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PROPOSALS FOR DEVELOPING GREEN SPACES IN THE SECOND UNIVERSITY POLE OF THE CITY OF TLEMCEN (ALGERIA)

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ABSTRACT

This work presents a critical appraisal of the organization of green spaces within the Second Pole of Tlemcen University, Algeria.
The paper quantitatively and qualitatively analyzes the allocation of green spaces within the Second Pole, considering factors such as the recommended area per person (7 square meters) and the diversity of tree species (18).
Furthermore, the paper identifies shortcomings in the current allocation of space for green areas and the limited selection of tree species within the Second Pole. Additionally, it critiques the ornamental trimming practices employed for various tree species.
In response, the paper proposes specific policies for the organization of green spaces, advocating for both vertical and horizontal expansion of plant varieties.

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Introduction.

Tlemcen boasts a rich history of arboriculture, contributing to its reputation as one of Algeria's greenest cities. Linear and ornamental woody plants hold particular significance at Tlemcen University, where administrators continually endeavor to preserve and augment their presence. Trees and shrubs constitute a permanent feature within this public institution of higher learning. Once established, these plantings typically endure for a decade or longer. When strategically employed, these highly adaptable plants serve not only an aesthetic function but also a deliberate approach to highlighting other ornamental elements.

Linear and ornamental trees and shrubs are now woven into the cultural heritage of our esteemed city of Tlemcen. However, to ensure their continued contribution to the urban landscape, these plantings necessitate judicious selection, meticulous establishment and maintenance, and ongoing renewal with proper management practices. The present work serves as a critical examination of the landscaping plan for the Second University Pole in Tlemcen, Algeria.

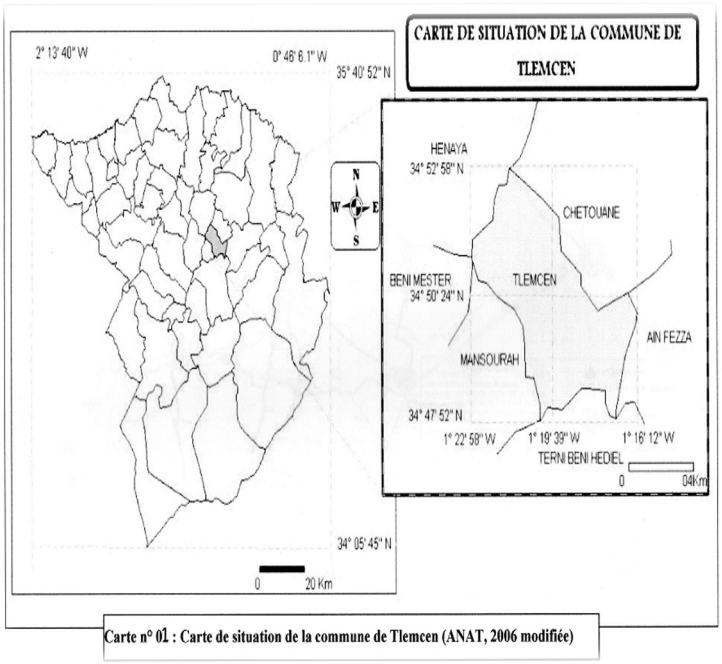
I. Quantitative inventory.

I.1 Study area.

The Wilaya of Tlemcen occupies a strategic location on the northwestern border of Algeria. Bordering the Mediterranean Sea to the north, it transitions from the coastline into the southern steppe region. This 901,769-hectare territory stretches 180 kilometers along the Algerian-Moroccan border and boasts a 70-kilometer coastline.

Our study focuses on the Second University Pole of Tlemcen's Abou Bekr Belkaïd University, a recently constructed facility situated within the commune of Mansourah.

The climate of the Tlemcen region is well-documented, with foundational studies by Seltzer (1946) and more recent contributions by Aimé (1991). This region experiences a classic Mediterranean climate characterized by two distinct seasons: a brief, cool and wet winter followed by a long, hot, and dry summer.



Map n°01. Location map of the Commune of Tlemcen.

