

Mangrove Regeneration

Natural Heroes to Combat Climate Change



GREEN
INTERNATIONAL
YOUTHWORK



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Mangrove plantation, Sor Diagne, Saint Louis

Introduction

This mangrove regeneration paper aims to provide youth organisations with the tools, information, and inspiration needed to make their youth mobilities more sustainable by saving and actively compensating CO₂ emissions.

Sustainable mobility is a topic that we all have to care about. As youth organisations, this has to be a self-evident part of our agendas, if we aim to create a just and sustainable future for young people. The way in which youth organisations carry out their activities and mobilities serves as a model, and connects and inspires young people.

The emissions in the tourism and transportation sector increase yearly, aggravating the climate crisis and its consequences, which lead to climate injustice. In order to act against this injustice, this publication will give an overview of the topic of reducing and compensating CO₂ emissions, and present good practice examples for trainers, youth workers, and youth leaders to include carbon compensation actions in their activities.

This publication was produced in the frame of the project "Green.International.Youthwork." - which aims to raise awareness about the climate impact of international youthwork and how to improve it - by the partnership consortium consisting of Naturfreundejugend Deutschlands (Germany), Association Sénégalaise des Amis de la Nature (Senegal), International Young Naturefriends (Czech Republic), GIAN-Gruppo Italiano Amici della Natura (Italy) and Biodiversa (Spain). During a youth exchange between these organisations, 18 young people from these countries traveled to Senegal, where they participated in the regeneration of mangrove forests and discussed the topic of reducing versus compensating CO₂ emissions. Keep reading to find out more about it.

The youth exchange and this mangrove regeneration paper were kindly funded by the Erasmus+ programme of the European Commission.



Rhizophora mangroves

Mangroves

A natural climate hero



Climate change resulting from natural disturbances and unsustainable production and consumption patterns has had a negative impact on the livelihoods of current and future generations.

According to the Department of water, forests, hunting, and soil conservation of Senegal¹, over the last half-century, 30-50 % of mangrove forests in Senegal have disappeared. This matter is of great environmental concern. While all ecosystems are important to our survival, the mangrove, covering just 1 % of the world's tropical forests, offers invaluable ecosystem services to humanity (Afonso, Filipa, et al, 2021)²

The mangrove is an amphibious forest ecosystem found on most of the world's tropical and subtropical coasts. Characterised by muddy soil on deltas, riverbanks, lagoons, and seashores, this ecotone is an intermediate space between the terrestrial and marine environments, where mangroves proliferate.

Requiring an average annual temperature of 20°C or more, this environment, periodically subjected to the tidal cycle of brackish waters (water whose salinity is between that of fresh and marine water), is home to a flora that may not be very diverse, but which is itself home to a rich and varied fauna.

In this chapter we are going to introduce the different species of mangroves, as well as explain their functions from the ecological, economic, and social perspectives.



Importance

Ecological function



Mangroves are some of the most productive coastal systems on the planet and provide valuable ecosystem services (Afonso et al. 2021)².

They stabilise soils and provide nurseries for fish and crustaceans, while endemic and migrating waterfowl nest in their branches. As a reservoir of biodiversity, mangroves provide a means of subsistence for the coastal communities, whose diets rely heavily on the fishfishes and seafood that live within the mangrove ecosystems.

Its enormous network of submerged roots acts as a sediment filter, preserving the quality of watercourses, and safeguarding various crucially important living organisms in the vicinity, such as coral reefs.

Mangroves provide coastline protection by dampening waves and reducing the impact of wave action, torrential storms, and tsunamis (Kamil et al. 2021)³.

They are also huge carbon dioxide reservoirs, capable of sequestering 3 to 4 times more atmospheric carbon than a tropical forest. Carbon is stored in the leaves, stems, roots and soil. Carbon sequestration lowers the CO₂ concentration in the atmosphere, making it a vital process for decelerating the climate crisis.

On average, mangroves sequester 1.4 gigatons of carbon dioxide per square kilometer per year. Overall, mangroves have a global cumulative sequestration potential of 24.0 ± 3.2 million tonnes of carbon per year (Bertram et al., 2021)⁴.



Khor, September 2022



Economical function

The economic impact of mangroves is indisputable, as they represent the daily livelihood of vulnerable communities in many coastal regions.

Local community

Mangroves provide an essential source of income and livelihood to local populations, through timber harvesting, shellfish gathering, aquaculture, beekeeping, fishing and more. They provide a rich and varied diet for local populations.

