Madrid Metropolitan Forest. septiembre 2022

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Metropolitan Forest ring

The Metropolitan Forest Project

The Metropolitan Forest is a large green infrastructure project that has emerged from the convergence of a favorable social, environmental and urban context for its proposal and implementation in the city of Madrid.

The Metropolitan Forest is conceived, as a project that is not proposed in quantitative terms of green ratios or standards but is conceived as a project capable of addressing environmental problems with a more global view. It is a project that comes up with a new way of using the territory and reducing the ecological footprint, providing an effective answer to the need to adapt to climate change and the urban island heat. It also aims to rearrange the city-nature relationship, provide a new identity for the city, creating new green services, agricultural and livestock production, education and research centers, markets, leisure spaces and sports.

The Metropolitan Forest is conceived as a 75 km forest belt that will surround the city of Madrid, based on the planting of native forest species, contributing to the ecological and landscape restoration of degraded areas and to environmental improvement and enhancement of the surroundings of new urban developments and to the city as a whole. Its development will be based on the green areas qualified by urban planning, both executed and not executed, in order

to form a green corridor located within the municipality of Madrid and running more or less close to the edge of the municipal borough, seeking greater ecological continuity as possible.

The forest masses will also provide recreational places with socio-recreational activities, trails for walking and practicing sports and facilities that contribute to the use of this space and its management, such as tree nurseries, crafts schools, green economy places, viewpoints or educational spaces. To guarantee its continuity, ecoducts (green bridges) are also contemplated, infrastructures crossings at the same level, above or below ground to connect the different green elements of the Forest..

This idea of the future Forest has begun to develop under four premises that are essential to understand the approach of the project that is beginning. In the first place, the identification of the land that is part of the project it is based on a mosaic of diverse environmental and urban situations, which will entail the need to formulate different forms of intervention, not always being posible to be developped with municipal reforestation actions on public land, but having other different forms of stategies, like engaging private owners and through figures of protection and regulation of the natural environment.

The second, since its conception as part of a broader strategy for the renaturalization of the city that must be structured at various scales, the metropolitan or urban scale that takes its form through the Metropolitan Forest project and the local network that is deployed in neighborhoods and districts, through streets, squares, parks, gardens and open spaces, even by roof buildings or underused spaces.

Thirdly, under the concept of environmental restoration of the territory, favoring and accelerating natural succession processes but always in harmony with the environmental conditions of the territory. One of the greatest difficulties faced by the project is to achieve the restoration of a highly degraded environment in a semi-arid Mediterranean climate. Soil management, the use of native species and the use of water are the main conditioning factors of reforestation actions.

