine *et al.*, 2009). If soils are losing their ability to host vegetation, habitats are getting destroyed and biodiversity loss is inevitable.

Additionally, inside the vicious cycle of the agricultural sector, where pesticides, herbicides, fungicides, and many other chemicals are used to exploit the maximum economic outcome of land per square meter, these utensils are not sustainable in the long term. Many nowadays accepted practices like pesticides and chemicals harm biodiversity.

Unsustainable agricultural measures are leading to the eutrophication of bodies of water, due to the artificial release of extensively high amounts of nitrogen and phosphorus, pressing ahead erosion (Leeprakton et al., 2018), leaving dead and overexploit soils behind, which are not livable or useable any more. Pesticides are causing endocrine perturbation and directly affect human health (Mnif *et al.*, 2011).

Reducing the use of fertilizers and pesticides, and allowing more sustainable land management, would at the same time halt and in the best case reverse land degradation, and would then directly result in a positive outcome for biodiversity and humans health.

### *c. Pollution of the oceans*

Human-caused climate change and global warming are causing rising temperatures in the world's oceans, resulting in dramatic changes of the oceans chemical composition and development.

Due to higher temperatures, the salinity of the water is increasing, oxygen-concentrations are dropping, ice is melting, causing the sea levels to rise and create a burden on vulnerable localities, ocean heat waves are becoming more frequent and the oceans are acidifying.

Carbon sequestration of global anthropogenic emissions happened to approximately 23.5% of the oceans between 2009 and 2018 (Pant *et al.*, 2023). Hereby, the carbon dissolved in the ocean can be found under different forms. Dissolved CO<sub>2</sub> is either used by phytoplankton for photosynthesis and released as oxygen, or is changed into carbonate-ions (Ocean and climate Platform, 2023b). Different forms of carbon can also be found in the ocean, including carbonate ion and bicarbonate ions. But as the CO<sub>2</sub>-concentrations in the air and then in the oceans is increasing, the concentration of bicarbonate ions and hydrogen ions goes up as well, causing the acidification of oceans (Ocean and climate Platform, 2023b). This phenomenon is based on the increase of the hydrogen ions-concentration, as H<sup>+</sup>-Ions determine the acidity of solutions. Unfortunately, the ability of the ocean to bind CO<sub>2</sub> is decreasing with rising water temperatures and further on could decrease if the stability of ecosystems is destroyed mainly through acidification (IPCC, 2022).

Concluding, this means protecting the ocean and soils worldwide will lead to better carbon sequestration, allowing the planet to partially recover from too high CO<sub>2</sub>

concentrations and at the same time allow the recovery of many species in healthier natural habitats and ecosystems. But the current state of the oceans is in very bad shape and if no action is taken, future climate models are predicting ocean warming to double by 2100 in optimistic scenarios, where it is expected to quadruple or even to octuple under more pessimist, but still realistic scenarios.

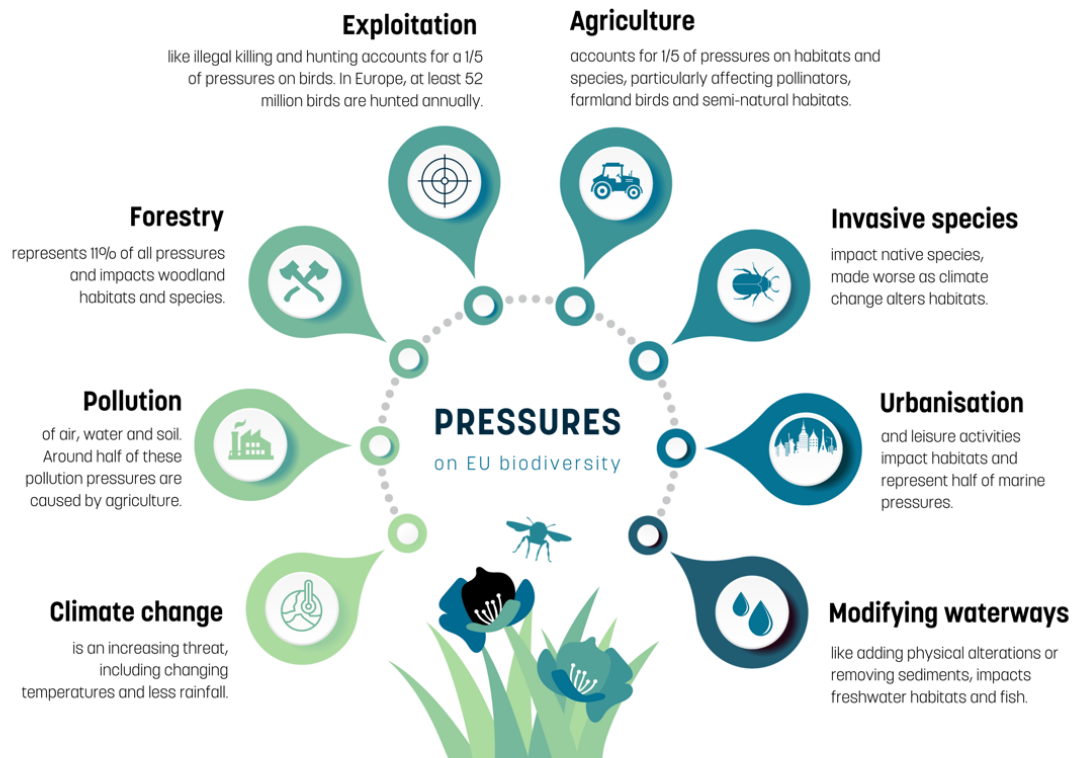
#### *d. Consequences*

Global warming is causing biodiversity loss. The diversity of nature on earth is dramatically decreasing. Experts are not sure about the exact numbers of biodiversity loss but estimate that of all species worldwide, 30% are threatened by extinction or have already been banned, since the year 1500 (Isbell *et al.*, 2023). The uncertainty of the exact numbers is due to the lack of monitoring and findings about the large range of time in which the species disappeared but also due to new research methods, which allow today the collection of more recent data.

The fact that biodiversity is urgently declining remains non-negotiable and the more biodiversity is studied, the more evidence is founded, underlining the need for action and changes (Figure 3). Different types of species, whether fauna or flora, have seen different high losses. Insects are one of the biggest representatives of biodiversity. They are on their own, counting a total amount of 75% of all species worldwide. Insects are a very diverse class, but unfortunately highly dependent on their environment, which leads to the explanation for their high losses in recent years, reinforced by pesticides. Even if climate change and higher carbon concentrations are leading to the greening of the planet's surface due to the fertilization effect (Zhu *et al.*, 2016), most species are not able to adapt in time to their fast-changing environment. But as the environment and surroundings of a species have a strong impact on their living, it will inevitably decide their survival or extinction.

The main drivers for biodiversity loss were identified in terrestrial areas, classified from more dominant ones to less significant ones: land/sea use change, direct exploitation, invasive alien species, pollution, and climate change. For marine areas, the main drivers are direct exploitation, closely followed by climate change, then pollution, land/sea use change, and lastly invasive alien species (Jaureguiberry *et al.*, 2022).

The change in land/sea use is directly linked to human activities in a certain area, ‘mainly the form of rapid expansion and intensifying management of land used for cropping or animal husbandry.’, (Jaureguiberry *et al.*, 2022). Direct exploitation in this context refers to unsustainable hunting and fishing practices and further on to wildlife trade. Newly introduced invasive alien species, not naturally belonging to the ecosystem, are a threat to indigenous species and can quickly lead to their extinction.



**Figure 3:** Different pressures weighing on Europe’s decreasing biodiversity. Source: EURACTIV. (2021). <https://www.euractiv.com/section/energy-environment/news/biodiversity-eu-aims-to-protect-30-of-land-and-sea/>

Pesticides are widely used in the agricultural sector to produce more in the same amount of time. These chemicals acting against the damages caused by insects and fungi, in this case, are called fungicides. Unfortunately, these are dramatically toxic for insects as they were produced to kill them. Insects and in a closer context pollinators are urgently needed for the reproduction of plants. While the production of pollinator-dependent crops has increased by 300% in the last 50 years, the number of pollinators have decreased dramatically (IPBES, 2016). This is not only a burden for biodiversity but directly affects future food security worldwide.

The consequences are a long list of extinct species and an even longer Red List of Threatened Species published by the International Union for Conservation of Nature (IUCN) (International Union for Conservation of Nature and Natural Resources, 2022). The close interlinkage between biotic and abiotic factors, ones destabilized, accelerate like chain reactions, resulting in a rapid and irreversible loss of threatened species.

Extreme weather events like heat waves, floods, and extended dry periods are getting more frequent with the continuous rise of the world's atmospheric temperature. Where exactly and how string these phenomena occur is not equally distributed on the planet. The polar hemispheres for example are losing billion tons of ice every year, resulting in loss of biodiversity, as the natural habitat of many species disappears together with the melting ice blocks. The same phenomenon has dramatic consequences in other places of the world. Islands and coasts, which are located under or close to the sea level, are drowning under the supplementary masses of water because of rising sea level. This is one of the best examples to show the interdependence of ecosystems, nature, and people worldwide. Nature goes behind borders and climate change is causing significant losses in places worldwide, but is mostly hitting on already vulnerable and deprived societies. This should once more demonstrate the need for collective action on a supranational level. Not every country and population has the same assets and the same starting points, but sufficient results will be achieved if we collectively join our efforts.