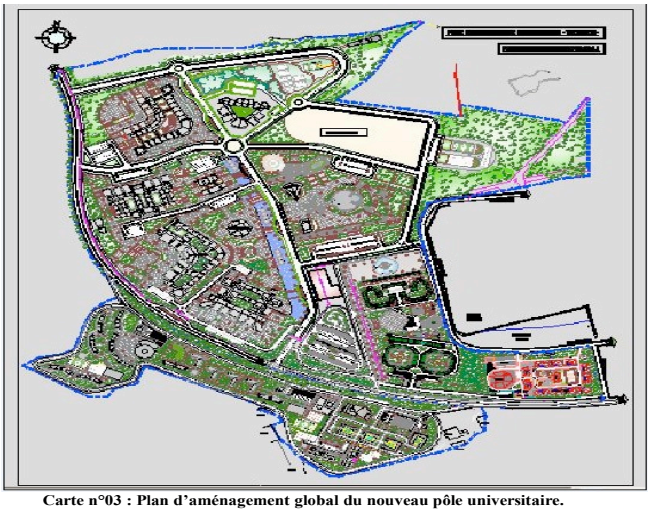
I.2 Material and methods.

An examination of the map depicting green spaces at the Second University Pole (Map No. 2) was instrumental in precisely measuring their total surface area. This map, created in 1981 by the Dembri design office in Constantine, Algeria, utilizes AutoCAD software – a well-established program for computer-aided design and drafting commonly used in various engineering disciplines. It is important to acknowledge that AutoCAD's primary function is linear measurement.

I.3 Results and discussion.

Our investigation area, the Second University Pole, encompasses a total surface area of 120 hectares. Of this area, 40% (48 hectares) is occupied by built structures, while the remaining 60% (72 hectares) is designated as landscaped space. This landscaped area incorporates both green spaces (22 hectares) and circulation elements such as roads and esplanades (50 hectares).

With an estimated population of 31,800 users, including 30,000 students, 1,000 teachers, and 800 staff members, the Second Pole offers a green space ratio of 7 square meters per person. This allocation falls short of the national standard for public socio-cultural facilities, which mandates 10 square meters of green space per person. In conclusion, our study reveals a discrepancy between the current provision and the recommended standard.



Carte n°03 : Plan d'aménagement global du nouveau pôle universitaire.

Légende :

1) 4000 places pédagogiques 1ère tranche. **2)** 4000 places pédagogiques 2ème tranche.
3) 4000 places pédagogiques 3ème tranche. **4)** 4000 /5000 places pédagogiques 4ème tranche.
5) 1000 /5000 places pédagogiques 4ème tranche. **6)** 2000 places pédagogiques 5ème tranche.
7) Animalerie. **8)** Pôle sportif.
9) Champ d'expérimentation. **10)** Restaurant central.
11) Auditorium. **12)** Tour de gestion.
13) Bibliothèque centrale. **14)** Hébergement 1000 lits.
15) Hébergement 2000 lits. **16)** Centre médico-social.
17) Incinérateur.

Map n°02. Overall layout of the Second University Campus.

I. Qualitative inventory.

Horticultural nomenclature serves as the governing system for naming plant categories that have been obtained, selected, or cultivated by humans. While all cultivated plants have origins in botanical species, assigning them scientific names according to the principles of binomial nomenclature can sometimes present challenges.

Table 1. List of woody species at the New Tlemcen University Campus.
The symbol used for decorative purposes is:

Fl: flower **Fe:** foliage **Fr:** fruit **Ec:**Peel

	Latine Name	French Name	Family	Adult Height (m)	Crown shape	Decorative value	Shady	Tree alignment	Ornamental tree
1	2	3	4	5	6	7	8	9	10
1	*Acer negundo* L.	Erable negundo	Aceraceae	10-15	Round	Fe, Ec	+	+	
2	*Bauhinia purpurea* L.	Arbre à orchidées	Fabaceae	12	Dome-shaped crown and spreading habit	Fe	+	+	
3	*Brachychiton Populneus* Schott.	Arbre bouteille	Sterculiaceae	10-15	Port pyramidal	Fe, Fl	+	+	
4	*Calocedrus decurrens* Florin.	Cèdre à encens	Cupressaceae	40-45	Fastigiate and colonnary	Fe	+		+

Table 1. Continuation.