Many commercially important species of crustaceans, molluscs and fish reproduce, feed and grow in mangroves, as their intricate roots serve them as a refuge from predators.

Tourism

Mangroves are a unique biotope as they serve as an ornithological sanctuary and breeding ground for animal species. This makes them a very attractive destination for tourists. The tourism sector around mangroves has been constantly growing in the past years. Therefore, it is important to support the growth of mangrove tourism, while ensuring that it does not harm the very ecosystems that fuel it.



Sor Diagne, Saint Louis

Social function



Mangroves are of utmost importance also for the socio-cultural life of the local population where mangroves are planted.

Medicine

Mangroves are biochemically unique and produce a wide array of novel natural products and are considered a rich source of steroids, triterpenes, saponins, flavonoids, alkaloids, and tannins. They can therefore serve as a natural source of medicine that can cure different illnesses, and are part of the natural medical approach of countries like Senegal.

Different parts of the plant can be used for extracting medicines, for example the leaves, stems, bark, and roots.

Cultural Function

In some cultures mangrove forests are a place for conducting cultural ceremonies such as cultural education, but also funerals and offerings. Mangroves therefore have an important role in the cultural and social life of the local population, which has to be protected from mass tourism.



Propagules harvest, Bango

Types of Mangroves

Red Mangroves



The red mangrove (*Rhizophora mangle*) grows on the seashore in deep water, forming shrubs up to 8 m high. It can be recognized by its elongated propagules and stilt roots with lenticels, the tiny buds visible on the surface of its roots, which can overcome anoxia by drawing oxygen from the air. Its leaves are thick, blunt at the tip, and have no conspicuous glands. It is a facultative halophilic plant, meaning it is resistant to salinity but can also grow in a non-saline environment. It even tolerates water with 90g/l salt, which is 2.5 times saltier than seawater.





Seedlings of red mangrove

Black Mangroves



The black mangrove (*Avicennia germinans*) is set back slightly from the red mangrove in a zone of shallow water, and can be recognized by its aerial roots called pneumatophores, root outgrowths emerging straight from the ground and equipped with salt filters, which enable these trees to capture oxygen from the air when they are not covered by water. Its leaves are elliptic-lanceolate and excrete excess salt to the leaf surface, where salt crystals form.





Avicennia flowers

White Mangroves



The white mangrove (*Languncularia racemosa*) can be recognized by its tough, oval, heart-shaped leaves. It grows in the low-salt environment of the mangrove hinterland, forming shrubs up to 3 m high. It sometimes has pneumatophores.





Conocarpus flowers

Grey Mangroves



The grey mangrove (*Conocarpus erectus*) or button mangrove, located higher up in sandier, less salty areas, can be recognized by its button-shaped fruits. It is not very abundant and is especially common along beaches. It has no supporting roots or pneumatophores. It is shrubby along the shore, but becomes tree-like further inland. There are two varieties: *erectus*, with shiny green leaves, and *sericeus*, with silvery leaves





Mangrove propagules planting, Languede Barbarie, Saint Louis

Let's plant

4- step plan to plant mangroves



1

Get prepared! Check if the place you identified to be the space for your new mangrove forest is suitable. It should be a muddy soil for them to grow. Don't forget to prepare your participants with everything they need like knowledge and equipment.

2

Get on board! Take a boat to search for ripe mangrove propagules and collect them in bags. Don't forget to check them and select the ones with the best quality to be planted.

3

Let's plant! Take each propagule and press it in the soil. One-third of it should be underground. Then walk two steps forward and press another propagule into the soil. Repeat until you have planted all of them.

4

Take care! Observe your mangroves and take care of them. If necessary protect them from environmental or human influences.

Around three-fourths of the propagules planted become mangroves. So what are you waiting for? Let's plant a mangrove forest.



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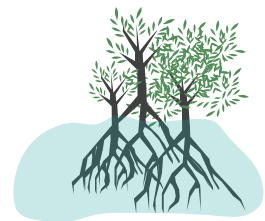
Mangrove planting, Sor Diagne, Saint Louis

Impact

How to calculate the carbon compensation?



One mangrove tree
sequesters 12.3 kg CO₂
per year



One hectar mangrove forest
sequesters 33.600 kg CO₂
per year



A round trip from Berlin to
Senegal with one stopover in
Spain emits approx. 951 kg CO₂



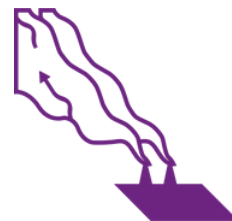
In order to compensate your flight,
you would need to plant approximately 77 mangrove trees within a year.