*e. European political context*

The need to take action is not entirely new. The importance of further nature protection is nowadays even stronger but previous attempts to benefit flora and fauna have been launched previously. Globally, the UN Conference on the Environment and Development in Rio 1992 set one of the first milestones for environmental protection and awareness (United Nations, 2023d). The EU can be seen as a pioneer in regard to nature protection, as even before the UN Conference in Rio took place, the EU published different guidelines and policies to implement solution-based approaches against the ongoing loss of biodiversity. The Birds Directive have been inaugurated in 1979 (Williams *et al.*, 2005), aiming to protect wild birds, their habitats, as well as their eggs and nest to protect their reproduction and conservation. The Habitats Directive (European Council, 1992)

followed, by being adopted on the 21st of May 1992, the same year as the UN Convention in Rio. The EU progressed in the following years to implement many other policies, strategies, and other initiatives throughout the years to benefit nature and her habitants.

The complete title for the Birds and Habitats Directives are the Directive on the conservation of wild birds (European Council, & European Parliament, 2009) and the Directive on the Conservation 'of natural habitats and wild fauna and flora' (European Council, 1992). These Directives directly address better conservation measures on the European continent and can each be divided into two sets of measures, aiming for the establishment of defined rules to protect specific designated areas and the geographical classification of these areas (Sundseth *et al.*, 2014). Both Directives have a very similar structure and implementation plan and are often referred to together as the Nature Directives (Tucker *et al.*, 2019). Unfortunately, as these Directives are not legally binding, their effectiveness are not as successful as hoped. The four main reasons for the lack of successful results were identified by the Ecologic Institute based on the annual reports of the EU Commission, and are: a too small amount of areas inside the Directives, insufficient authority by the EU in regard to infringements, and finally insufficient measures to protect species and their habitats (Tucker *et al.*, 2019).

The Commission adopted as a follow-up, five measures in total, to ameliorate the realization of these Directives. The measures focus on better cooperation between the EU and their Member States, going a step towards skeptical stakeholders by reacting better to complaints, creating expert groups, improving the financial plan, and finally launching a new process to enhance cooperation with the Member States the conservation of the Natura 2000 network (Sundseth *et al.*, 2014).

The Natura 2000 network (European Commission, 2023e) is the largest coordinated and protected area in the world, counting in total approximately 27% of EU's superficies in 2021, composed of 18.6% land and 9% marine area (European Environment Agency, (EEAS), 2022). The network contains different ecosystems, and habitats, home to threatened species across Europe. Natura 2000 has been financed by the LIFE Programme in 1992 and was adopted under the EU Habitats Directive. Even if the Natura 2000 network can be seen as a pioneering act due to the early investment of the European Union

for protected areas and biodiversity, which was not common back in the 90s and is still not prioritized today across the world, some flaws in the network can be identified.

First, some argue that the network is not actually a network interconnecting the protected areas with each other, but is, in reality, counting a number of isolated protected areas (Verschuuren, 2015). One reason for this disruption is the non-cooperation between the Member States, valid as well between authorities within different regions of one country. This is fatal as biodiversity goes beyond borders and needs green corridors in order to build resilience.

Additionally, the question could be raised as, to why the conservation status of these areas, especially forests, is still not satisfactory (Alberdi *et al.*, 2019), even if these areas have been protected for now around 30 years. Experts see a lack of consistency and engagement. The level of ambitions is strongly influenced by the priorities of each Member State and their own perception of the need for conservation and biodiversity engagement. It has become clear that more action is needed to halt or reverse biodiversity loss than the conservation measures applied in the Natura 2000 network.

### 3. Green Deal

#### *a. The European Green Deal*

‘Climate-neutrality by 2050’, is the new goal set by the President of the European Commission Ursula von der Leyen, and Vice-President Frans Timmermans in 2019. The challenges set by climate change seem unachievable and the European Union suggested the Green Deal, a package including many different initiatives and approaches, which overlap and reinforce each other in order to achieve the overall goal of continent-wide climate neutrality by 2050. This long-term policy framework incorporates many binding and non-binding legislations in various sectors including the energy sector, food production, and infrastructure. The Green Deal is supported by the European Climate Law which has been finally adopted on the 29<sup>th</sup> of July 2021 (European Commission, 2023a). The Law should reinforce the policies listed inside the Green Deal and further on under the Fit For 55 Package.

This new policy framework is not only a strategy by the EU, setting targets and proposing different projects but goes far behind this. The Green Deal is described by Frans

Timmermans as a paradigm shift (European Commission, 2019b). The climate crisis is used as a starting point, to create a new economic and political model, which should not only tackle the climate crisis but which should at the same time be fair, competitive, and include all citizens. The EU is addressing everyone, especially vulnerable members and citizens, to ‘leave no one behind’ (Timmermans, 2022).

The roadmap to climate neutrality by 2050 is enshrined in the Green Deal with a detailed timeline for each project as part of the bigger picture. The timeline is a fundamental part of the organization for the high number of different projects, setting clear ambitions and assuring their implementation in time.

The Green Deal is not only influencing internal policy changes, as the EU needs external relations and partnerships in order to accomplish its realization. Following Mario G. Varrenti’s advice (Head of Cooperation at the EU Delegation), it is important for the EU to politically extend the Green Deal on the inside but also internationally (Varrenti, 2020), underlining once more its external interconnection due to ‘trade, development, and foreign and security policy’ (Koch *et al.*, 2021).

#### *b. Biodiversity Strategy by 2030*

The Biodiversity Strategy by 2030 is one of the core parts of the Green Deal, aiming to contribute to the restoration and conservation of nature, mitigate climate change, and benefit animals, plants, and Europe’s citizens. The Strategy is acting in many different sectors besides climate change mitigation enhancing food security, and mitigating the risk of forest fires and pandemics (European Commission, 2020a). Some of the core projects contributing to the reverse of biodiversity loss are the New Forest Strategy for 2030, the Soil Strategy for 2030, and the Farm to Fork Strategy, which will be shortly presented.

The New EU Forest Strategy for 2030 has been launched as one of the puzzle pieces complementing the Green Deal and the Biodiversity Strategy by 2030. The Strategy itself presents 8 priorities in total, called measures, like ‘promoting sustainable forest management’ or ‘planting 3 billion new trees by 2030.’ (Caprile, 2022). While reforestation and protecting European forests, the EU aims to benefit biodiversity and climate change mitigation. One supporting tool will be the creation of a digital platform called the European Urban Greening Platform (European Commission, 2023f). The New EU Forest



Strategy not been elaborated with Member States or other potentially relevant actors like local forest experts (Lier *et al.*, 2022), in contrast to previous strategies elaborated after the Better Regulation Agenda. This has been criticized by the Council and creates, therefore, uncertainty about its realization success.

Additionally to the New EU Forest Strategy, and part of the Biodiversity Strategy by 2030, the Commission launched the Soil Strategy by 2030. The overall goal of this policy is to protect and ensure healthy soils across Europe. This should protect biodiversity but should as well secure the sustainability of natural resources, especially in regard to changing climate conditions resulting in desertification processes.

Following the newest IPCC report of 2022 (Pörtner *et al.*, 2022), climate change and the loss of diversity of fauna and flora will significantly threaten food security in Europe, because food production has a direct impact on environmental wealth (Deconinck *et al.*, 2022). The consequences will be especially hard in the long-term as unsustainable short-term solutions can give a wrong impression, while enhancing land degradation, overexploitation, and high carbon-emissions. The Farm to Fork Strategy proposed by the Commission inside the Green Deal aims to promote more sustainability in the agricultural sector, especially focusing on climate-neutral or positive food production, enhancing Europe's food independence and security (Nasr, 2022). The idea is to create a more sustainable food system for more affordable and healthier products available for Europe's consumers and at the same time reverse the biodiversity loss and mitigate climate change. The EU proposes different approaches to concretize these goals. First, the EU wants to change the way pesticides are used in the agricultural sector, as they are causing soil, water, and air pollution while being used in high amounts and frequency (Rajmohan *et al.*, 2020). In regard to living stocks and the widespread use of antimicrobials, the EU aims to reduce sales by 50%. Consequently to the frequent use of microbial in aquacultures and farms, animals and humans are facing problems with antimicrobial resistance. Once a resistance is present, the treatment of dangerous infectious diseases becomes more difficult and the risk for fatality increases. The WHO listed the need to act to avoid the further establishment of antibiotic resistance in the future as a high priority (WHO, 2020).

### *c. EU's Funding Programmes*

Next to the various strategies of the EU to achieve the targets set within the Green Deal, the EU elaborated different funding opportunities. These are mainly based on the participation of European Innovation and Research Centers and their citizens.

In 1992 already, the European Parliament launched L'Instrument Financier pour l'Environnement (LIFE), creating a budget of approximately 400 million euros as a fund to finance multiple environmental projects in Europe (European Commission, 2023d). The natura 2000 network has been financed due to this Funding Programme by monitoring and protecting different species and their natural environment.

The special aspect of the LIFE Programme is that as well private as well as public institutions, independent of profit or non-profit organizations, can apply to the European Parliament to ask for financing for their project, by applying before a yearly application procedure. The annual budget set by the European Parliament has grown gradually over the last two decades and is reaching 5.45 billion euros for the projects of 2021-2027 (European Commission, 2018).

Horizon Europe is a funding mechanism elaborated by the EU. This is the most important funding programme especially for research and innovation as the annual budget of this programme is 95.5 billion € for the timeframe of 2021 to 2027. Some goals set by the EU due to the funding of participatory projects in line with the Green Transition are to 'tackle climate change', 'achieve the UN's Sustainable Development Goals', and to 'boost EU's competitiveness and growth' (European Commission, 2021). The funding of the Horizon Europe budget will be distributed due to grants among selected projects following proposal rounds, whereas the EU evaluates each project proposal (European Union, 2021).

## 4. The Nature Restoration Law

### *a. Content and aim*

The need for action to protect and restore natural resources, habitats, and species has reached a time, where the choice of whether to act or not, is outdated. The EU has seen itself with tied hands, not able to regulate acts or prevent damages inside its own borders as a consequence of the subsidiarity of each Member State inside the European framework.