1	2	3	4	5	6	7	8	9	10
5	*Cedrus atlantica* Mantti.	Cèdre de l'Atlas	Pinaceae	40	Pyramidal flatteningwith age	Fe	+	+	
6	*Cedrus deodara* G.Don.	Cèdre déodar	Pinaceae	25	Pyramidal appearance	Fe	+	+	
7	*Cedrus libani* A.Rich.	Cèdre du Liban	Pinaceae	35	Conical habit, later to become tabular	Fe	+	+	
8	*Chorisia speciosa* A.St.Hil.	Chorisier speciosa	Bombacaceae	15	Round	Fe, Fl	+		+
9	*Cycas revoluta* Thunb.	Cycas révoluté	Cycadaceae	1-3	Crown of evergreen leaves	Fe	–		+
0	*Dracaena draco* L.	Dragonn-ier des Canaries	dracaenaceae	20	Parasol-shaped	Fe	+		+
1	*Erythrina crista-galli* L.	Erythrine crête de coq	Fabaceae	4-6	Round	Fl	+	+	
2	*Ficus australis* Willd.	Figuier d'Aust-ralie	Moraceae	8-10	Round	Fe	+	+	
3	*Ficus nitida* Thunb.	/	Moraceae	4,5	Round	Fe	+	+	
4	*Jacaranda mimosaefol-ia* Don.	Jacaranda,Flomboy-ant bleu	Bigniniaceae	5-8	Tuft	Fe, Fl, Fr	+	+	
5	*Platanus hispanica* Mill.	Platane commun	Platanaceae	40	Large	Fe, Ec	+	+	
6	*Thuya aurea*	/	Cupressaceae	5-10	Pyramidal	Fe			+
7	*Thuya orientalis* L.	Thuya d'orient	Cupressaceae	5-10	Pyramidal	Fe	+		+
8	*Yucca elephantipes*	Yucca	Agavaceae	1-1,25	Tuft	Fe, Fl	–		+

A notable trend observed is the prioritization of ornamental foliage in the selection of woody plant species. As shown in Table 1, a significant portion of the chosen species represent new introductions to the city of Tlemcen. While these species have demonstrated success in other Mediterranean cities (Spain, France), their ability to acclimatize to Tlemcen's specific conditions remains uncertain.

Concerns regarding the winter hardiness of three particular species warrant further investigation:

- *Brachychiton populneus:* Limited tolerance to temperatures below -6°C.
- *Chorisia speciosa:* Limited tolerance to temperatures below -5°C.
- *Erythrina crista-galli:* Limited tolerance to temperatures ranging from -3°C to -6°C.

II.1 Choice of species.

Despite the extensive variety of woody species available for both alignment and ornamental purposes, as presented in Table 1, shade provision should be the primary criterion guiding our selection. This is particularly crucial at our latitude, where high solar radiation and intense sunlight necessitate thoughtful design.

The concept of the "shade garden," widely employed in southern Spain and exemplified by Seville's renowned patios, offers valuable inspiration. Effective shade creation can be achieved through trees with dense canopies (e.g., plane, mulberry, lime) or by manipulating light filtration through strategically positioned trees like pines.

While the plane tree (Platanus) is undeniably aesthetically pleasing in rows and provides ample shade, its current near-monopoly (90%) in Tlemcen's urban landscape should be reconsidered. Species diversification is crucial to mitigate the risks associated with plant diseases like powdery mildew and color canker. Additionally, some plane tree varieties possess leaf and fruit hairs that can trigger allergies. Their leaves are also notoriously difficult to decompose, requiring regular collection to prevent blocked waterways and the formation of unsightly and slippery leaf litter during wet weather (Bourgery & Castaner, 1988).

Table n°02 categorizes trees based on their ability to provide either full glare control or a more dappled light effect. We strongly encourage landscape architects and green space planners to utilize this diverse portfolio of species when designing future plantings.