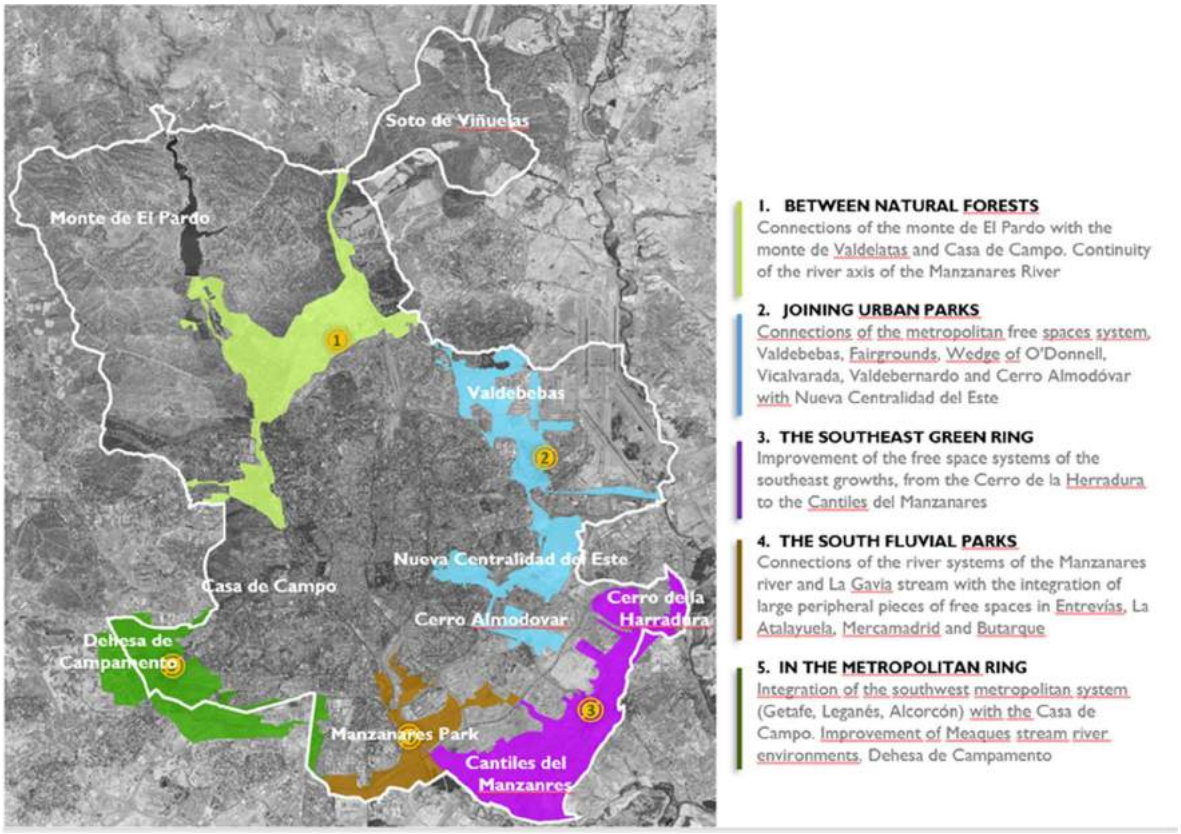
Fourth, innovative ways of conceiving the project. It is trying to be implemented through a collaborative work with other municipal areas, with the business sector and with professionals who have wanted to be given a voice through working groups and an international competition for ideas to make the project a reality. It also has the expert support of the scientific community and citizen participation. A multi-stakeholder alliance is needed to carry out this ambitious project.

The international lanscaping contest (2019-2020) was the most fruitful moment in terms of ideas, the most important milestone in terms of the conception and design of the Metropolitan Forest.

Global data

The green belt of Madrid has an area of about 32.000 hectares. The spaces where forestry works are proposed represent 14%, about 4.910 hectares of new Forest; most of the surface is made up of existing spaces that are already part of the set of urban forest parks and natural spaces of the municipality such as Monte del Pardo, Soto de Viñuelas, Casa de Campo, large parks such as Valdebebas, Juan Carlos I, or the Forest Park of Entrevias, that will be connected by this new actions.

The area included in the competition, divided into 5 lots, with specific goals



Of the 4,9100 hectares. 4.000 hectares are planned to have a natural forestry while about 900 hectares will be used for agricultural activities.

The project includes public and privately owned land, as well as land where it is possible to take action in the short term and others that will be incorporated into the Forest through the urbanization processes of different urban developments.

As a planing tool, a **Master Plan**, will be developed to organize all the actions to be carried out: forestation, agreements with land owners, conditions for urban developments . It will be the legal framework to develop the infrastructure over time.

The Forest represents a potential to plant 1,3 million trees and 10 million shrubs in the final 2030 scenario in the city of Madrid, with a CO2 absorption capacity considering trees and shrubs of about 400,000 tons of CO2/year over a period of 30 years and 550,000 tons of Co2/year over a period of 40 years. Likewise, it is estimated that the forest will be capable of producing around 20,323.8 tons of oxygen annually and avoiding 188,507.4 m3 of runoff.

The territory and its specific goals

The territory of the Forest is divided in 5 lots with some specific goals to be achieved

1. Valverde: Enhance its value

It is a protected natural space, a transition area between the city and places of high environmental value such as Monte del Pardo and the Cuenca Alta del Manzanares Regional

Park. Local organic farming is part of the healthy and sustainable food strategy of the city of Madrid, which can give this space a renewed boost.