In recent times, reinforced by scientific evidence, citizens' initiatives and nature's non-negotiable own rules and agenda lead to a proposal that could revolutionize environmental law and action in the internal and European policymaking.

In order to stop the ongoing extinction of species and the decline of natural habitats, and to reach the targets set by the Biodiversity Strategy by 2030, a new law has been proposed and should help to make the difference, and to reach the targets in time. This Law is called the Nature Restoration Law. The spectacular aspect of this new Proposal is that the Law, once adopted would be the first time a continent-wide environmental EU law. It has been proposed on the 22 of June 2022 by the Commission. The overall objective set by this Proposal is 'to contribute the continuous, long-term and sustained recovery of biodiverse and resilient nature across the Union's land and sea areas through the restoration of ecosystems, achieving the Union's overarching objectives concerning climate change mitigation and climate change adaptation; meeting the Union's international commitments', as written down in Article 1.1 of the Proposal of the Nature Restoration Law. The Nature Restoration Law is the Commission's answer to the fast-paced biodiversity loss in Europe and the decline of Europe's ecosystems, and should therefore stop and further on, reverse the ongoing biodiversity loss in Europe (European Commission, 2022e).

All targets set inside the Proposal for the Nature Restoration Law are definite for 2050, and some specific targets are set for 2030 or 2040, allowing better and more focused time management to be kept in mind. This new law should close the gap between the already existing Birds and Habitats Directive and other precedent measures taken by the EU. The new aspects of this proposal, which should ideally lead to better and more effective

results, are that the proposal is listing specific legally binding obligations, clear targets, as well as annex-based regimes. The European Commission published additional documents besides the proposal. Next to the legal text, on the website of the European Commission, the Staff Working Document, 7 Annexes, and 12 Impact Assessments providing scientific evidence, and legitimating the proposal for a Nature Restoration Law, can be consulted by the public's eye.

All targets and obligations together should help, complement and reinforce each other and are listed in Chapter 2 of the proposal, starting with Article 4 until Article 10. For the re-established habitats, the goal is set even higher, as all of them should be in good condition by 2050. The goal has been set very high, regarding the actual conditions classified as at least 80% being in poor conditions (European Commission, 2020b). Next to the overall goal, that in 2050 the percentage of improved habitats in good condition should be at least 90%, each article of Chapter 2 is listing different types of ecosystems and issues to be changed favorably. Therefore Articles 4 until 7 address the restoration of terrestrial, coastal, and freshwater ecosystems<sup>1</sup>, marine ecosystems<sup>2</sup>, urban ecosystems<sup>3</sup>, and the natural connectivity of rivers and natural functions of the related floodplains<sup>4</sup>. Article 8 is specifically targeting the restoration of pollinator populations within the EU<sup>5</sup>. By adopting the Restoration Law, the legal basis allows to adopt and implement measures to monitor and restore pollinator populations.

Besides some articles which are referring and adhering to already existing European policy frameworks like Article 5 contributing to Directive 92/43/EEC, the Law specifically targets for the first time urban ecosystems. The Proposal, as listed in Article 6 regarding urban ecosystems, will not tolerate 'any loss of urban green space (...) compared to 2021'<sup>6</sup>. Specific deadlines have been set for every additional ten years to reach this goal. By 2040 the green spaces in cities should increase at least by 3%, and

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<sup>1</sup> Art. 4 Proposal for Nature Restoration Law.

<sup>2</sup> Art. 5 Proposal for Nature Restoration Law.

<sup>3</sup> Art. 6 Proposal for Nature Restoration Law.

<sup>4</sup> Art. 7 Proposal for Nature Restoration Law.

<sup>5</sup> Art. 8 Proposal for Nature Restoration Law.

<sup>6</sup> Art. 6 Proposal for Nature Restoration Law.

even by 5% in 2050. Also, urban spaces have to increase their tree canopy by 10% by 2050, to secure 'a net gain of green spaces' (European Commission, 2022d).

The new proposal doesn't only require protecting already declining nature, the Nature Restoration Law is about restoration. This means actively improving and widening natural sites to an early, already lost condition. This also enlightens the missing part in the Habitat Directive, as the Nature Restoration Law targets all species, and not only the species registered in the Natura 2000 network (Blicharska *et al.*, 2016).

### *b. Definition of Restoration*

Ecological restoration can be defined in two ways. The first definition is based on the goal which should be achieved by the restoration measures. The goal-oriented definition of ecological restoration is about bringing back an ecosystem to its prior condition (Cairns *et al.*, 1996). The prior condition is described as an ecosystem's status before any disturbance has been caused.

The second definition is process-oriented and is defined as 'the process of repairing damage caused by humans to the diversity and dynamics of indigenous ecosystems' (Cairns *et al.*, 1996). The difference between both definitions reflects perfectly the issues confronted by the law. Restoration goes one step further than conservation, as the rehabilitation of nature has to be actively implemented by specific restoration measures. Only by putting in additional effort, nature will be able to recover, especially in already degraded ecosystems.

In order to set targets for the restoration of European ecosystems, the previous status of these and therefore the 'goal' which should be achieved, has to be defined. The problem is that defining a previous status is not always easy because some ecosystems have not been studied before and in general, there is a gap in information regarding existing species. This issue will be addressed by the Law as monitoring will especially be reinforced by legal obligations.

### *c. Legal framework*

As the Nature Restoration law has been proposed inside the EU Biodiversity Strategy by 2030, the Regulation is defined inside the European Union law under Article 288 TFEU. This means, once adopted, the Nature Restoration Law is legally binding and can be applied directly, based on general application. The governments have therefore no choice or need to transpose the legislation in their own national law (DG Communication, 2022), but is automatically and without any choice binding for all Member States of the EU on European as well as on national level.

Environmental policy is a non-exclusive competence of the EU<sup>7</sup> and its application is therefore to be regarded with special attention. How far the EU can act in this competence is determined by the principle of subsidiarity and the principle of proportionality.

The principle of subsidiarity<sup>8</sup> is used to determine the level on which the case should be dealt with, following the vertical power of levels (e.g.: European, national, or regional level) inside the EU. Ideally, the EU should only have the right to act if it is shown that the efficacy and competence are not adequate on a lower level. This way the centralized and exclusive power of the EU as a supranational organ, overshadowing her Member States, should be avoided. As the Nature Restoration Law has been proposed in order to protect all ecosystems and based on the evidence that nature and biodiversity don't stop at every Member State's border, the application on the supranational level is required. In order to be successful, the Law requires to be applied EU-wide.

The principle of proportionality<sup>9</sup> is regulating the tools used in order to achieve the aim of a regulation. Only necessary measures should be applied, avoiding unnecessary costs and time. If the Nature Restoration Law is indeed in line with this principle can be argued. Previous measures have failed until now and this promotes a more drastic measure, including the legally binding obligation of all Member States to protect and restore nature. Only if the aim of the Biodiversity Strategy by 2030 should be achieved with success, the

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<sup>7</sup> Article 11 TEU.

<sup>8</sup> Article 5.3 TEU.

<sup>9</sup> Article 5.4 TEU.

proportionality of the Regulation has to be recognized. This way fast and well-defined actions, coordinated across the entire EU could be realized with the overall goal to stop biodiversity loss.

The legal basis for the new Proposal of the EU is in Articles 11 TEU and 192(1) TFEU. Article 192(1) describes how the environmental policy stated in Article 191 has to be implemented concretely. The Law is adopted under the Ordinary Legislative Procedure (OLP). This is consequently linking the European Parliament, the European Council, and the European Commission together, due to their participation in the decision-making. In further steps, the national legislatures will also be involved in the procedure as well. The European Council is involved in political decision-making but has no legislative authority.

The Commission initiates a proposal in the OLP, as defined in the EU legal framework<sup>10</sup>. In this case, it was the Directorate-General on Environment that initiated the Regulation. Following the Initiation, the Regulation underwent an impact assessment to ensure its legitimacy and entity. This process is part of the EU Better Regulation Agenda. A support for more restoration of nature's good has been shown with the EUROBarometer (European Commission, 2019a). After further developing of ideas contributing to the success of the Regulation, the European Parliament and the Council reviewed and voted for the proposal. Only if both agree on the text adopted, the trialogues can take place in multiple rounds. The aim of the different rounds of trialogues is to find a common agreement in order to, later on, adopt the Regulation successfully.

This final step is expected to take place at the end of 2023. The next step will take place on the 10<sup>th</sup> of July, when the Parliament including the Committee on Environment, responsible for the Proposal, will meet in a plenary session (European Parliament Legal Observatory, 2023).

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<sup>10</sup> Article 17.2 TEU, Article 194.2 TFEU.

#### *d. National Restoration Plans*

One of the most innovative measures of the Nature Restoration Law are National Restoration Plans (NRP) described in Articles 11 and 12 of Chapter 3 of the Proposal for the Nature Restoration Law (Hoek, 2022). This newly introduced policy tool should guarantee a more adequate answer to local problems by letting freedom to each Member State, to create individual restoration plans inside the framework regulated by the EU. The NRPs will have to be created by the Member States first, but their aim, content, submission, assessment, and implementation have been described in the Proposal for the Nature Restoration Law. While Article 11 describes the preparation of the NRPs, Article 12 aims exclusively at the description of their content. To name a few points regulated under Article 12, the NRPs should provide information about the ‘quantification of each area to be restored’<sup>11</sup>, a ‘description of the restoration measures planned’<sup>12</sup>, or about the timing<sup>13</sup> for each measure proposed.