Table 2. List of trees with an anti-glare effect and those providing subdued light.

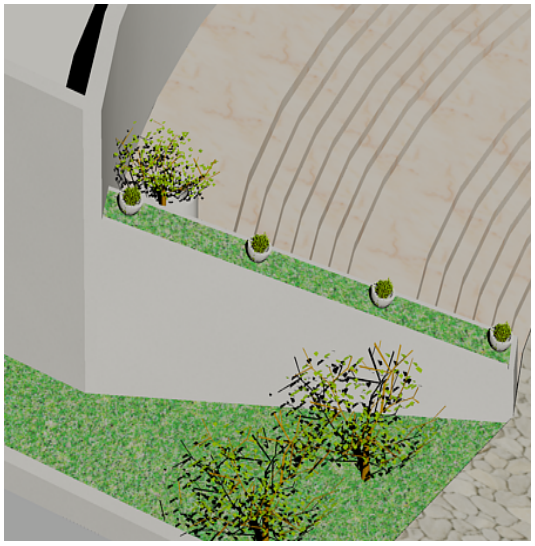
Anti-glare trees	**Trees providing subdued lighting**
Acacia cyanophylla	*Brachychiton populneus*
Acacia lophanta	*Callitris quadrivalvis*
Acacia retinoïdes	*Calocedrus decurrens*
Acer negundo	*Casuarina tenuissima*
Aesculus hippocastanum	*Casuarina coccinea*
Ailanthus glandulosa	*Cedrus atlantica*
Albizia julibrissin	*Cedrus deodara*
Bauhinia purpurea	*Cedrus libani*
Catalpa speciosa	*Cupressus arizonica*
Celtis australis	*Cupressus macrocarpa*
Ceratonia siliqua	*Cupressus sempervirens*
Cercis siliquastrum	*Eucalyptus camaldulensis*
Dracaena draco	*Nerium oleander*
Erythrina crista-galli	*Nicotiana glauca*
Ficus australis	*Parkinsonia aculeata*
Ficus nitida	*Pinus halepensis*
Fraxinus excelsior	*Pinus pinea*
Garrya elliptica	*Tamarix gallica*
Ginkgo biloba	*Thuya orientalis*
Hibiscus rosa-sinensis	
Jacaranda mimosaefolia	
Laurus nobilis	
Ligustrum japonicum	
Machaerium tipu	
Melia azedarach	
Morus alba	
Morus nigra	
Morus papyrifera	
Myoporum pictum	
Pittosporum tobira	
Platanus acerifolia	
Platanus hispanica	
Platanus hybrida	
Platanus orientalis	
Populus alba	
Populus nigra	
Prunus cerasifera	
Robinia pseudoacacia	
Sapindus utilis	
Schinus molle	
Sophora japonica	
Tilia platyphyllos	
Ulmus campestris	

II.2 The quality of the work.

The success of any landscape design hinges on the quality of its execution. This is particularly true in Mediterranean regions, where walls and paving elements serve as fundamental architectural components within gardens. Floral displays and shrubbery often function to complement these structural features, rather than acting as the primary focus.

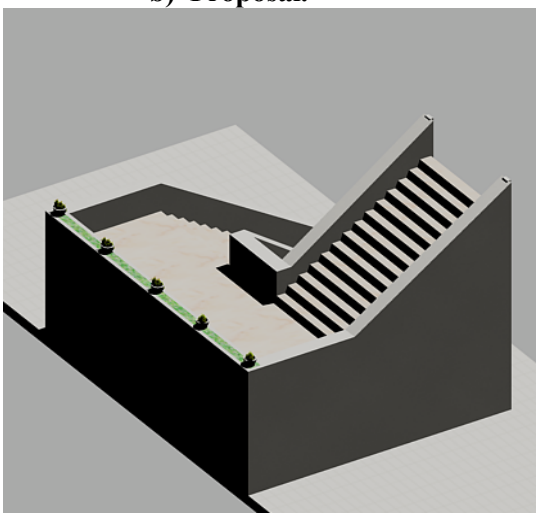
The strategic integration of ornamental plantings with these architectural elements, as illustrated in Figure 1, offers a twofold benefit. Firstly, it allows for a practical increase in the overall green space ratio (achieving 3 square meters per person in this instance). Secondly, by incorporating greenery within the built environment itself, it fosters a psychological sense of calm and stress reduction for students, faculty, and all university personnel.

a) Current state.



b) Proposal.

a) Current state.



b) Proposal.

