

Environmental legislation and the importance of urban afforestation in the municipality of Campo Grande - Mato Grosso do Sul

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SUMMARY

The Federal Constitution of 1988 established the decentralization of competence to legislate on the environmental issue, and, consequently, the competence of the municipality to legislate on the environment, including the issue of urban afforestation. The objective of this article is to analyze urban afforestation, based on the legislation that deals with the subject, diagnosing the main problems derived from inadequate afforestation, either by choosing the wrong species or by the lack of maintenance and monitoring of the chosen seedlings. In this context, we also sought to verify the role played by the municipality in order to avoid the impacts caused by inadequate afforestation. It was concluded that, despite the importance of protecting the artificial environment and the existence of a vast legal apparatus available for the implementation of urban afforestation, the legislation is not fully effective, lacking in important technical aspects, which ends up leaving it to subjective criteria the implementation of afforestation, including respect for the tree species to be used.

KEYWORDS: Environmental protection. Sustainable development. Green areas.

1. INTRODUCTION

Urbanization, driven by the Industrial Revolution in Brazil, had its solidification started in the 1930s. However, what was to be celebrated as a great economic and social development, was followed by several problems, especially of an environmental nature. When approaching the historical evolution and its consequences to the environment, despite the harmful behavior adopted by humanity in general, it was at the time of the Industrial Revolution that the process of environmental degradation was accelerated, even though the related notion of preservation did not exist; this is because common sense understood natural resources to be eternal. It is possible to state that until the middle of the last century, society was not aware of the scope of the environmental issue (CATALAN, 2008).

The disorderly growth and without the necessary planning, added to the unbridled quest to satisfy human and commercial needs, imposed by the capitalist production system, ended up causing the loss of quality of life, a common scenario until the present day, mainly in developing countries. In this context, especially from the 1970s onwards, concern for the environment and its preservation began to emerge. This situation is linked to the increasing generation of polluting elements, forcing countries to worry about environmental preservation.

Derived from this concern, there were several important moments of discussion of environmental issues in conferences, such as the Stockholm Conference (1972 - Sweden), the United Nations Conference on Environment and Development or ECO-92 (1992 - Rio de Janeiro, Brazil), Rio +10 held in Johannesburg (2002 - South Africa), COP 15 in Copenhagen (2009 - Denmark) and Rio +20 (2012 - Rio de Janeiro). More recently, the COP 21 in Paris (2015 - France), demonstrates the efforts, at a global level, for sustainable development (MANSANO; BARBOSA, 2011; GALVÃO *et al.*, 2018).

At the national level, one can mention as environmental milestones the drafting of the National Environmental Policy Law - Law No. 6,938/1981 (BRASIL, 1981) and the Federal Constitution of 1988 (BRASIL, 1988), in the so-called 3rd generation of fundamental rights, treating the balanced environment as a right of present and future generations. For Catalan (2008), the enactment of the National Environmental Policy Law can be established as the starting point of Brazilian environmental law, replacing the sectorized legislation that existed until 1981, seeking to harmonize socioeconomic development and the environment, based on sustainable development.

The insertion of individual rights and guarantees occurred before the positivization of norms that seek environmental preservation. This fact is justified since the first constitutions are from a time when there was no concern for the environment and the problems were of a different nature, such as the excess of power of sovereigns and the interference of the State in the private lives of citizens

(CATALAN, 2008). However, such an understanding was consolidated by the Federal Constitution of 1988, which dedicated a chapter to dealing with the environment (BRASIL, 1988).

As can be seen, this Constitution was the first to deliberately deal with the environmental issue, so it can be said that it is an eminently environmentalist Charter. It deals in several chapters, directly or indirectly, with the protection of the environment, providing for the matter in a specific chapter, which, due to its importance, is inserted in the title of the Social Order. Since then, there are several legislative sources that deal with the environment and provide for the need for its preservation, trying to reconcile economic and social growth with the environment in search of sustainable development. In this sense, the issue of urban forestry stands out due to its importance for the quality of life of the population, playing a vital role in reducing heat islands and increasing relative humidity, in addition to other social, physical and environmental benefits (RAMESH; PRIYA, 2017). In addition, the presence of urban trees improves air quality, fixing toxic gases and suspended particles, in addition to softening the local microclimate, reducing wind speed and improving urban aesthetics (SILVA *et al.*, 2017).