Until the 1980s, in the rustic land of Madrid there were irrigated agriculture areas on river terraces, farms, mills, hermitages. This activity was gradually left due to the owners' expectations of land urbanization and due to the process of urban expansion, nowadays peri-urban agriculture is currently testimonial and Valverde is one of the few spaces to preserve, protect , value and enhance agriculture activity.

The goal is to reach land stewardship agreements with the owners of the land and create the figure of a peri-urban park, enhancing its important environmental values. Here we can still see predatory species such as the golden eagle, falcons, kestrels, sparrowhawks and nocturnal birds such as owls, scops owls, owls. The ornithological value is a very unique issue in this area due to its proximity to a large city.

The forest is working to reconcile environmental protection with uses as walking and healthy leisure, also promoting revegetation with native species, mainly holm oaks, and at the same time promoting new crops with greater commercial value in areas with availability of water and dry crops such as almond trees, pistachios, pomegranates, fig trees, vines and olive trees.

We also have elements that stand out for their historical value integrated into the proposal, for the awareness of all Madrid citizens, such as part of the Camino de Santiago route and the Finca del Duque del Arco, which are intended to be made known and integrated into the proposal.

The aim is to value a peri-urban space of 1,400 hectares, located in the forest environment with the highest environmental value in the municipality of Madrid, made up by Monte del Pardo, mountains of Valdelatas, Vadegrulla and Viñuelas, a transition area with the Regional Park of the Cuenca Alta del Manzanares at the foot of the Sierra del Guadarrama National Park.

By developing land stewardship agreements with landowners, the goal is to create a peri-urban park, which enhances the land's environmental and agricultural value.

Views of the city from Vlaverde

2. Connection of large parks as Valdebebas, Juan Carlos I and Valdebernardo with the Cerro Almodóvar.

Madrid has large parks that are disconnected from each other due to the presence of urban infrastructures. This is one of the commitments of the forest: seek physical continuity with ecoconnectors or ecoducts that allow the movement of pedestrians and cyclists, as well as animal and plant species, improving biodiversity, channeling winds that ventilate the city and reduce pollution. We know that the environmental benefits of green infrastructures happen when spaces are connected. It will be supported with a modular element called Crisalida to incorporate different services for bike rental, terraces, cultural elements...

The main goal is to join these large parks of Valdebebas, Juan Carlos I, the Vicálvaro green wedge, and the Valdebernardo park, through a large forest avenue that will allow pedestrian and cyclist mobility for people, but also for animal and plant species. A soft mobility that connects not only parks, but also schools, workplaces, including the Adolfo Suarez Airport and the IFEMA fairgrounds. This avenue has been incorporated into each of the project's lots, adapting to the territorial conditions of each one, which will enable the pedestrian and cycling route of the 75 km of metropolitan forest.

Through the creation of a forest pathway, the city aims to connect its large parks in the northeast of the city. This will allow sustainable pedestrian and cyclist mobility, as well as the movement of animals and plants.

3. Cerro Almodóvar Km 0 of the forest. Madrid new urban developments

Cerro Almodóvar is km zero because for a long time there has been an important neighborhood claim to protect this space. It is a witness hill very characteristic of the landscape in the southeast of Madrid, where the geology favors the appearance of layers of hard flint that generate this type of morphology with vegetation associated with botanical and endemic peculiarities (for example, the giant orchid, Himantoglossum robertianum, or the annual herbaceous Geropogon hybridus). This space also has an archaeological interest, fossils of giant tortoises and certain mammals have been found; and archaeological sites with Paleolithic flint utensils. It was also the place where the painters of the Vallecas school, an artistic vanguard movement of 1927, made their paintings of the landscape of Madrid (Benjamín Palencia, Alberto Sanchez).

Its potential for views allows us to contemplate the existing city and the new developments, being the Hill the point of connection between the city with the new Forest that will emerge from the new developments. In this new developments there will be almost 1,000 hectares to reforest where the idea is to develop a joint project that guarantees a complete vision of the green spaces in this area of Madrid, achieving a territorial continuity between all of them, protect the spaces of greatest environmental and landscape value: the Herradura hills , the Manzanares cliffs and the Gavia and Los Migueles streams that connect with the Regional Southeast Park. They are gypsiferous soils that favor aridity, which entails the use of specific vegetation in addition to measures to improve this soil. Services as a grazing and plaster school, a circular economy center or a naturalized graveyard will be developped in this area.