#### *e. Dialog between European Commission and Member States*

In a first step, the environmental problems on local, regional and national level have to be specifically localized and studied, providing more qualitative and quantitative information from experts to the accountable political authorities. As a lot of ecosystems until today, not have been studied enough to create measures tackling the problems with efficiency, setting measures to obligate further monitoring is one of the key innovations proposed by the Law. Therefore, to achieve the first step, the European Commission foresees each Member State to study and gather enough information in order to design precise and closely adjusted plans covering up the timescale upon 2050<sup>14</sup>, later on presented for the first time to the European Commission within two years<sup>15</sup>. The Commission will then assess the draft plans from each Member State<sup>16</sup> within 6 months and will be able to change, recommend and ask for amelioration if needed, regarding ‘the

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<sup>11</sup> Article 12.a Proposal for Nature Restoration Law.

<sup>12</sup> Article 12.b Proposal for Nature Restoration Law.

<sup>13</sup> Article 12.f Proposal for Nature Restoration Law.

<sup>14</sup> Article 12.1 Proposal for Nature Restoration Law.

<sup>15</sup> Article 13 Proposal for Nature Restoration Law.

<sup>16</sup> Article 14 Proposal for Nature Restoration Law.



targets and obligations'<sup>17</sup> listed in Articles 4 to 10. Once approved by the Commission, every Member State, in a second step has to implement the measures listed in the NRPs<sup>18</sup> as they will be legally binding.

By doing so, the European Commission is hoping for more commitment and ambition of each Member State to apply measures adapted to the fast-paced biodiversity loss. Better coordination between the Member States can be achieved as the European Commission will be able to adapt the plans coming from each Member State to each other. This will help to address restoration and measures against biodiversity loss on a continent-wide level, avoiding gaps and misalignments between varying Member States. Different from before, complementary measures and missing ones could be added following the request of the European Commission. This tool has been elaborated based on the malfunctioning of the Birds and Habitats Directives, which both failed mostly due to implementation issues (Blicharska *et al.*, 2016).

#### *f. Monitoring and Reporting*

The NRPs also include a wide range of instructions regarding monitoring and reporting described in Articles 17 and 18 of Chapter 4 of the Proposal. The idea is to create an 'EU-wide methodology', and based on this scientific database, set individual measures for each ecosystem. This should bring more cooperation between science and politics, which is probably the biggest improvement learned out of previous measures that failed to show success. There is strong pressure coming from politics and governments as land use and regulations are closely interlinked to economics and industry, having especially an impact on the local level.

Not only the starting point for each Member State will have to be monitored but also the progress will have to be scientifically followed and closely reported to the Commission as NRPs will have to be renewed every ten years<sup>19</sup>, newest scientific evidence will be integrated into the NRPs, allowing more precise measures and letting the possibility to react to missing improvements or unexpected developments in general. This is one of the main weaknesses recognized and improved since the Natura 2000 Network, in which

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<sup>17</sup> Article 14.2 Proposal for Nature Restoration Law.

<sup>18</sup> Article 11, 12, Proposal for Nature Restoration Law.

<sup>19</sup> Article 15.1 Proposal for Nature Restoration Law.

database never has been updated and many species weren't even listed (Hermoso *et al.*, 2019).

Once the Proposal for the Nature Restoration Law is adopted several implementation measures will have to be realized. The success of the implementation of the Law is mainly based on the close dialogue between the Member States and the European Commission along the NRPs but involves other key players as well.

*g. The European Environment Agency*

The European Environment Agency (EEA) will be involved, having a special role, in providing further support, especially in regard to more technical aspects of the implementation measures. The EEA will transmit an annual technical overview of all achievements of the Regulation to the Commission<sup>20</sup>. During the first 2 years, once the Proposal is adopted, the EEA will support the Member States by defining specific targets to reestablish nature to the 'favorable conservation status' (European Commission, 2022f). This will be expected to take place between 2024 and 2026. Once these are put in place, the EEA and a helpdesk will support the Member States to implement their NRPs from 2026 on. Additionally, the EEA will be in charge of electronic reporting systems and data quality control from 2024, up to 2050. Better communication of the scientific results and won data is as well a task of the EEA. Every 3 years, starting in 2030, the EEA will assess a progress report. The Joint Research Centre of the European Commission will complement the work undertaken by the EEA and the DG ENV by providing scientific evidence and tools (European Commission, 2022f).

*h. Local and regional authorities*

Going further down inside the vertical power alignment are local and regional authorities. These have a key role as the implementation measures and their further development will have to be applied on this level. For the success of the NRPs, technical support to ameliorate and guarantee their expertise will be essential. As every Member State doesn't

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<sup>20</sup> Article 18.5 Proposal for Nature Restoration Law.

have the same standards and structures, uniformity across the continent will be a challenge but has to be addressed. The coordination across all the different players will decide the success of the Nature Restoration Law.

Article 21.2 inside the Proposal for the Nature Restoration Law describes a procedure, which allows the institution to adopt implementing acts for methods to monitor pollinator populations<sup>21</sup>, to establish a uniform format for the national restoration plans<sup>22</sup>, to specify the methods for monitoring, to develop a framework for setting the satisfactory levels<sup>23</sup> and to establish the format, structure, and detailed arrangements for the reports of the Member States<sup>24</sup>.

*i. Economic impact*

The Nature Restoration Law should ideally avoid supplementary costs, which will inevitably occur if the ecosystems are not protected now. The Law, therefore, aims to anticipate the future costs related to the decline of these protected areas and the biodiversity loss. As the more an ecosystem is degraded, the harder and more costly it is to regenerate this specific area. The European Union aims to earn between 8€ and 38€ from every euro invested in nature restoration (European Commission, 2022c). Following the impact assessment published within the Proposal for the Nature Restoration Law, this will mean a payoff of 1.8€ trillion out of the previous investment of 154€ billions (European Commission, 2022b).

Due to better-coordinated protection of nature in Europe, the agricultural sector should benefit widely from this amelioration. The Nature Restoration Law directly aims to benefit the survival of pollinators and should ideally lead to their reestablishment and protection, as one of the most essential ranges of organisms for sustainable ecosystems. Bees and other pollinating insects could increase the quality of crops and boost their productivity (Aubert, 2022). Consequently, next to more food security and economic

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<sup>21</sup> Article 8.2 Proposal for Nature Restoration Law.

<sup>22</sup> Article 12.4 Proposal for Nature Restoration Law.

<sup>23</sup> Article 17.9 Proposal for Nature Restoration Law.

<sup>24</sup> Article 18.3 Proposal for Nature Restoration Law.

benefits of the agricultural sector, other avoidable costs linked to mediocre land status, like restricted water supply and desertification could be avoided simultaneously.

Additionally, the restoration of nature is known for opening new job opportunities. The Natura 2000 has shown previously, how the protection of nature can on the one side open new jobs directly linked to the protection of the site, but also on the other side help to protect the long-term availability of jobs linked to natural resources available inside protected areas by the law. This category primarily counts jobs in fisheries, agriculture, and forestry, where sustainable management will decide about their future existence. This explicitly reinforces the idea of the law, not to ‘freeze’ certain areas, but to change the way they are taken care of.

Further on the Nature Restoration Law will also allow the creation and preservation of jobs that are less directly linked to ecosystem protection. The tourism and recreation sector will benefit from visitors, the health sector will benefit due to a better mental and physical health of civilization, and climate mitigations and adaptation, as well as research and innovation will benefit due to more financial funds and opening job opportunities (ten Brink *et al.*, 2017).

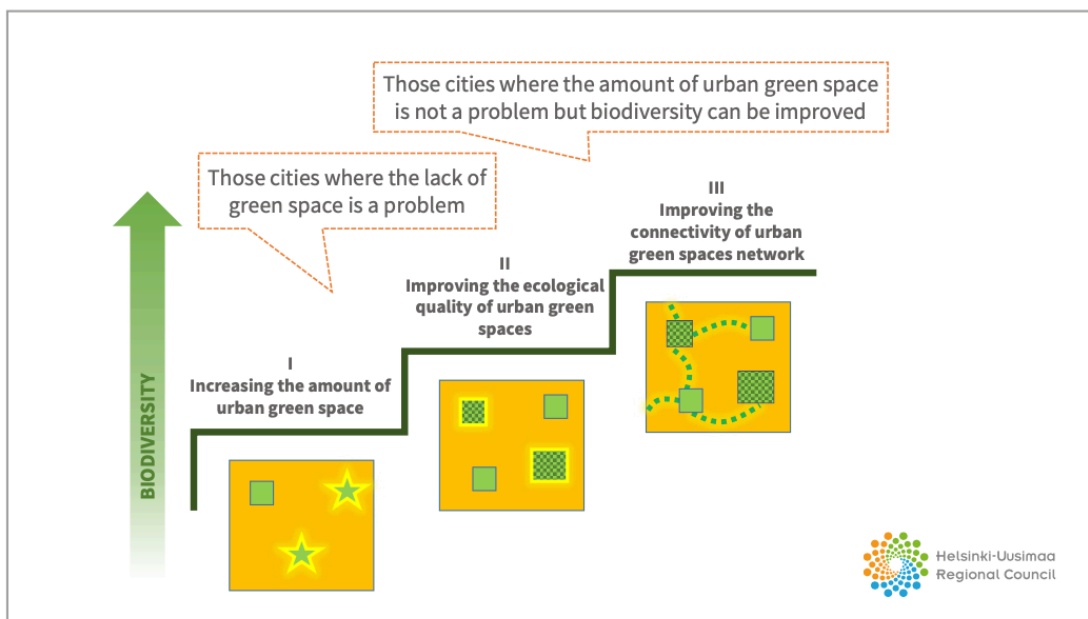
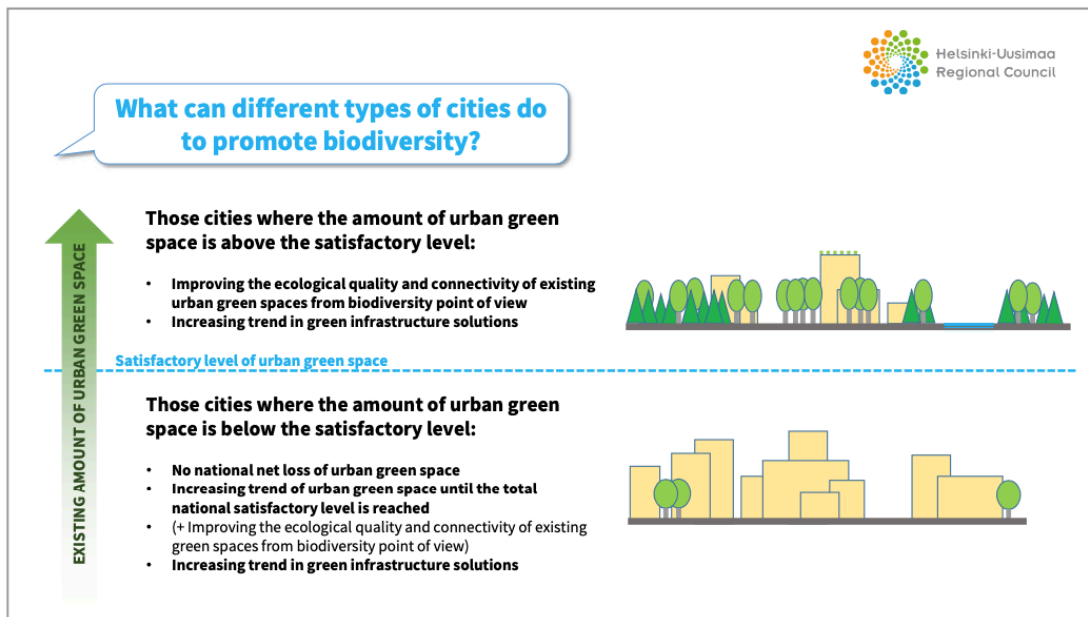
Overall, the Nature Restoration Law proposed by the EU should not be damned as an additional financial burden but should provide new and sustainable opportunities for many sectors, including food production, tourism, research, and many others. Of course, the loss of certain jobs will be inevitable, for example in the pesticide industries or in the energy sector based on fossil fuels, but this readjustment will probably will not be avoidable within the Green Deal of the EU. This way, unsustainable, current jobs will gradually start to shift to other job opportunities in line with the Green Transition.