Despite its importance, according to Bae (2011), in Brazil, urban afforestation is a recent topic and, for this reason, subject to several environmental and legal problems. Gonçalves and Paiva (2017) and Silva *et al.* (2017) report that the process is usually carried out without prior planning, proper maintenance and scarce specific legislation, which leads to a series of problems. This situation is related to the fact that the formulation of public policies related to the subject must consider several aspects, such as the design of the spaces to be used, ecological characteristics of the species, soil quality and residents' preferences, for example (BAE, 2011).

For these reasons, there are always conflicts between the afforestation processes, the demands of the population and the urban environment itself, which requires species suited to its characteristics, which leads to the production of booklets, books and articles, in addition to specific legislation on afforestation. Despite all scientific production and the existing legal apparatus on the subject, there are several conflicts identified with regard to vegetation and urban infrastructure, which also occurs in the city of Campo Grande, capital of the state of Mato Grosso do Sul. The city is considered largely wooded, with avenues and streets standing out for the presence of numerous tree species, native and exotic, in addition to having squares, parks and protected green areas that stand out in relation to the built environment.

2 OBJECTIVES

The objective was to verify the environmental legislation and the effectiveness of the legal instruments made available to the Public Power and society with regard to urban afforestation in the capital of Mato Grosso do Sul.

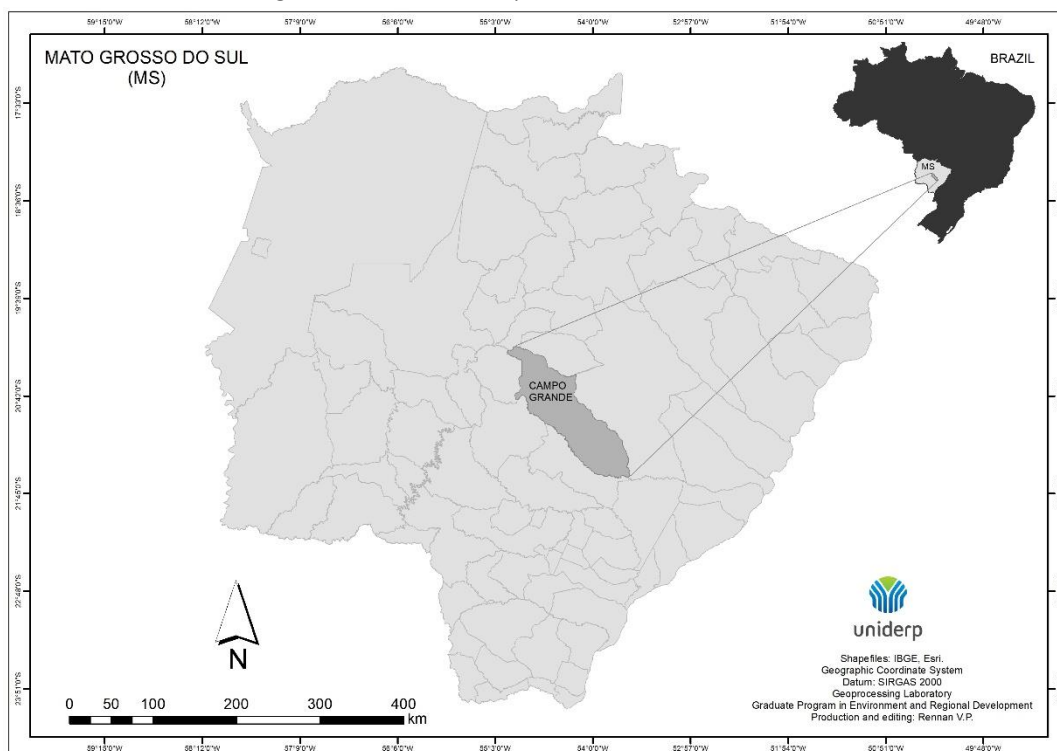
3 MATERIAL AND METHODS

3.1 Study area

The research was carried out in the municipality of Campo Grande (Figure 1), capital of the state of Mato Grosso do Sul, with an area of 8,096 km², in the vicinity of the watershed and hydrographic basins of Paraná and Paraguay, with an approximate population of 853,622 inhabitants (IBGE, 2015). The city has 8,082.97 km² and is geographically located in the central portion of the state, representing 2.26% of its total area. It has the geographic coordinates of ground zero: Latitude (S):

20°28'13.40737, Longitude (W): 54°37'25.87099", having as neighboring municipalities Jaraguari, Rochedo, Nova Alvorada do Sul, Ribas do Rio Pardo, Sidrolândia and Terenos (HOKAMA *et al.*, 2021).

