SDG 15, life on land: The Three-North Afforestation Program (TNAP) – the largest afforestation program in the world

Introduction

One of the challenges that threatens life on Earth is deforestation, which is the process of removing forests from land. This is often due to the willingness to change forests into agricultural areas for farming or livestock grazing, to expand urban areas, or to sell the timber. Even though these practices have been known and applied for centuries, today we observe this phenomenon on an unprecedented scale. It contributes significantly to the quality of terrestrial life in at least a few ways. First, deforestation results in habitat loss for some species; thus, it will contribute to biodiversity loss. Second, trees play an important role in preventing soil erosion and regulating water cycles; thus, deforestation contributes to disruptions in these phenomena. Moreover, deforestation contributes to climate change because forests serve as carbon sinks. A carbon sink is anything that absorbs carbon dioxide (CO_2) from the atmosphere. Forests absorb quite significant amounts of CO_2 and store it in wood, leaves, and roots. They are one of the most important carbon sinks contributing to climate regulation or change (in the case of carbon release).[1] The opposite of a carbon sink is a carbon source, which is anything that releases carbon in bigger quantities than it absorbs CO_2. This can come from burning fossil fuels (coal, oil, gas), deforestation, or industrial processes.

Trees store carbon through the process of photosynthesis, during which they absorb CO_2 from the atmosphere through their leaves and change this CO_2 and water into glucose and oxygen. Glucose is used by trees as a building material, and oxygen is needed by us and contributes to better air quality. Thus, trees and forests play a crucial role in terms of halting climate change and contributing to air quality. Taking care of existing forests and afforestation[2] are two of the easiest and safest ways to improve the state of our environment. Unlike climate

[1] The other two crucial carbon sinks are oceans (they absorb CO_2 from the air and store it in water and marine organisms) and soil (it stores carbon from dead plants and animals that decompose and become part of the earth).
[2] Afforestation is the process of planting trees in an area where there were no previous forests, or where forests have not existed for a long time. This is crucial for combating climate change by creating new carbon sinks. While it could help, it has to be remembered that trees need time to grow, so the effect is delayed in time.

engineering,[3] they are very safe and entail no side effects, bearing in mind that time is needed to grow trees that will absorb a significant amount of CO_2.

The Three-North Afforestation Program (TNAP)

Afforestation can never be a onetime activity; the best programs are those that are implemented on a long-term scale. An impressive, prolonged project was launched in China in 1978 under the name Three-North Afforestation Program (TNAP). It will run until 2050, and it aims at covering approximately 4.07 million km² (about 42.4% of China's land area, in the northeast, north central and northwest of the country). This is the longest afforestation program in the world, and its objectives are to combat desertification, reduce soil erosion, improve agricultural productivity through the creation of shelterbelts, enhance carbon sequestration, and restore degraded ecosystems in arid and semi-arid regions.

The program has some achievements, such as increasing the forest coverage of the country, producing a minor improvement of crop yields, reducing soil erosion, and achieving carbon sequestration of 1.96 petagrams of carbon (Pg C) (see Zheng et al. 2025). As the UN (n.d.) states, 'the project has (…) effectively combated desertification in the program area, improved the overall situation of serious wind-sand hazards and soil erosion, enhanced the resilience and adaptability to natural disasters and climate change, which have contributed to the realisation of the Global Forest Goal (GFG) 1 of the United Nations Strategic Plan for Forests 2017-2030 (UNSPF) and Sustainable Development Goal (SDG) 13 and 15 of the 2030 Agenda for Sustainable Development'.

The TNSP does not only serve ecological goals; it has contributed to the development of forest- and fruit-related industries. Thanks to this 'tens of millions of local people have been pulled out of poverty. These achievements demonstrate that the TNSP is a good example for achieving GFG 2, and SDG 1, 2, and 8' (UN, n.d.). Thus, the program is more than just protection of the terrestrial ecosystem. As is often the case in any sustainable activity, it is a holistic approach that tries to improve both ecological and social systems.