#### *j. Criticism and opinions*

The Nature Restoration is very ambitious and sets legally binding targets. Therefore, it is not surprising that criticism occurs, especially from the Member States themselves. Northern countries are especially opposing the proposal with the argument to fear job losses. Sweden, Finland, and other Nordic countries with a large forestry industry are currently blocking the proposal. Despite the skepticism of these stakeholders, accordingly

to Marta Múgica, a coordinator for tree planting actions at the Life Terra Foundation, there is still hope. She argues, that the Law would bring forward new ‘nature-friendly’ jobs, due to the halt of land deterioration (Kurmayer, 2023). As the forestry industry already sees job losses, which has been predicted in a joint study between researchers of the United Nations in New York and Geneva already in 2003, scientific evidence and clear numbers predicting opportunities for these countries could lead to change in their perception of the future opportunities made available by the Law (Blombäck *et al.*, 2003). The timeframe has been criticized by Austria’s Environment Minister, Leonore Gewessler, during the negotiations between the European Commission, Parliament, and the Council on the 21st of April 2023. She especially emphasized the importance of a ‘coherent policy-mix’ (EURACTIV, 2023). On the other side climate activist and supporters of the proposal, like Senior Biodiversity Policy Officer at WWF European Policy Office Sabien Leemans, press for more and quicker climate action, as they underline the urgency to restore the declining ecosystem in order to prevent the dramatic consequences of neglected natural areas and their habitats in regard to the climate crisis (WWF, 2022).

In a joint statement between many different cities and regions in Finland, the stiffness of the Law especially hard for small municipalities or for cities that have a decent amount of green urban spaces (Helsinki-Uusimaa Region, 2023). The main argument is about Article 6 of the Nature Restoration Law encouraging quantity over quality, as green urban space on its own is not yet beneficial for biodiversity, but different parameters and circumstances in the specific area play a major role, like connectivity between them or their ecological level. Therefore, the opponents proposed three different alternatives, allowing more flexibility on a local stage, setting a threshold value to take into account already existing urban spaces, and finally setting an obligation for all Member States to act for more biodiversity due to green infrastructure (Figure 4).



**Figure 4:** Graphic visualizing the propositions made to improve the implementation of the Nature Restoration Law, based on the idea to take into account already green urban spaces in cities. Source: Helsinki-Uusimaa Region. (2023). *Statement on Article 6 of the EU Nature Restoration Law.*

The Nature Restoration Law is setting a certain percentage of at least 10% tree canopy on each city. Setting such a specific goal is not taking a look at cities with specific criteria. Europe is a very large area and for political regards like democracy or fundamental values, standards can and have to be applied. Unfortunately, ecosystems can't be generalized over a continent. Some cities are located in the mountains, next to the sea,

located in dry, southern areas, or colder and poorer in light, northern areas. Climate conditions depend on the geographical circumstances of the city.

Many cities will face difficulties due to geographical or demographical modalities, reflecting very limited free spaces and possibilities. In order to improve green urban spaces, by achieving a higher superficies of trees, the city would have to either remove or relocate citizens. Such organizational affairs could never be discussed on the European level and are therefore in favor of national restoration plans, where the collaboration of national and regional governments can take over and act more precisely.

Finding the right balance between legally binding targets and enough space for municipalities to adapt the targets to their specific municipal localities, has been stated in a joint statement of Eurocities and the Council of European Municipalities and Regions (CEMR). They are calling to the authors of the Proposal for the NRL to move away from specific targets as this one-size-fits-all approach is inappropriate given the varying existing conditions of cities' (Eurocities and the Council of the European Municipalities and Regions (CEMR), 2023). They suggest switching to steadily increasing trends adapted to the cities' capacities. Further on they argue, that the quantity and quality of green spaces have to be improved and that current European satellite-level data is not reliable and precise enough.

By designing the Nature Restoration Law, the EU based the provenance of the funds on more than just a European fund. Projects and implementing acts will be financed by the EU, Member States, and private investors. The main funds will still be based on the budget set by each Member State. This could be an issue as not every Member State prioritizes the sustainability of ecosystems and climate change-adapted measures. As most measures are still new, they are mostly pretty costly (Schaefer, 2022).

Already tight and dense cities, having high living costs due to limited apartments and rents, could suffer by giving away living space to be replaced by trees. Additionally, green urban spaces in cities tend to elevate housing prices, as they ameliorate the attractiveness of neighborhoods with access to nature (Panduro *et al.*, 2013). This is an alarming side effect

as everyone should profit from greening cities, and it should not create barriers leading to exclusion. How and if this is achievable remains unclear.

Creating urban spaces means subtracting living space for people. This will therefore, inevitably have to be compensated. The result: more sprawled and less dense cities. This effect has been criticized by Heather Brooks under the reasoning that urban sprawl, first is leading to the construction of buildings on the peripheries of cities and therefore, to the destruction of rich and biologically diverse spaces. Second urban sprawling is not necessarily beneficial for climate change-oriented urban planning in regard to energy efficiency for example (Colclough, 2023). Ideally, green urban spaces should be incorporated within dense cities, but this remains a challenge as space is limited and housing prices increase.

## 5. The Application of the Nature Restoration Law in Cities

### *a. Nature Restoration in Cities*

Once successfully adopted, the Nature Restoration Law will have to be implemented on an EU-wide level. In order to analyze possible challenges and difficulties occurring as a consequence of the heterogeneity of cities within the Member States, two case studies will be analyzed and compared with each other in regard to their different history, geographical parameters, political situation, and others.

Both case studies have been elected European Green Capitals and have been rewarded by the European Commission for their engagement in more sustainable and eco-friendly city management in the last years. While the European Green City Award (European Commission, 2023b) is mainly a title encouraging further steps into green infrastructure and green projects, cities don't have until today a legal obligation to restore nature. The Green City Accord (European Commission, 2023c) is an initiative promoting the implementation of greener and more sustainable urban management, but is again only an attempt of the EU to strive for more sustainability on local and regional level, based on the collaboration willingness of each municipality.



As the Nature Restoration Law would be legally binding, finding the balance between the obligations due to the Regulation and the heterogeneity of European cities will be the major challenge. If the obligations are relatively wide and not very concrete, this will let more space for each municipality to implement measures inside their capacity. Consequently, this means that the level of measures for the restoration of nature, will depend on the ambition of each municipality. Sadly, volunteer-based implementation hasn't been efficient enough, as proved in previous attempts. But if the obligations are too strict, some cities could be overstrained due to limited capacities. The fact that the regulation is legally binding could not solve the incapability of these cases in regard to technical, societal, or economic issues. Therefore, the case studies will pursue to gain an overview and an insight into possible challenges and difficulties which should be calculated and anticipated by the EU inside the drafting procedure for the Nature Restoration Law.

#### *b. Cities nowadays*

Cities have always been evolving and in the last years, new forms of co-living and urban planning have evolved. No matter if the narrative is about 'Green Cities', 'Smart Cities', or 'Smart Communities', all of them have one point in common: Adapting and incorporating new technologies and innovations in today's challenges and future scenarios. Following the research paper of Bencardino, especially so-called 'soft infrastructure' has become a core puzzle piece to achieve competitiveness while incorporating human capital and environmental aspects. 'Soft-infrastructure' is defined as gathering different types of networks, platforms, and organizations, together with citizens, administration, leaders, and experts to contribute to innovative urban development (Bencardino *et al.*, 2014).

#### *c. Urban Ecosystems*

With the phenomenon of cities, green spaces have been widely banned from certain areas with an overproportionate high density of housing, which is reflected in a decline in the quality of air conditions, higher accumulation of aerosols, and growing pollution.