A 1000-hectare forest will be developed in the new south developments of the city, ensuring a comprehensive vision of green spaces. There will be territorial continuity between all of them, as well as protection of the most valuable natural and landscape spaces

4. Manzanares River

It is the final stretch of the ecological corridor of the Manzanares River. River of small flow of 69 km which has been underestimated, but the truth is that the river and its numerous tributaries (30 streams) have conditioned the shape of Madrid and the structure of its streets. Some paths are historically streams that disappeared and were channeled such as the Castellana, Abroñigal, Arenal or San Pedro. The river cornice, due to its defensive position, was also key in locating the old fortress, later the Royal Palace, and the population settlements around the water. The name of Madrid is also due to the water; In Arabic, Magerit means water travel, and there is a large aquifer underground that supplies the city with pipes and fountains, with water that filters through the permeable geology of granite and sand. Despite conditioning the shape and initial settlement of the city, the growth of the city from the 19th century turned its back on the river and its channeling and regulation with dams was executed to prevent its strong floods.

The recovery of the river began in 2004 with the great urban transformation project Madrid Río, that entailed the traffic removal of part of the M-30 and generated a new park for the citizens that connects with a first Manzanares South park in the district of Usera, built up by recovering a dump area. After these actions, in 2015, renaturalization project of the river began, which opens the dams, recovering the natural dynamics, which has returned the vegetation and birds to the new channel and which has recently been awarded with the Best Practices Award. Locals for Biodiversity, of the Spanish Federation of Municipalities and Provinces.

The last stretch will be part of the Forest, being a project indesign in a contemporary key, the idea is not to hide the sewage infrastructure of this area, but to integrate them, to work so that the treatment plants (China, Gavia, Butarque and Sur) can provide water to the new forest becoming attraction poles for the population, so that the urban water cycle is not foreign to them. The project aims to respect environmental values and answer to intense neighborhood demands to increase the offer for social use of this place. In addition the project will promote the development of an agroecological park whose management entity will be located in the farmer's house, a rehabilitation project of a building related to the Manzanares Canal called "Casa del Peón", it will shelter a house museum uses and in a new building will introduce administrative , training and co-working uses linked to the agro-ecological park.

There is also an historical component with the remains of an old canal, it was Felipe II's very ambitious attempt to make the Manzanares River navigable from Madrid to Aranjuez and from there to Lisbon and Seville. The project remains unfinished, a section was made to Toledo and Aranjuez, which is used to supply the town and the court with flour, porcelain and tapestries, until the arrival of the railway in the mid-19th century. The trace of the canal will be enhanced and use for the watering of this agricultural area.

agroecological park

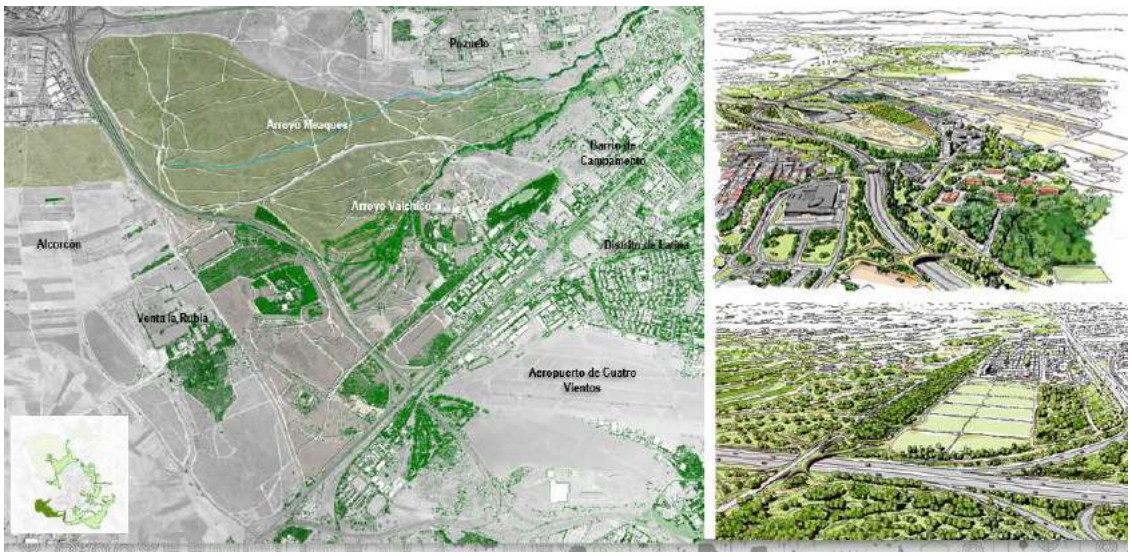
With the integration of the treatment plants in this area, the newly planted forest will have access to water. In the fertile plain of the Manzanares river, the urban water cycle will create an attraction pole for the population and promote agriculture, proposing the establishment of an agro-ecological park.