Figure 1 - Location of Campo Grande, Mato Grosso do Sul



3.1 Methodology

Based on the hypothetical-deductive methodological modality, a critical literature review on the process of afforestation in the city was proposed, through the analysis of the relevant legislation regarding the use and protection of the city's artificial environment. The work was developed from the study of legislation, from the most general to the most specific, from the Federal Law 6.938/81, which established the National Environmental Policy (BRASIL, 1981) and the Federal Constitution of 1988 (BRASIL, 1988). The municipal laws studied were Law No. 10,257/2001, which provides for the City Statute, the Municipal Master Plan and the Master Plan for Urban Afforestation – PDAU, Land Use and Occupation Law and Complementary Law No. 186, of 12 December 2011, in addition to the city's Urban Forestry Guide.

Information was obtained on the afforestation processes, made available through the Division of Inspection of Green Areas and Environmental Postures. In addition to this data collection, a visit was also made to the Municipal Nursery “Flora do Cerrado”, located at Presidente Lincoln Street 316, equipped for the production of seedlings suitable for afforestation. At this location, the technical manager informed the procedures regarding the removal of plants from the site. For the visitation, the Secretary of Environment and Urbanization, through the Head of the Division of Inspection of Green Areas and Environmental Postures, provided authorization and the Ethics Committee of the University considered that its opinion was not necessary.

4 RESULTS

It is the duty of the Public Power to give effect to the principle established in art. 225 of CF, being able, for this purpose, to make use of political, legal, technical and economic instruments, with the objective of guaranteeing an ecologically balanced environment. Thus, it is up to the municipalities the responsibility and competence to prepare the urban development policy plan, which should be instituted by general guidelines established by law with the main purpose of ordering the use and occupation of urban spaces, as well as the development of social functions of the city.

It follows then that the municipality has at its disposal several instruments of environmental protection and, consequently, of afforestation, as efficient means of control and preservation of green areas. Hence the importance of implementing an urban development policy aimed at the full development of the city's social functions and the guarantee of the well-being of its inhabitants, as established in art. 182 of CF. An example of this is the possibility for the Public Power to act when urban property fails to fulfill its social function established in the fundamental requirements of the city's organization expressed in the Master Plan (TORQUATO *et al.*, 2020).

Urban Law is the set of legal norms that regulate the activity of the Public Power by ordering habitable spaces, which is to say: that regulate urban activity. Its main foundation is the principle of the social function of property, as a means of protecting the environment. The law that regulated art. 182 of the CF, which dealt with urban development policy, is number 10257/2001, known as the City Statute. It establishes norms of public order, of social interest and regulates the use of urban property for the benefit of the collective wellness and security of citizens (art. 1 of the said Statute). Among the planned instruments, the most important for its implementation is the Master Plan, which outlines the urban development policy and provides guidelines and strategies for the urban and economic development of the city, guiding public investments. Aided by implementation instruments, such as the Land Use and Occupation Law, the plan will be able to guide where the city should grow and develop (SIRVINSKAS, 2021).

With the advent of the City Statute, a more intense protection of the artificial environment was possible, highlighting the importance of urban planning as a guarantee of a healthy and good quality of life for the community, establishing several instruments capable of ordering the sustainable occupation of urban spaces. The importance of adequate afforestation is easily seen from its relationship with the good quality of life of the population, closely linked to the way in which the soil is used and occupied. Although a large proportion of people live in a world dominated by technology, the well-being of all depends, ultimately, on environmental services directly or indirectly, the so-called ecosystem services, and their degradation affects environmental quality (FORD *et al.*, 2015; SANDIFER *et al.*, 2015).

Human activities capable of causing a substantial reduction in the number of species can directly harm ecosystem services, such as flower pollination, seed dispersal, climate regulation, carbon sequestration, pest control and agricultural diseases, in addition to affecting negatively human health. This is because the greater the number of species in urban ecosystems, the greater their productivity, resistance to diseases and benefits to the population's quality of life, for example. Thus, problems in land use and occupation may negatively impact ecosystem services, directly affecting human beings (MACE *et al.*, 2012; KOWARIK *et al.*, 2020).