However, there have been some challenges in implementing it. It has to be emphasised that planting forests in arid and semi-arid areas is challenging, as the water scarcity and poor

[3] Climate engineering is also known as geoengineering. These terms refer to large-scale interventions in the Earth's climate system to counteract the effects of climate change. Even though it is believed to be very effective, it is controversial, as not all the consequences of these technologies are known. Some of the side effects are hard to predict. Usage of these technologies also raises ethical considerations about the long-term or cross-border consequences.

soil limit the growth of vegetation (Qi 2023). Moreover, planting the same species leads to monocultures that are less resilient. Thus, the results of the project are not as successful as were expected at the beginning. Still, it has to be remembered that the project will run until 2050, so there is still time and opportunity to correct the mistakes and execute the project more efficiently.

What should be done to ensure the expected outcomes are achieved? A larger range of native species could be used, and the planted trees could be varied to provide greater biodiversity and to avoid monoculture, which is when only one species is planted. From the perspective of the person planting monocultures, it is much easier. However, for environmental balance, it is better to have biodiversity. Monoculture eliminates habitat variety, reducing the number of species that can live in the area. Favouring one species could lead to ecological imbalance. The more monocultural an ecosystem is, the more vulnerable it is to pests and diseases. Genetic diversity is key to natural resilience. Repeating the same crop planting also depletes some nutrients from the soil, which could lead to its reduced fertility and increased reliance on chemical fertilisers. An insufficient or lack of crop rotation also reduces the soil's ability to retain water, which leads to water stress. Monocultures are also less resilient when it comes to climate change. One of the priorities of the TNAP should be diversification of species and reduction of monocultures.

There is also a need to implement post-afforestation management of the TNAP for better monitoring of its results and constant improvement of the program implementation. The proper progress and implementation monitoring tools could boost the results of the program and help avoid future mistakes. After all, the program is quite ambitious, long-term and very costly, so it is important to use these resources in the best possible way. Even though the TNAP is not as successful as was expected, it is still operating, so there is time for improvement and corrections.

Afforestation initiatives in the private sector

National programs like the Chinese one are quite impressive, both in geographical and time scale. However, there are cases of private initiatives done in this regard. After the introduction of social responsibility (CSR/ESG), corporations have also been including tree planting in their activities. This could serve meeting ESG goals or carbon offsetting. All initiatives also improve the company's reputation and thus lead to improved customer loyalty.

Business enterprises are also increasingly engaging in sustainable logging practices that help to acquire wood for production in a way that is more environmentally friendly.

Beyond business, many projects are being undertaken by non-governmental organisations, which are arranging various projects aiming at sustainable forestry or afforestation. This contributes to raising ecological awareness and adds to afforestation. Also, 'individual landowners can significantly contribute to forest conservation by adopting sustainable land management practices that align with broader conservation goals' (Forestry.com 2024). One very interesting case in this regard comes from India, where an environmental activist, Jadav Payeng, planted a forest by himself. He is known as the Forest Man of India, and he has spent 30 years of his life planting trees, creating 550 hectares of forest (Fourtané 2025). At the age of 16, Jadav witnessed the death of hundreds of snakes in Molai, the largest Indian river island. Then, still at the age of 16, he decided that he will plant one tree every day on barren soil (Schueman 2024). This small action, repeated consistently for 30 years, has led to changing the barren land into a lush forest. 'His efforts have garnered international acclaim and have inspired countless individuals and organisations around the world. The government of India and various environmental groups have recognised his contribution to conservation and the environment. However, despite the accolades, Payeng remains humble and focused on his mission' (Chopra 2024). This is a very inspiring case of private initiative that is small, yet due to consistency, contributes significantly to bettering the situation.

Summary

Afforestation is one of the easiest and most effective ways to help fight numerous environmental problems. Moreover, in comparison to technological projects (like climate engineering) it doesn't bring negative side effects. It takes time, money, effort, and skill to plant trees in a way that contributes to biodiversity and fighting climate change. However, as has been shown above, afforestation can be performed by governments as well as private businesses, and even individuals. This is one simple action that does not cost much but contributes to bettering the natural environment.

Questions

1. What are the main differences between afforestation and climate engineering in the long-term view?

2. What are the advantages of afforestation?
3. What should be done to ensure afforestation is effective?
4. Do you know of any afforestation actions in your country or your local area?
5. Is there anything you could do to contribute to afforestation?

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Author Dominika Dzwonkowska

dominika.dzwonkowska@lazarski.edu.pl