Urban Ecosystems only represent 3.7% of the ecosystems in Europe, but count in total 32.7% of Europe's population (European Commission, 2022a). This means cities are a very dense agglomerations of people in very limited space. The challenge relies on finding a balance between space management, allowing people to live and house in fair and just conditions, in line with healthy ecosystems as urbanization causes soil sealing, habitat destruction due to artificial land use changes, and the overall ban of nature of these areas.

Nevertheless, the importance of urban ecosystems is based on their connecting function between different already existing ecosystems in suburban areas. Areas, connecting different ecosystems with each other, are known as green corridors (Cömertler, 2017). Cities create a barrier for nature, where animals and plants can't live in appropriate circumstances (Rouquette *et al.*, 2013). Many flowers have to be pollinated by insects, but the number of pollinators is declining for years (Potts *et al.*, 2010). If these insects can't survive due to poor vegetation, high pollution, and heat waves, especially dangerous in summer, the vegetation can't survive either. This symbiosis shows how interdependent nature is and how important it is, not only to pay attention to vegetation but to pay attention to both worlds at the same time.

Fostering the green transition is particularly important within cities, especially in regard to their impact on setting trends, innovations, and cultural changes within communities, due to their capacity to reach many citizens (Koefoed, 2019).

Unfortunately, together with the increased population density, the total loss of urban green areas has decreased in the last few years. The European Environmental Agency (EEA) analyzed the net land taken in cities and commuting zones inside the EU-27 region, divided by different land categories in the timeframe of 2012 until 2018. The data has been provided by the Urban Atlas 2012 and 2018 together with the Copernicus Land Monitoring Service. Besides the category of 'herbaceous vegetation associations', all other categories show a total land take. As defined by the EEA, this means the superficial of unconstructed land is being removed and changed into artificial urban areas. The statistics give evidence about the decrease in non-artificial urban areas being an EU-wide trend.

Until today, there is no legally binding obligation or regulation put in place that would guarantee, support, or help the restoration of urban ecosystems. The history of restoration inside cities remains blank and will have to be written for any kind of improvement. This shows the urgent need to act on the European stage, as the trend is EU-wide significant and as there are no initiatives until today, besides voluntary-based, national, or municipal ones. Following these recent developments, showing the degradation due to net land take, something has to change if the trend should be broken apart and redirected towards greener healthier cities.

*d. Benefits of trees for nature and Biodiversity*

Trees have the ability to cool down their surroundings by allowing shadow and due to ‘evapotranspiration’. Evapotranspiration is the process where energy is taken away from its surroundings to transform a liquid into a vapor (Kum *et al.*, 1994). In the case of trees, water is released on the surface of the leaves and is then transformed due to heat into vapor, creating a cooling effect. Trees’ cooling effect is highly beneficial during severely hot summers, especially in dense and tarred areas (Lanza *et al.*, 2016).

The necessity for urban management to address heat waves and other consequences linked to climate change is nowadays part of the political discourse and has become a priority in multiple countries. This is crucial as heat, in this specific case, is directly harming humans’ health and increases mortality (Barboza *et al.*, 2021), and even shows a connection to a higher risk of preterm births (Zhang *et al.*, 2022).

Unfortunately, restoring nature to benefit biodiversity and humans by planting trees is not as easy as it might look like, because a long-term balance for each ecosystem has to be found and established. This especially is a major challenge in forests. According to previous studies, one challenge is linked to the lack of expertise regarding ‘diverse ecosystems like wetlands, coniferous forests, dry tropical forests, and woodland savanna’ (Southworth *et al.*, 2009). For a long time the focus for restoration of forests laid on tropical forests and not on other forests with different needs, like coniferous or broadleaved forests. Unfortunately, these forests are the most represented ones in Europe (Larsson, 2006).

How exactly nature will be restored is very important, if biodiversity and ecosystems should become sustainable and self-sufficient in the long term, which ideally will avoid additional costs. Planting thousands of the same tree is not a solution. This might seem like a good starting point to ‘re-create’ a forest, but this is not how nature works. Besides increasing soil degradation, monocultures don’t allow biodiversity to recover and will lead to further loss (Balogh, 2021). This phenomenon is also called the ‘green desert’ (Hórák *et al.*, 2019). As biodiversity is highly defined by co-evolution between species, the co-dependence of species can lead to an imbalance. Restoration means the reintroduction of species, changing the balance inside an ecosystem, benefitting some species or sometimes harming another.

## 6. Case Studies

### *a. Copenhagen*

The Capital of Denmark is at the same time the largest city in the Country. In 2023 Copenhagen’s Population is estimated to be at 1.381.005 and is expected to grow even further in future years with a growth rate of 0.79% indicating its annual change (World Population Review, 2023). Due to its localization at the Baltic Sea, the climate in Copenhagen is temperate and the temperatures are mild throughout the year with an average of 8.9°C. The annual rainfall lies at 728 mm and there are around 78.32 hours of sunshine per month on average (Climate-Data.org, 2023).

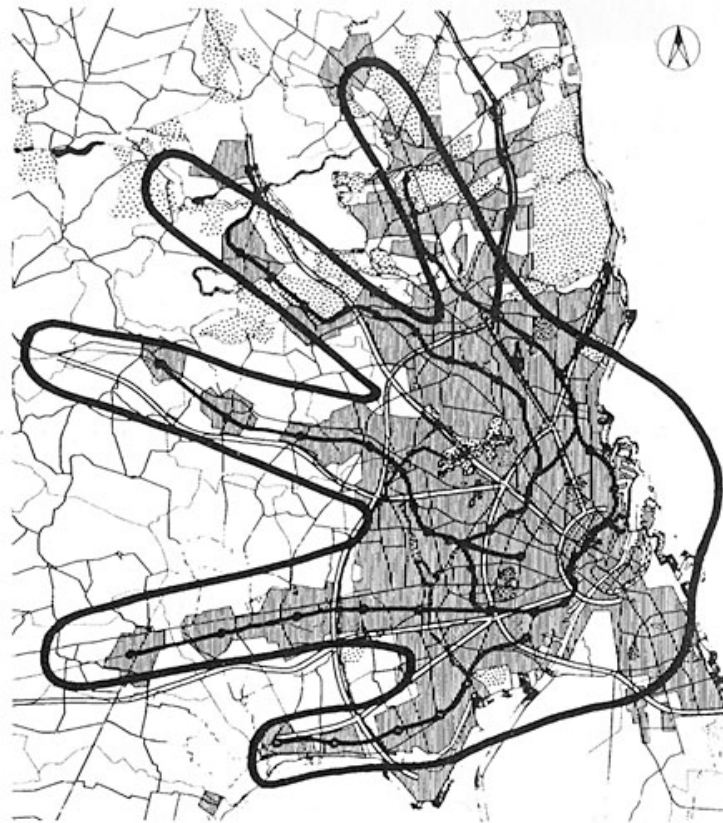
Copenhagen has a long history of mayors from Social Democratic Parties. The current mayor Sophie Hæstrop Andersen (Hæstrop Andersen, 2023) has been elected in 2021 and is since then leading the Copenhagen City Council (The City Council Secretariat, 2018).

For many years already, Copenhagen is a pioneer in Green Urban Planning. This is due to many different factors, as well structural as societal. In 2014, Copenhagen has been elected European Green City Winner. The City has set the goal to become the first city to be carbon-emission neutral. Copenhagen is well known for its biking culture and the low carbon emission of the city traffic is significantly contributing to Copenhagen’s low carbon emissions. In fact, the city of Copenhagen set the goal to reach 50% of the citizens

to use the bike as their prior way to reach their working or educational placement. Accordingly, to the reports of 2022 made by the municipality about cycling development, 35% of the citizens reached their working space by bike in 2021 (Københavns Kommune, 2022). Further plans to reduce car traffic and replace those by cycling, are described in the strategy set by the municipality.

Additionally, Copenhagen has elaborated, for many other cities' almost futuristic, waste management. Over 90% of building waste is recycled and reused inside circular waste management. In total, 58% of all municipal waste is recycled and around 40% found a second use while being used as fuel in the heating network of Copenhagen. Consequently, Copenhagen only produces 2% of waste that found its final destination in landfills (European Green Capital Secretariat, 2014).

The importance of access to green urban spaces has been acknowledged at a very early stage in Denmark's capital. The city has been implementing plans and policies to make and remain rich in green urban spaces for almost 20 years like the Park policy decided in 2004. This policy pushes urban planning to elaborate and protect parks and green areas in general. Additionally, the so-called 'Finger Plan' has been published and presented in 1947. This plan is an attempt to react to Copenhagen's significant population growth expectations while including green urban spaces. The idea is that the finger represents railroads (Figure 5), where in proximity to them, the housing and therefore artificialized areas are allowed. The space between the fingers should remain free as natural 'green corridors', and should guarantee the expansion of the city is in harmony with nature (Les Horizons, 2020). This early form of sustainable urban management has been renewed and the latest version dates from 2007, which become then legally binding (Fertner *et al.*, 2011). The newest version states specific guidelines for buildings over a certain capacity to be not further away than a certain distance from a train station. This benefits at the same time the accessibility and the preferred choice of the citizen to actually use the public transports, and protects the preservation of urban green spaces.



**Figure 5:** Copenhagen's Finger Plan. Source: Townscape. (2017). *The Finger Plan at 70*. [Http://Danishdesignreview.Com/Townscape/2017/9/3/the-Finger-Plan-at-70](http://Danishdesignreview.Com/Townscape/2017/9/3/the-Finger-Plan-at-70).