Propagules harvesting in Langue de Barbarie, Saint Louis

CO₂ Offsetting

or better not?



Carbon offsetting was recommended by the Intergovernmental Panel on Climate Change (IPCC) in order to absorb some of the CO₂ emitted into the atmosphere, as a way to compensate for emissions that are supposedly impossible to avoid.

This concept has become very popular in people's everyday life. If we are preparing a trip and we have a closer look when we book our accommodations or transport tickets, we may come across the possibility of paying a certain amount in order to compensate for the CO₂ emissions of our travel.

A whole carbon market has been created around the carbon offsetting concept, and anyone can buy "carbon credits" to compensate for their emissions, making it easier to become carbon neutral. But does this really serve its purpose?

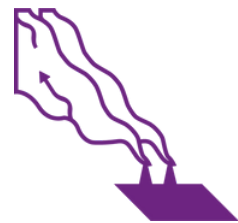
Flaws

The workings of the existing carbon market are highly imperfect. Double counting and additionality are very common. In "double-counting", both companies (the one paying for the offsetting and the one doing it) count the CO₂ reduction. In "additionality", the company that's being paid for, let's say, planting trees, would have done the planting anyways. In both cases, more CO₂ reductions are counted than the ones actually reduced.



Propagules planting in Langue de Barbarie, Saint Louis

Just greenwashing?



This mechanism of purchasing "carbon credits" to finance projects and programs for reducing or sequestering greenhouse gases, has been misused and is problematic. It serves the communication needs of major emitters rather than the climate. Polluters give themselves a clear conscience by redeeming their social acceptability, while continuing to pollute.

This unspoken greenwashing then serves as a licence to destroy, linking the idea that as long as you can pay to offset, it's permissible and acceptable to engage in climate-changing activities.

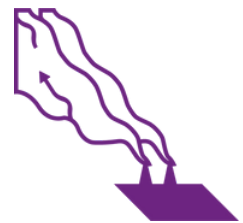
Unfortunately, in the battle against greenhouse gas emissions there is often an overemphasis on offsetting as the ultimate solution. Instead, the focus should be on prioritising reduction and, most importantly, prioritising avoidance. Faced with this excess of CO₂ in the atmosphere, the choice is no longer between simply reducing and compensating. In order to meet the climate challenge we should focus on avoiding emissions. These two measures (reduction and avoidance) are essential for effectively limiting emissions and, consequently, playing a more impactful role in the fight against climate change.

In other words, offsetting or reducing without first thinking about avoiding emissions is simply greenwashing. For an efficient carbon-neutral policy, you should only offset what you can't avoid or reduce.

Offsetting is the last resort for unavoidable damage.



What does this have to do with climate justice?



Low-income countries, the first victims of global warming, with a very low contribution to global CO₂ emissions, find themselves bearing the brunt of losses and damage resulting from the activities of the most industrialized countries.

In the countries of the global South, where most projects are implemented to compensate for emissions from the North, we often note a vertiginous loss of biodiversity, the disruption of ecosystems, and the trampling of human rights (expropriations, grabbing of huge tracts of land for monoculture and forced displacement of local populations).

CO₂ insetting

A better solution

Carbon 'insetting' focuses on doing more good rather than doing less bad within one's value chain.

Insetting is the implementation of nature-based solutions such as reforestation, agroforestry, renewable energy, and regenerative agriculture to capture carbon from the atmosphere.

Some insetting activities also improve the livelihoods of indigenous communities as a result.



Examples *get inspired!*



International cooperation

During the "Greening International Youth Work" project funded by the Erasmus + project, and under the guidance of the conservator of the Parc de la Langue de Barbarie, a group of young people from Benin, Senegal, Germany, Italy, Spain, and the Czech Republic harvested and reforested 2 ha of *Rhizophora* in the Gandiole region, in cooperation with local people. This enabled the young people to discover mangrove ecosystems, learn how to identify good propagules, and practice reforestation techniques.

If we follow our calculations from before, this means that with this international project the group was able to plant mangroves that will capture around 672.000kg of CO₂ per year, which is significantly more than what they emitted due to their travels (approx. 133.000 kg).

Through this concrete mangrove reforestation activity, this group made a significant contribution to the effort of insetting emissions.



Sor Diagne



Involve your local community!