Contact with nature and wooded areas increases the health and well-being of human beings by reducing stress and increasing positive emotions, indicating the relevance of natural settings for

maintaining the quality of life of the population (CLARK *et al.*, 2014; BRATMAN *et al.*, 2015). For this reason, the recognition that mental health is related to the environment (an ecosystem service) is an indication of the importance of green areas in the urban environment and their correct use (COSTA *et al.*, 2020). Vegetation also plays an important role in climate elements, such as the intensity of solar radiation, temperature, relative humidity, precipitation and air circulation, among others. That is, the afforestation of public areas, in addition to beautifying the environment, is directly responsible for improving the quality of life of the population, providing environmental services to man.

In addition to ecosystem services, it is known that green areas increase property prices, as reported by Panduro and Veie (2013). With regard to the economic function, it is evident that properties with afforestation or located close to parks or wooded regions have added economic value to them, as mentioned by Biao *et al.* (2012) in Beijing, China, serving as an important attraction for those seeking a better quality of life. However, despite all the unquestionable benefits offered by urban afforestation and green areas (LIEBELT *et al.*, 2019), doing it incorrectly ends up causing numerous problems, both for the manager and for the users. Hence the importance of knowing the most suitable tree species for each location, taking into account not only the visual aspects, but also the practical aspects and maintenance of the introduced vegetation. Thus, the correct choice of plant is fundamental to avoid undesirable conflicts between the trees and the urban setting, full of wiring, street lamps, buildings and sidewalks.

The tree to be used must meet certain conditions to minimize impacts on the urban environment, for example, preferably using species of evergreen leaves, which do not fall during the dry season. Another relevant factor is the root system, giving preference to plants with pivoting roots, which, in addition to preserving sidewalks, are more resistant to wind and do not invade pipes. In addition, the ideal seedlings for afforestation should be small, without interfering with the electrical network, as this could lead to constant pruning, which is not always carried out properly. With regard to shading, one must take into account the place of insertion of the tree. When dealing with wide streets or in medians, large species can be used. It is still important to take into account the production of flowers, preferably small and without odors, and fruits (reduced fruiting), thus avoiding the detachment of fruits that can cause problems (GONÇALVES; PAIVA, 2017; SILVA *et al.*, 2017). Thus, species with flowers and fruits must be well evaluated, because although they offer beauty and pleasure, they can cause problems, despite being necessary for the maintenance of birds.

Taking into account all the issues mentioned, numerous precautions are needed with the processes of urban afforestation. In the municipality of Campo Grande, the afforestation process relies on legal instruments that establish the requirements and standards for implementing green areas in the city. Within planning, in use of the constitutionally conferred competence to deal with issues of local and peculiar relevance (art. 30), the most important ones can be mentioned the Municipal Master Plan, Master Plan for Urban Afforestation, Law of Use and Land Occupation and Complementary Law No. 186, of December 12, 2011, in addition to the Urban Afforestation Guide and the Environmental Zoning plan.

With regard to legislation, the Land Use and Occupation Law was enacted with the express objective of environmental preservation and sustainable development, while the Master Plan of the Municipality, in turn, was established as a basic instrument of the policy of development and urban expansion. These two instruments should guide the expansion of the city, within certain principles. However, it is possible to observe undesirable environmental effects resulting in part from the fragility

of regulations, which do not follow the situations experienced by citizens and leave room for extremely relevant decisions to be taken subjectively and unilaterally by citizens.

On the other hand, the PDAU was created so that, in view of the problems that normally occur, in relation to afforestation, the public manager is able to outline effective goals and plans. However, it also indicated that the main negative points of urban afforestation are related to the use of inappropriate species, improper management and even people's own lack of knowledge about the benefits that trees can offer (i.e., lack of dissemination of knowledge). Among such verifications, the need to choose the most suitable species, the correct planting method, the maintenance of the aforementioned vegetation and the insertion of standardized procedures in the afforestation process stand out, making the species compatible with the urban infrastructure, with case-by-case analysis, in certain situations.

It is in this context that the importance of technical knowledge for handling plantations stands out, in order to avoid unwanted consequences of the use of inappropriate species, a situation often associated with the disorderly growth of cities (unquestionably harmful to the environment, to a greater or lesser extent). For this reason, plantings without proper planning, prior study or periodic monitoring are often not environmentally viable, resulting in a series of inconveniences to the population. This results in serious problems with the electricity grid and urban lighting, paving, sewage and treated water networks or buildings in a broad sense, factors almost always related to the clash between planted trees and local infrastructure.