Figure 1. Some ideas for greening architectural elements.

Given the ephemeral nature of flower blooms, our focus should shift towards architectural elements that provide a suitable framework for a variety of plant selections. These elements could include balustrades, staircases, baskets, and others (Figure n° 02). Examples of well-suited plant choices include agaves, aloes, acanthus, pittosporum, yuccas, *prickly pear cacti*, and various other cacti species.

The overarching goal for the green spaces at the Second University Pole is to cultivate an environment that fosters relaxation, tranquility, and a sense of calm. However, it should also accommodate focused work and meditative practices for the dedicated student body.

To achieve this multifaceted objective, designated areas incorporating pergolas and arbors can be established. These structures, when overgrown with climbing plants such as jasmine, climbing roses, clematis, honeysuckle, and wisteria (*Glycine spp.*), can offer inviting shaded retreats. Additionally, groupings of two to four trees (*plane*, *black locust* [Robinia], ash, etc.) can be strategically placed to provide further dappled shade. These areas can be further enhanced with the inclusion of benches and tables, creating ideal settings for outdoor reading and studying.

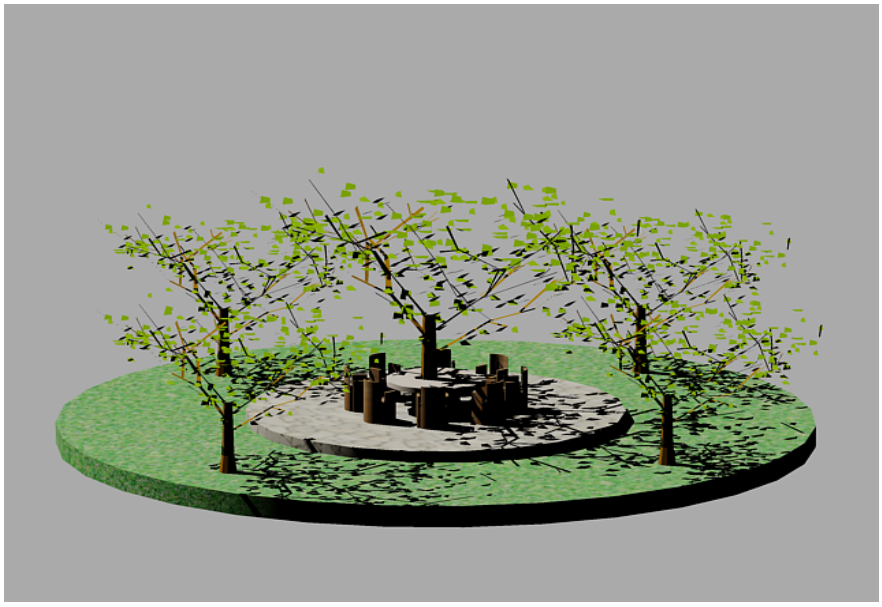


Figure 2. Ideal for working and reading outdoors.

II.3 Tree symbolism.

Trees frequently hold significant symbolic value within the collective memory of various cultures, weaving themselves into the fabric of myths and legends. Their enduring presence is further reflected in their prominent place within religious, poetic, and literary symbolism. For instance, the slender and elegant horizontal form of the Provence cypress (*Cupressus sempervirens f. horizontalis*) is still widely known as the "Tree of Friendship." Due to its symbolic significance, this species would be most effectively employed in a few carefully selected locations.

The olive tree, with its rich symbolism representing wisdom, peace, and strength, would be a particularly fitting choice for the main entrance of the Second University Pole. Similarly, the willow tree, traditionally associated with poetic and literary inspiration, could be strategically incorporated near the entrance of the Faculty of Letters, perhaps in the form of a small grove. The inclusion of the apple tree, symbolizing life and knowledge, should also be considered. When laden with fruit, it would serve not only as a symbolic reminder but also as a visually striking aesthetic element.