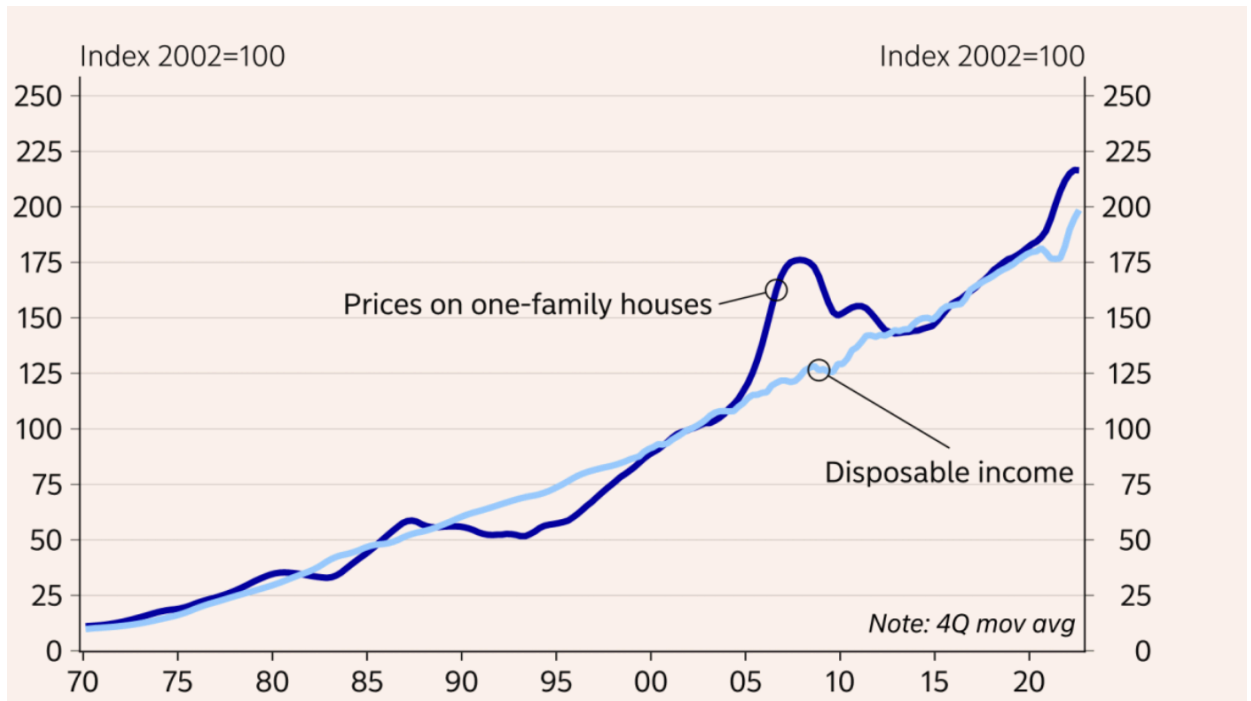
Therefore, it is not surprising that Copenhagen already acquired the prescribed minimum tree cover of 10% set by the Nature Restoration Law. The city herself counts a tree cover of 16.3% in 2021 and a total of 25.8% including commuting zone, accordingly to the EEAS (European Environmental Agency, (EEAS), 2023). The municipality will not need to increase the tree canopy by planting additional trees but will have to secure their preservation. While Copenhagen can be seen as a front leader in greening their capital, only now other cities just started recently more proactive work towards nature's inclusion in future urban planning.

In 2011, the capital of Denmark endured heavy rainfalls causing a destruction of 6.2 billion DKK, which represents approximately 832€ million euros (Christensen, 2022). The importance of this rainfall event for the city development, striving for more green infrastructure and more climate change resilience should not be underestimated. Cloudburst events, like the one of July 2011, are supposed to happen only every 100 years, but they are expected to occur more frequently, say researchers at the Danish Meteorological Institute (DMI) (Christensen, 2022). While during winter, precipitation is

expected to rise by 25-55% in 2100, summer months will be drier than in the past, and reduced precipitation to 0-40% by 2100. On the other side, heavy rainfalls are expected to become more frequent with an expected frequency of 20-50% more (City of Copenhagen, 2011). As preparatory measures the city of Copenhagen has since then specialized its urban planning around wastewater management, especially by bringing into shape the old water runoff systems and ‘safety valves’ (City of Copenhagen, 2011). This should benefit the safety of Copenhagen’s citizens, but at the same time, prevent untreated runoff water, containing bacteria, pesticides, fertilizers, and other particles, to contaminate the environment (United States Environmental Protection Agency, 2023). In the same year as the cloudburst catastrophe in 2011, Copenhagen published its City Adaptation Plan with the overall goal to reach climate neutrality by 2025, and in the same scope, to adapt their urban planning to future challenges opposed by climate change expectations. As Copenhagen wants to remain attractive and enhance its competitiveness, since then, multiple innovative projects have been put in place. One of them is a green urban space in Østerbro, a popular neighborhood of Copenhagen. The park was built to fight for more water retention and at the same time to reduce heat islands (City of Copenhagen, 2018).

The main future challenges the municipality of Copenhagen will have to face are not directly linked to the Nature Restoration Law targets, that will have to be implemented, but the challenges set by the climate crisis. As Copenhagen has already adopted climate resilience building inside its urban planning management, the minimum tree canopy is already reached and the conservation of urban green spaces is already foreseen by the city.

While extreme weather events will occur more frequently in the next decades, the challenge will be to find a balance between climate adaptation, which requires investments and climate resilience building, and affordable housing prices to anticipate gentrification. This is especially a challenge in Copenhagen, as Danish housing prices are constantly rising since 1993 (City of Copenhagen, 2018) and are expected to grow consequently, even if currently housing prices are falling, mainly due to high interest rates and a general slowdown of Denmark’s economy (Størup Nielsen, 2023 ; Figure 6).



**Figure 6:** Danish one-family house prices from 1970 until 2020 and the disposable income in the same timeframe. Source: Størup Nielsen. (2023). Danish housing market in decline. *Nordea Economic Outlook*.

Overall, Copenhagen will have no other particularly dramatic challenges to overcome as the municipal urban planning management of the last years has been very efficient. Increasing green urban areas is in the cities' interest, especially in regard to predicted stronger and heavier rainfalls in the following years. The Nature Restoration Law will therefore only reinforce the already planned measures by their City Adaptation Plan, published in 2011.

### *b. Grenoble*

Grenoble, a 160,000-citizens metropole located in the French Alps, is the capital of the department Isère in the region called Auvergne-Rhône-Alpes (Energy Cities, 2023). The city is surrounded by three massifs: the Vercors on the west side of the city center, the Chartreuse in the north, and the Belledune in the southeast. This geographical specificity is creating a unique setting, as the city center lies in the valley and is surrounded by very high mountains, attracting many hiking, skiing and nature-loving citizens, but also retaining pollution and restricting the habitants from breathing fresh air.

Grenoble is located 200m above sea level and is known for its very diverse microclimate. Even if winter temperatures of below  $-20^{\circ}\text{C}$  can be reached, summers are often very hot



and these disparities are increasing with climate change in the last years. The average temperature for the years 1991 to 2020 is 11.55°C (Climat et voyages, 2023). For the same timeframe, Grenoble has on average 106 rain days a year with 935 mm of rainfall in total. The sun's average per month is 172 hours (Climat et voyages, 2023).

Grenoble has been known for its gloves factory back in the 19<sup>th</sup> century and since then grew constantly. The often so-called 'Capital of the Alps' is nowadays well known for its scientific research cluster counting institutes like EMBL (European Molecular Biology Laboratory), CNRS (Centre National de la Recherche Scientifique), the European Institute of Innovation and Technology's Knowledge, and Innovation Communities for sustainable energy. One of the most famous research centers is the European Synchrotron Radiation Facility (ESRF) (ESRF, 2023), counting to one of the world's brightest X-ray source, which found its place in the valley of Grenoble in 1992. The University of Grenoble Alpes has in total 59 000 students (Université Grenoble Alpes, 2023), providing the next generation specialized in scientific research. Further on, the French high-tech industry found its place in this valley. French President Emmanuel Macron announced in 2022 the micro-electronic strategy for 2030, launching the construction of a factory for semiconductors and creating over 1000 new job positions (Boujon, 2022), door to door with the 300 already existing high-tech enterprises. Grenoble is often named the 'French Silicon Valley' (Bembaron, 2021), emphasizing its agglomeration inside the French Alps. Besides the economic impact of those investments for the city of Grenoble, the municipality has to fight in regard to the mobility of those people. Grenoble started as a small city decades ago, but sees today a constantly growing population, confronted by the challenges due to the limited space of Grenoble. The mountain chains around the city make it impossible to grow more and more, which is reflected in major infrastructure deficits, especially in regard to mobility.

Traffic jams on highway A 480, connecting Lyon and the South of France, passing through the city center of Grenoble, are usual for most hours of the day, even on Sunday evenings. This issue is known for approximately 20 years and ideas, like building a tunnel to facilitate mobility not around but through one of the massifs, namely the Vercors, connecting the South and the North of the city away from the city center was one of the ideas (Figure 7). Unfortunately, this idea remained theoretical even if already in 1994, an

earlier mayor of Grenoble Alain Carignon proposed and even obtained a guarantee for the realization of this ambitious project (Grenoble le Changement, 2018). Another idea is to build a tunnel connecting the east and the west of the city through the Chartreuse (Figure 7). As both tunnels would be very expensive and technically difficult to realize, the projects have not been retained.

As tunnels are not an option, other resolutions have to be found in order to decrease the traffic pressure in Grenoble. This issue will have to be solved, even more as further investment projects, like the nano-tech factory are planned, encouraging further population growth in the next years to come. Better urban planning has been a core topic in Grenoble and within the climate change-linked biodiversity loss in Europe, Grenoble have to invest in more green and sustainable infrastructure to be able to provide its citizens with healthy air quality, reduce noise pollution and in order to adapt to changing demographic circumstances.



**Figure 7:** Maps showing the theoretical tunnels connecting the South and North (red) of Grenoble and the East and West of the city (orange). Source: made by Marie Müller.