5. Campamento

The aim of this lot is to generate a green space between the municipalities of Madrid, Getafe, Leganés and Alcorcón (adjacent municipalities/ regional connection) supported by infrastructure borders, the Butarque stream and promote a large natural reserve land called the Dehesa de Campamento.

This spot has enormous potential to link the Manzanares River with the Guadarrama, currently it is a land belonging to the Ministry of Defense dedicated for barracks and manouver fields, which has preserved it from other uses as housing. A very important environmental value contains within cattle trails and the Valchico and Meaques streams that connect with the Casa de Campo. It is currently a place demanded by the population for hiking, physical activity of the surrounding residents, with very active platforms and associations.

The development of the projects in these five lots over the next few years will change the city of Madrid, generating environmental benefits due to its function as a carbon sink, reduction of the heat island effect, improvement of biodiversity, but above all it is going to change the way in which we understand the design of the city.



Meassures for environmental restoration.

Pursuing the restoration of a highly degraded environment in a semi-arid Mediterranean climate is one of the biggest challenges facing the project.

The average annual rainfall is estimated at 420mm, being in the semi-aridity range.

Soil and climatic conditions have a great influence and clearly limit the selection of the most suitable species of native flora for plantations. However, the orography of the place creates places where the availability of water for vegetation can be reduced (high parts of steep slopes with rapid evacuation of rainwater by runoff) and more favorable areas for receiving extra contributions to be at the bottom of micro basins (reception of water from high parts). In the same way there are slopes exposed to sun and others more shady, which entails small variations that aggravate or subtly attenuate the effects derived from summer sun exposure and water stress.

These differences described, plus others such as the upwelling of rock debris, must be considered to determine the planting species best adapted to the conditions of specific sites and increase the diversity of the flora used by the inclusion of species in these places with relevant particularities.

These semi-arid Mediterranean areas already represent a high degree of demand for vegetation, which has had to adapt to develop and survive with minimum levels of rainfall, withstand long periods of summer water stress, as well as cyclical droughts that aggravate to the extreme and periodically the effects of drought.

Current forecasts of the effects of climate change at the regional level, point to a likely increase in the frequency of extreme weather events, such as increased rainfall irregularity, increased frequency and intensity of drought events, or an increase in the frequency and intensity of so-called "heat waves". If this situation occurs, the turning point could be overcome from which plant species adapted to current weather conditions are not able to survive the new scenario.

However, although current forecasts suggest that the evolution towards the scenario described above are possible and probable, the effects of Climate change on the local or regional climate are not sufficiently known, since predictive models on this scale maintain a high uncertainty.