With regard to the species recommended for planting, the Urban Forestry Guide highlights the importance of prioritizing native species capable of better adapting to the adverse conditions found in the environment, without, however, disregarding the exotic ones. The use and predominance of exotic species is a common situation in several Brazilian cities, as reported by Franco *et al.* (2018) in Cáceres, MT and Pimentel and Ximenes (2020), Santarém, Pará, for example.

The Guide is quite informative, but its lack of publicity and, consequently, of access to information by the population, ends up making it inefficient. This situation occurs, despite the guide having the objective of providing norms and guidelines for the implantation and maintenance of urban afforestation. In this sense, it is emphasized that shrubs should not be used, since they do not have the necessary environmental characteristics and do not provide the same result achieved in the case of using a tree species.

He also points out that, preferably, a single species will be used for each street, or at least, for each side of the street, a procedure that seeks to facilitate both the monitoring of the development of the species, with the control of pests and diseases and the pruning program. This is not the predominant scenario found in the city, where there is a diversity of species in the same place. A relevant factor is still the distancing of trees from the elements of public roads, which, according to the guide, must consider the minimum limits between the dimensions reached by the species chosen in their adult form and the location of the building and other urban furniture, guaranteeing space for mobility in the city. This is another situation that is not observed on the sidewalks of the city.

The PDAU diagnoses the extreme need to carry out Public Awareness and Environmental Education Programs, with the aim of reducing irregular planting (voluntary) by the population, which ends up causing various problems typical of street afforestation in Brazilian cities, as a whole. However, awareness would go beyond reducing irregular planting, instilling in the population's mentality the concern with the correct afforestation, disseminating technical information that is often far from their

reach. If the population truly knew about the benefits brought from a well-structured urban forestry, certainly the current scenario would be different and the problems derived from poor forestation, controlled.

The biggest problem is the lack of criteria, action programs and planning guidelines capable of meeting local needs. This demonstrates the lack of continuous programming on the part of the municipalities for the afforestation of public roads, including in the sense of planting new seedlings or replacing trees that have already exercised their social and environmental function, and are close to causing problems, such as falling branches. There is no doubt that the environmental issue has taken on important proportions in the public administration scenario, which has been concerned with improvements in the sector, albeit slowly, compared to the emergence of environmental problems. Within this context of improving the environment, the PDAU diagnosed the shortage of seedlings most suitable for afforestation, pointing to the need to implement a plant production program and nursery restructuring. Based on this diagnosis outlined by the PDAU, the Municipal Nursery was implemented (Figures 2 and 3).

Figure 2 - Images of the construction phases of the Municipal Nursery “Flora do Cerrado”, Campo Grande, Mato Grosso do Sul



Source: the authors.

Its operation is related to the distribution of seedlings, which is carried out based on a simple standard authorization from SEMADUR (Municipal Secretary for the Environment and Urban Development), which indicates which seedling to be provided and its approximate value. With each delivery, manual control is carried out, through a form, containing the name of the beneficiary and the place where the seedling will be planted.

Figure 3 - Production of seedlings in the Municipal Nursery “Flora do Cerrado”, Campo Grande, Mato Grosso do Sul



Source: the authors.

However, the citizen often does not have all the necessary information for the correct choice of the species, as he fails to inform: the size of the place where the species will be planted; the distance from walls or walls; the existence of a sidewalk or pavement on the street. In addition, it is often not taken into account that some species that are in great demand, such as the Ipês, shed their leaves during part of the year, not providing shade and requiring constant cleaning. In addition, when in bloom, they can attract various insects and their flowers, although beautiful, when they fall to the ground, form a carpet of organic matter that must be swept daily.

All this indicates that after reaching a certain size, constant pruning or even removal of the tree may be necessary, as the species may: (i) bother its owner, (ii) disturb the movement of people on the sidewalks, (iii) make it difficult for visibility of road signs and traffic lights, (iv) causing conflicts with the electrical network and piping, as well as clogging of manholes (which significantly increases the risk of flooding), among other situations.

In the information obtained, it was verified that the Municipal Nursery has manual control (approximate), dividing the seedlings according to their height (relevant factor for choosing the appropriate plant for planting). This is important, as it allows knowing the number of trees that can be used each period and, in this way, allows planning on when new seedlings should be prepared.