II.4 A few recommendations.

To ensure the establishment success of a plantation, meticulous selection of plant species and consistent monitoring over several years are paramount. This ongoing monitoring is most effective and appropriate when accompanied by a well-defined distribution and coordination of tasks between the planting company and the management department throughout the establishment period. There are two types of monitoring and/or care:

Short-Term Monitoring (2-3 Years): During this critical phase, the planting company often bears the primary responsibility for monitoring. Young trees face intense competition from weeds for vital water and mineral resources. To facilitate robust establishment, maintaining a weed-free zone of at least 1 square meter around each tree is essential. This can be effectively achieved through hoeing around the base of the plant two to three times a year. Hoeing not only removes weeds but also aerates the soil, disrupts capillary rise at the surface, and consequently minimizes water evaporation from the soil.

The application of herbicides is a delicate and potentially hazardous task, requiring strict adherence to recommended dosages, application protocols, and a thorough understanding of the product's intended use. Given the potential risks, such applications should be reserved for specialists. Regular inspection of tree ties is crucial to prevent strangulation or injury to the sapling. Over time, these ties need to be adjusted to allow for unimpeded growth.

Medium and Long-Term Care: The management department assumes responsibility for this extended period, which necessitates a skilled and dedicated workforce with specialized knowledge in arboriculture. Maintenance pruning and various other forms of tree care become paramount during this phase. Pruning can be performed throughout most of the year, with the exception of two brief windows corresponding to the tree's physiological shifts (budburst in spring and leaf fall in autumn). The primary objective of training pruning is to establish or maintain a central leader while respecting the tree's overall form and crown structure. Pruning mature trees demands a high level of expertise and necessitates specialized training in arboriculture.

Conclusion.

From a purely visual and physical perspective, landscape can be defined as a space apprehended by an observer at a local scale, or one that can be encompassed within a single glance. Furthermore, its perception evokes impressions and emotions within the observer, which are influenced by their cultural, historical, social, and individual background. Indeed, a growing consensus among contemporary geographers suggests that landscape is inherently subjective and contingent upon perception.

The green spaces at the Second University Pole (University of Tlemcen) fall within the category of public spaces associated with socio-cultural institutions. The national standard for such spaces mandates a minimum green area of 10 square meters per inhabitant. However, a quantitative inventory conducted in this study revealed a discrepancy, with the current provision at the Second University Pole amounting to only 7 square meters per person. Additionally, a significant portion of the available surface area is occupied by tiling, further diminishing the extent of dedicated green space. Our investigation proposes strategies to increase the overall chlorophyll surface area through both horizontal and vertical landscaping interventions.

The study also identified a limited selection of woody species (18) used for both alignment and ornamental purposes. While a wider variety exists, a noteworthy aspect is the prevalence of exotic plant species introduced for the first time in Tlemcen. This observation is particularly relevant when considering the reservations expressed regarding the winter hardiness of three specific species (*Brachychiton populneus*, *Chorisia speciosa*, and *Erythrina crista-galli*).

The paramount importance of incorporating shade-providing tree species with dense canopies cannot be overstated. These species are crucial for mitigating the sun's intense rays during the June, July, and August months. The concept of the "shade garden" serves as a guiding principle for garden and green space design in Algeria. To this end, we have compiled a list of suitable woody species possessing substantial canopies that effectively create shade.

Furthermore, the symbolic value associated with certain trees was acknowledged, recognizing the cultural significance of this public institution of higher education.

Inadequate tree management practices lead to a cascade of negative consequences. These repercussions can be categorized into economic terms (increased maintenance costs associated with aging or diseased trees), aesthetic considerations (the detrimental impact of dying trees on the landscape), and user safety (elevated risk of falling branches or compromised tree structures).

In conclusion, the essential nature of regular tree care by qualified personnel cannot be overstated. Effective tree care is not a task that can be undertaken haphazardly. Proactive planning of such operations allows for the timely allocation of necessary funding and ensures proper monitoring by trained personnel.

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