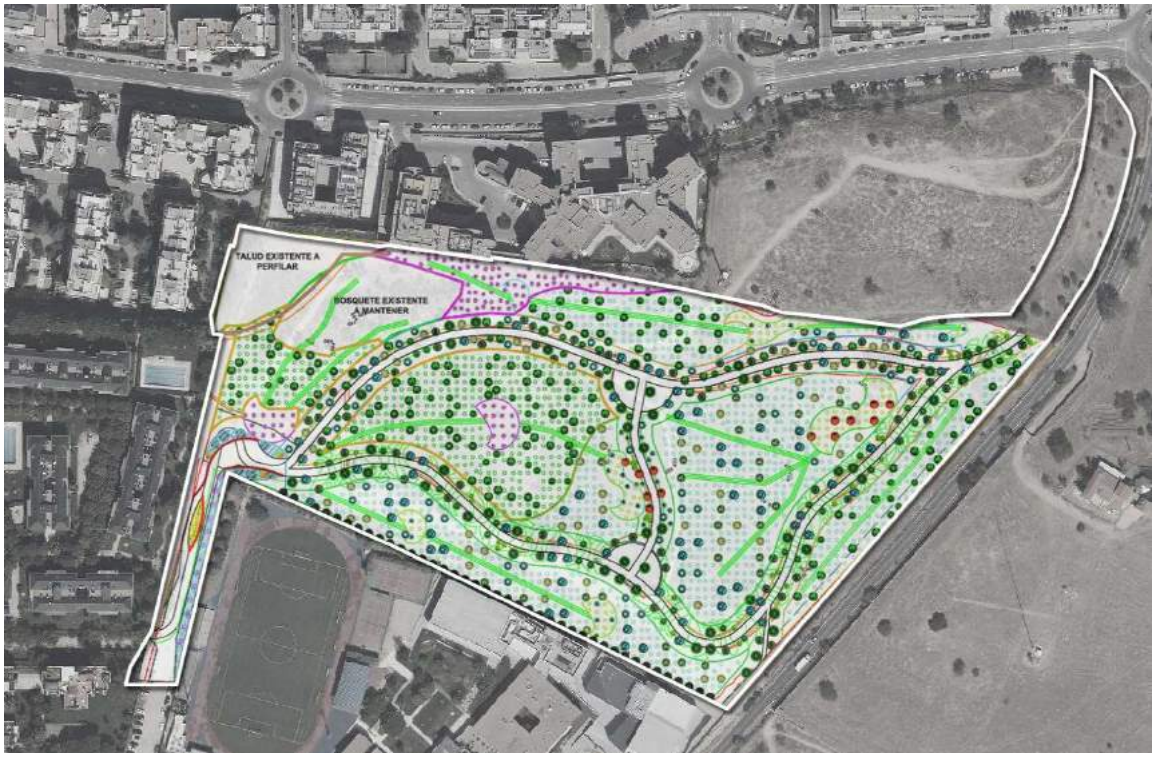
It is also necessary to manage invasive species. There may be an important brake on the settlement and development of multiannual and / or woody vegetation due to the effect of overgrazing caused by the very high densities of rabbit observed. Also plant species such as ailanto and nitrophilous species can enter into competition with native vegetation, therefore the importance of the conservation of these new urban forest spaces.

The techniques we are using on site go through the proper management of soil, preserving the natural soil and improving with organic matter amendments that favor permeability and nutrient supply. Soil analyses are carried out to dose the amendments. Previously the waste is removed, we find remains of floors, discharges of appliances, inert waste of works and slopes are reprofiled eliminating burrows.

Native species produced expressly in forest nursery are planted, plantations are carried out manually to avoid compaction of the land and protected with anti-advice meshes 1m high and buried about 50cm in the ground.

Conservation requires replacing dead trees, watering in summer and weed removal for the first two years to avoid competition with plants.

Avda de Talgo



Work objectives:

1. To reduce earthwork. Only for an accesible pathway with a 6% slope, construction of Wetlands to collect runoff and tillage to introduce soil amendments before planting
2. To reduce water demand. A drip irigation system is set for tallest trees close to pathways. And hydrants are included for watering plants only during summer (1 time per week or 1 time every 10 days)
3. To control Plagues. Hunting Rabbits and providing protection nets to trees and shrubs.
4. Soil amendments. Shallow tillage 15 cm deep and 15% compost, so that the organic material is greater than 2%. Planting holes are filled with 40% natural soil, 40% topsoil and 20% compost.
5. Slopes are stabilized with geocells
6. Planting:
   Species for arid forests:pines, holm oaks
   Species for wetlands:poplars ans ash trees
   Pathway and gates: elm, pines, cypress, maples
   Shrubs: arbutus, broom, hawthorn, fruithorn, wild and rock roses and lavender