It was also observed that, in the list of available species, the non-existence of *Ficus* spp. This species was previously used in large quantities in afforestation and, according to the PDAU, has caused many problems, such as the breaking of pipes and sidewalks. In this way, it is almost no longer provided. On the other hand, the species *Oiti* {*Licania tomentosa* (Benth.) Fritsch}, formerly widely used on public roads and causing different problems, such as the release of sap during a certain period of the year, which leads to soiling or staining cars parked underneath of its canopy, is still produced and distributed, although in smaller quantities (especially for planting in central avenue beds).

According to the person in charge of the nursery, there are currently around 120,000 seedlings and the ipês (*Handroanthus* spp. and *Tabebuia* spp.) are among the most used species. It should be noted that there is a great demand for these species and in this way, the collection of seeds occurs annually. As the germinability of ipês species is usually high, a large number of seedlings are formed.

However, the factors already mentioned for this group are not taken into account, such as the loss of leaves (deciduous species), the large production of flowers, fruits and seeds, in addition to

the fact that some trees, such as the pink ipe (*Handroanthus heptaphyllus* (Mart.) Mattos.), reach up to 35 meters in height. This situation, depending on the place where the species will be planted, can lead to its early cutting, causing a series of inconveniences.

For this reason, among the ipês, the most suitable type would be the white one, a small to medium-sized tree with less flower production, which would reduce the risk of the problems already listed above. Of the fruit trees, the most used species is the acerola (*Malpighia emarginata* DC.), which, in addition to producing tasty and highly appreciated fruits (including the amount of vitamins they contain), is resistant and compact, which reduces the risk of pests and diseases, requiring little handling.

One observed factor is the lack of an integrated system capable of facilitating communication between SEMADUR and the Municipal Nursery, streamlining the process of requesting and supplying seedlings; for this reason, the procedure for obtaining seedlings is often bureaucratic and time-consuming. This ends up encouraging the purchase of seedlings by private individuals in flower shops and nurseries, without any technical guidance, increasing the risk of inadequate afforestation and, consequently, environmental problems, which may even lead to cutting them down.

Whether due to its importance, relevance or complexity, what is verified is that the afforestation of urban centers should be treated separately by Environmental Law (SIRVINSKAS, 2021). The procedures for afforestation must be well studied to avoid future problems. However, it is also necessary that public administrators have knowledge about urban environmental management, which involves afforestation, and have better control over the process, avoiding species that are not suitable for specific locations, which may cause environmental problems derived from inadequate afforestation.

From all of the above and the characteristics that must be considered when afforestation of the urban area, what is verified is that the mere implantation of trees along the roads does not qualify the afforestation, even because inappropriate trees are often used, among other problems. The process of urban afforestation, as it has been used, many times without specific technical support, despite contributing to the quality of life related to the environment, has generated problems for public administration. This occurs due to the lack of technical information (or its application), indicating fragility in the process of urban afforestation in the city.

5 CONCLUSIONS

The municipality, in use of the competence that is constitutionally guaranteed to it, has elaborated several legal instruments to provide for the use and occupation of the land, including urban afforestation. However, despite the existence of such precepts and the elaboration of the PDAU, there is no effectiveness or periodic planning for the effectiveness and implementation of afforestation in the urban scenario. There is currently no pruning planning or periodicity in the management of the trees that already make up the city's green areas. This fact alone removes the full effectiveness of the legislation, proving the fragility of the current urban forestry system. In addition, it was diagnosed that there is a preference for certain species for use in afforestation, such as ipês, which are not fully suitable for different locations in the city and should not be used without a prior study of the place of planting.

Although there is concern for public management, which is responsible for maintaining a Municipal Nursery (organized and well-structured) and providing seedlings for citizens, the bureaucracy that involves its supply ends up encouraging the purchase of plants by private individuals directly from flower shops or nurseries, leaving the choice of the species that will compose the afforestation of the city outside the citizen's subjectivity.

The requirement inserted by article 37, item VI, letter a of the Land Use and Occupation Law of the Municipality, which determines the implantation of a tree species in buildings, without any technical specification on the species that can be used in that particular region, proves the fragility of the law (Complementary Law No. 74, 2005). That is, even though the legal determination is well-intentioned and demonstrates the concern of the public authorities with the issue of afforestation, it ends up proving the lack of planning or awareness of the environmental problems that may derive from the use of inappropriate species to comply with a requirement.

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