With funding from Germany's Federal Ministry for Cooperation and Development (BMZ), the 3-year "Reforestation of mangroves for climate protection in St Louis Senegal and Janjanbureh The Gambia" project aimed to build the capacity of local communities in sustainable mangrove management, raise awareness of climate issues and strengthen regional cooperation between Senegal and The Gambia.

A total of 20 ha of mangroves, 15 ha in Saint-Louis and 5 ha in Janjanbureh, are being reforested in 4 districts of Saint-Louis (Sor Diagne, Khor, Bango and Bopp Thior) and in (Balangharr) Janjanbureh/The Gambia, where groups of women and young people in communities close to the plantations are being trained to protect the mangrove plantations sustainably.

At a rate of 5,000 propagules per hectare, the project will have enabled the reforestation of 100,000 mangrove trees ($\frac{3}{4}$ *Rhizophora* and $\frac{1}{4}$ *Avicennia*).

Ultimately, the environmental awareness of the population (women's groups, fishermen, and students) has increased thanks to the acquisition of knowledge about reforestation activities and sustainable mangrove management.



Conclusion



Act now!

The climate crisis is affecting dramatically the livelihoods of the countries of the South, making them more vulnerable. The rich countries, which are largely responsible for this ecological disaster, must assume their responsibilities and act now.

We need to reduce the concentration of greenhouse gases in our atmosphere, and mangrove ecosystems are among the most capable of sequestering atmospheric carbon than any other forest. In the face of rising sea levels, mangrove regeneration in tropical and subtropical zones is one of the most effective adaptation measures. Safeguarding and restoring these mangrove ecosystems, with their immense ecological and socio-economic functions, remains a priority mainly for the rich countries responsible for the climate crisis.

It's a question of true climate justice to strengthen the resilience of the most vulnerable populations, hardest hit by climate change to which they have contributed a tiny fraction.

Coastal mangrove ecosystems play a fundamental role in climate change mitigation and adaptation strategies. The effective protection and enhancement of this biotope, a larder for local communities and a living laboratory for scientists, must be an absolute priority for present and future generations to benefit from.

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Organisations



Asociación BIODIVERSA is a non-profit and non-governmental grassroots environmental organization based in Asturias, Spain. It provides meaningful learning experiences in nature for young people and adults since 2011.

Its mission is to promote care for nature and the environment through education and awareness raising. Its vision is a planet in which humans live in harmony with themselves, each other, and their environment. www.asociacionbiodiversa.org



GIAN-GIO is an informal group within the network of GIAN (Gruppo Italiano amici della natura) which is a non-profit and non-governmental grassroots environmental organization based in 4 regions in Italy. GIANGIO's main pillars are connected to solidarity, sustainability, and non-formal education. Since 2017, GIANGIO has connected young people in Italy to other nations and fights against climate change on different levels. Its local network reaches 7 localities within small and medium size municipalities. Via this local section, GIAN manages to conduct activities and initiatives that are also promoted to increase and improve human relations by fostering, for example, exchange between different cultures, different social backgrounds and different approaches to nature. www.giangiovani.org



As an independent youth organisation, NFJD gets engaged on questions of justice, stand up for the rights of children, fight for climate justice and a sustainable transformation of society. Democracy and participation are at the heart of our educational work. Young people need to be enabled to take part in political decision-making. We demand: do not talk about them, talk with them! We value diversity and we go for colourful and active groups of young people. Together we explore new forms of living in solidarity and young politic initiatives.

For any questions feel free to contact our national office in Berlin: info@naturfreundejugend.de



ASAN - Association Sénégalaise des Amis de la Nature (Senegal), founded in 1983, is the first organisation in Africa entirely dedicated to nature protection. ASAN aims to protect and restore the environment, end poverty through good management of natural resources, promote sustainable tourism, and fight against climate change. ASAN achieves these missions through a participative approach and direct collaboration with the communities. ASAN is one of the funding organisations of "African NaturFriends Networks" (RAFAN) and a member of the International Naturefriends Movement.



IYNF- International Young Naturefriends (Czech Republic)

IYNF is an international organisation bringing together Young Naturefriends and their organisations across Europe. It was established in 1975 and currently has 18 member and 14 partner organisations. With more than 120.000 young members organised in over a thousand local groups, it is one of the major European youth organisations.

The fundamental reason for IYNF's existence – or what we jointly want to become – is an international network to connect and inspire Young Naturefriends for living values of respect, solidarity, equality, sustainability and love and care for nature.



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