Grenoble's unfortunate geographic placement inside a valley surrounded by massifs, leads to a dramatically bad air quality, as air particles are caught inside the valley and can't evade. Therefore, one idea to reduce air pollution was to decrease city traffic. In 2016 already, the city of Grenoble decided to reduce the speed limit from 50 km/h to 30 km/h in 80% of the streets in Grenoble and some of its surroundings (Ville de Grenoble, 2022). The municipality hoped to reduce the traffic in general by creating better mobility alternatives for its citizens. Accordingly, to the FUB (Fédération française des Usagers de la Bicyclette), Grenoble has shown the best improvement for the development of biking infrastructure in the last years (Ville de Grenoble, 2022). Unfortunately, the traffic jams have resisted until today and will have to be further addressed with more ambitions as the city's geographical challenge asks for more investments and stronger measures.

The present mayor *Éric Piolle*, elected since 2014 (Grenoble.fr, 2023), is one major force behind the improvement of the last years as he is associated with Europe Ecologist-The Greens, a French center-left political party engaged in the 'Green transformation' of Europe (European Greens, 2023).

In 2019, Grenoble published its own plan for more climate action. The 'Le Plan Climat Air Énergie Métropolitain 2020-2030', short PCAEM, sets voluntary targets by the municipality for herself to mitigate and adapt to climate change (Grenoble Alpes Métropole, 2019). The targets set in 2019 for 2030 are to reduce in comparison to 2005, carbon emissions by half and energy consumption by 40%, to provide better air quality based on the recommendations set by WHO, reach 30% of renewable energy, and to put in place adaptation measures to climate change (Grenoble Alpes Métropole, 2019).

Accordingly, to its self-dedication to more engagement in green urban planning, Grenoble won the European Green City Award in 2022. The municipality is working closely with and towards the targets set by the EU and is dedicated to align herself with the SDGs set by the UN and the Paris Agreement.

In Grenoble, one major challenge to provide more urban green spaces will be simply the availability of free spaces. Since the city is surrounded by three massive mountain chains, the Belledonne, Chartreuse, and Vercors, the urban space is already strictly limited (European Commission, n.d.). With the growing population of Grenoble, nearby agricultural spaces had already been transformed into living spaces (Vannier, 2019). But

as the Nature Restoration Law foresees an increase in free-standing green spaces, the city management of Grenoble will be forced to take action.

Following restoration plans for Grenoble, scientists expect Grenoble to grow further as sustainability, restoration, and city development are driving the regrowth of cities (Haase *et al.*, 2021). While in shrinking this is the opposite case. Incorporating green urban spaces, and at the same moment, anticipating gentrification will be a challenge. Urban sprawling is mostly prevented by the mountain chains and the place restriction but will have to be strictly followed, in order to preserve Grenoble's biodiversity-rich surroundings. Like Copenhagen as well, Grenoble largely reached the minimum percentage of tree canopy for its municipality, but will have to preserve those as well as its urban spaces.

In regard to the challenges opposed by climate change, Grenoble will have to fight against heat islands, especially due to its rather south-European localization. Applying the measures foreseen by the Nature Restoration Law would be a great opportunity for Grenoble to tackle its air pollution issues. Increasing green urban spaces have a positive effect to reduce air pollution through the benefits of plants, and binding microparticles, and would further encourage the municipality to further reduce car traffic replaced by more carbon-emission-free transportation. One major opportunity, combined with the installation of green urban spaces would be to improve the infrastructure for public transport in Grenoble. Reducing cars and roads could allow a net gain of space inside the city and will not put any pressure on already existing living spaces, nor contribute to the city sprawling as no living space would be removed. This could then at the same time take away pressure from the massive mobility problems, causing never-ending traffic jams inside and outside the city, as well as benefit the citizen's health due to reducing air pollution, encouragement for biking and walking possibilities and other health benefits due to more connectivity to nature.

## Conclusion

The Proposal for the Nature Restoration will have some obstacles to pass before being finally adopted by the EU, hopefully by the end of the year 2023. The opponents to the law have valid arguments and should not be set apart, but should furthermore be involved in the creation process of the law. This will encourage the law to be adopted and shaped to current flaws and mistakes, for more success and a better outcome for Europe's biodiversity following the implementation process.

The Nature Restoration law is today still a Proposal, which at one side means its adoption is insecure, but on the other side, this is a chance as this flexibility allows the proposal to be improved, fed by criticism inside the socio-political discourse. One criticism shared by the Region of Helsinki in regard to take in account the already undertaken work in green infrastructure and green urban spaces could benefit the quality of the biodiversity protection measures. Previous failed attempts undertaken by the EU for nature protection showed that quantity is not to be aligned with more biodiversity, but as nature is a complex interlinkage of many aspects, the quality and especially connecting different ecosystems is one of the key points to success.

The National Restoration Plans will be another key aspect for the success of the Nature Restoration Law. These will allow the Law to distinguish herself from previous measures to create a difference. Close cooperation, renewed and timely ambitious measures are desperately needed, if the EU wants to safe its biological diversity, disappearing day after day.

In overall this work showed the difficulty of the Law, as having legally binding objectives, to find the right balance between futuristic ambition and realistic implementation. Europe is a very wide area and includes many different ecosystems with different needs, and current degradation statuses. Some ecosystems will have to be rebuild, starting at the bottom, and some will need more specific measures like the creation of 'green corridors', benefiting their inner resilience.

As the Nature Restoration Law targets for the first urban ecosystems, its implementation in each municipality on EU-wide level will be a significant challenge. Each city has a different geographical context, history, political preference and so on. Nevertheless, previous years have shown already a significant evolution of populations dense areas.

The ongoing digitalization and the passed COVID crisis have reinforced the view on the importance of healthy and socially just living spaces. Hereby can urban green spaces play a major role. Incorporating more vegetation in dense areas will benefit its civilization due to lower air pollution, cooler air temperature, more sport facilities, and other physiological and psychological benefits.

Both case studies Copenhagen and Grenoble will have challenges to overcome while implementing the Nature Restoration Law. Creating injustice due to the gentrification risk opposed by the creation of green urban spaces will have to be avoided at all cost in Copenhagen, while Grenoble will have difficulties to find free urban space to add vegetation. Not only in the short-term the EU want to see results, but accordingly in the long-term perspective, cities will have to become greener. The challenges imposed today can seem unrelatable or overstepping for some people, but with the ongoing climate change, their necessity will become clear quickly from year to year. The earlier adaption and mitigation start, the less victims of cloud storms, heat waves, or other natural catastrophes will have to pay the price of non-action.

Climate change is fast-paced and non-negotiable. How the world of tomorrow will evolve, and how species will adapt to it, can only be projected based on today's evidence and with the help of projection models. The work of politics for nature protection will have benefits and can show results, but its success has limits. The Law could be one missing piece to the puzzle of the Green Deal, but will not return or change fundamentally the nature's current state.

The biggest pressure on biodiversity loss is changing land use, further triggered by unsustainable practices and land management. But this is not the only cause for biodiversity loss. The pressure of global warming and too high carbon-emissions are not addressed by the Nature Restoration Law, but are heavily weighting on biodiversity as well. Unfortunately, even with the best restoration measures the EU could implement, the initial issue leading to the decrease of life's diversity, is very closely linked to the burdens of climate change. Only by applying regulations and changing the current unsustainable practices of the EU, and all industrialized nations worldwide, climate change can be addressed appropriately.

Time is hereby a significant factor. The world today is very fast-paced and so does the answers to problems have to follow quickly to be able to withdraw. The Nature Restoration Law has already been delayed, and the risk of further delays has to be kept in mind. Even if the EU has been one of the most and earliest actors in environmental politics, time is still running. Achieving a perfect regulation should not be the most important goal. It is more important to find a common agreement in order to start to implement significant measures for biodiversity protection.

## List of acronyms

CNRS	Centre National de la Recherche Scientifique
COP	Conference of the Parties
CO <sub>2</sub>	Carbon dioxide
°C	degree Celsius
DG ENV	Directorate-General for Environment
DNA	deoxyribonucleic acid
€	Euro
eDNA	Environmental deoxyribonucleic acid
EEA	European Environment Agency
EMBL	European Molecular Biology Laboratory
EC	European Commission
ESRF	European Synchrotron Radiation Facility
EU	European Union
EP	European Parliament
GDP	Gross domestic product
IUCN	International Union for Conservation of Nature
IPCC	Intergovernmental Panel on Climate Change
LAI	Leaf Area Index
LIFE	L'Instrument Financier pour l'Environnement
m	meter
m <sup>2</sup>	square meter
m <sup>3</sup>	cubic meter
µg	microgramm
NRP	National Restoration Plans
PM	Particle Matter
SDG	Sustainable Development Goals
UNFCCC	United Nations Framework Convention on Climate Change
PCAEM	Plan Climat Air Énergie Métropolitain
PgC	petagrammes (10 <sup>5</sup> grammes) de carbone
ppm	parts per million
WHO	World Health Organization



## List of Figures

Figure 1: IPCC. (2021). *Technical Summary*. In *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*.

Figure 2: Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223). <https://doi.org/10.1126/science.1259855>.

Figure 3: EURACTIV. (2021). <https://www.euractiv.com/section/energy-environment/news/biodiversity-eu-aims-to-protect-30-of-land-and-sea/>

Figure 4: Helsinki-Uusimaa Region. (2023). *Statement on Article 6 of the EU Nature Restoration Law*

Figure 5: townscape. (2017). *The Finger Plan at 70*. [Http://Danishdesignreview.Com/Townscape/2017/9/3/the-Finger-Plan-at-70](http://Danishdesignreview.Com/Townscape/2017/9/3/the-Finger-Plan-at-70).

Figure 6: Størup Nielsen. (2023). Danish housing market in decline. *Nordea Economic Outlook*.

Figure 7: made by Marie Müller.

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