



Σχολή Εφαρμοσμένων Τεχνών και Βιώσιμου
Σχεδιασμού

Περιβαλλοντικός Σχεδιασμός για την Αντιμετώπιση της
Κλιματικής Αλλαγής

Διπλωματική Εργασία

«Διερεύνηση της επίδρασης διαφορετικών ειδών βλάστησης κατά
μήκος κεντρικού οδικού δικτύου στο θερμικό περιβάλλον και στην
ποιότητα του αέρα σε μεσογειακή αστική περιοχή»

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Επιβλέπουσα καθηγήτρια: Αρετή Τσέλιου

Αθήνα, Ιούλιος 2026

Η παρούσα εργασία αποτελεί πνευματική ιδιοκτησία της φοιτήτριας («συγγραφέας/δημιουργός») που την εκπόνησε. Στο πλαίσιο της πολιτικής ανοικτής πρόσβασης ο συγγραφέας/δημιουργός εκχωρεί στο ΕΑΠ, μη αποκλειστική άδεια χρήσης του δικαιώματος αναπαραγωγής, προσαρμογής, δημόσιου δανεισμού, παρουσίασης στο κοινό και ψηφιακής διάχυσής τους διεθνώς, σε ηλεκτρονική μορφή και σε οποιοδήποτε μέσο, για διδακτικούς και ερευνητικούς σκοπούς, άνευ ανταλλάγματος και για όλο το χρόνο διάρκειας των δικαιωμάτων πνευματικής ιδιοκτησίας. Η ανοικτή πρόσβαση στο πλήρες κείμενο για μελέτη και ανάγνωση δεν σημαίνει καθ' οιονδήποτε τρόπο παραχώρηση δικαιωμάτων διανοητικής ιδιοκτησίας του συγγραφέα/δημιουργού ούτε επιτρέπει την αναπαραγωγή, αναδημοσίευση, αντιγραφή, αποθήκευση, πώληση, εμπορική χρήση, μετάδοση, διανομή, έκδοση, εκτέλεση, «μεταφόρτωση» (downloading), «ανάρτηση» (uploading), μετάφραση, τροποποίηση με οποιονδήποτε τρόπο, τμηματικά ή περιληπτικά της εργασίας, χωρίς τη ρητή προηγούμενη έγγραφη συναίνεση του συγγραφέα/δημιουργού. Ο συγγραφέας/δημιουργός διατηρεί το σύνολο των ηθικών και περιουσιακών του δικαιωμάτων.

Διερεύνηση της επίδρασης διαφορετικών ειδών βλάστησης κατά
μήκος κεντρικού οδικού δικτύου στο θερμικό περιβάλλον και στην
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Περίληψη

Η αστική θερμική νησίδα και η ατμοσφαιρική ρύπανση αποτελούν δύο φαινόμενα που επικρατούν στις σύγχρονες πόλεις και επιφέρουν αρνητικές επιπτώσεις στην υγεία του ανθρώπου. Το αστικό πράσινο αποτελεί μέσο βελτίωσης των θερμικών συνθηκών και της ποιότητας του αέρα. Στην παρούσα εργασία, εξετάστηκε η επίδραση βλάστησης με διαφορετικές τιμές LAD στις παραπάνω καταστάσεις, σε πόλη με μεσογειακό κλίμα, με τη χρήση του μικροκλιματικού μοντέλου ENVI-met. Εξετάστηκε η επίδραση των τιμών LAD $0.3\text{m}^2/\text{m}^3$, $2\text{m}^2/\text{m}^3$ και $5\text{m}^2/\text{m}^3$ στο βιοκλιματικό δείκτη UTCI και στη φωτοχημική αντίδραση που συνδέει τους ρύπους NO_2 - O_3 - NO . Βρέθηκε ότι όσο μεγαλύτερη είναι η τιμή του LAD, τόσο βελτιώνεται η θερμική άνεση και μειώνεται η συγκέντρωση του επιβλαβούς τροποσφαιρικού O_3 . Παράλληλα, αυξάνεται η συγκέντρωση του NO_2 , το οποίο ενισχύει την υποβάθμιση της ατμόσφαιρας. Όταν $\text{LAD}=5\text{m}^2/\text{m}^3$, η κατηγορία θερμικής καταπόνησης έφτασε έως και το «μέτριο θερμικό στρες», και σε περιορισμένη έκταση η θερμική καταπόνηση μηδενίστηκε. Το O_3 μειώθηκε έως και 23.54% στο σύνολο της περιοχής. Φαίνεται πως η συγκεκριμένη τιμή LAD συμβάλλει θετικά στα υπάρχοντα ζητήματα, έχοντας τη μεγαλύτερη επίδραση σε σχέση με τις υπόλοιπες τιμές που μελετήθηκαν. Όμως θα πρέπει να εξεταστεί περαιτέρω το μέγεθος της αύξησης της συγκέντρωσης NO_2 , καθώς οι απόλυτες τιμές των συγκεντρώσεων δεν θα πρέπει να ξεπερνούν τα θεσπισμένα από την ΕΕ όρια. Επίσης, παρατηρήθηκε ότι σε δρόμο με προσανατολισμό βορρά-νότου, η επίδραση είναι ισχυρότερη σε σχέση με δρόμο με προσανατολισμό ανατολής-δύσης ή βορειανατολικό-νοτιοδυτικό. Η συνδυαστική μελέτη της επίδρασης της βλάστησης στη θερμική άνεση και την ποιότητα του αέρα έχει σκοπό την επιλογή των βέλτιστων ειδών βλάστησης για τον αστικό ιστό, για τη διαμόρφωση ευνοϊκών συνθηκών για την ανθρώπινη υγεία.

Λέξεις – Κλειδιά

θερμική άνεση, UTCI, ποιότητα αέρα, τροποσφαιρικό όζον, πυκνότητα φυλλικής επιφάνειας (LAD)

Investigation of the impact of different types of vegetation along a major road network on the thermal environment and air quality in a mediterranean urban area

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Abstract

The urban heat island effect and air pollution are two prevalent phenomena in modern cities that have negative impacts on human health. Urban greenery serves as a means of improving thermal conditions and air quality. In this study, the effect of vegetation with different LAD values on the above conditions was examined in a city with a mediterranean climate, using the ENVI-met microclimate model. The impact of LAD values of $0.3 \text{ m}^2/\text{m}^3$, $2 \text{ m}^2/\text{m}^3$, and $5 \text{ m}^2/\text{m}^3$ on the UTCI bioclimatic index and the photochemical reaction linking the pollutants NO_2 , O_3 , and NO was examined. It was found that the higher the LAD value, the greater the improvement in thermal comfort and the decrease of the concentration of harmful tropospheric O_3 . At the same time, the concentration of NO_2 increases, contributing to atmospheric degradation. When $\text{LAD}=5\text{m}^2/\text{m}^3$, the thermal stress category ranged from “moderate thermal stress” to the absence of thermal stress in a limited surface area. O_3 concentration decreased by up to 23.54% across the entire region. It appears that this specific LAD value has a positive impact on the existing issues to a greater extent compared to the rest of the LAD values studied. However, the increase of NO_2 concentration must be further examined, as the absolute concentration values should not exceed the limits established by the EU. It was also observed that on a north-south road, the effect is stronger than on an east-west or northeast-southwest road. The combined study of the effect of vegetation on thermal comfort and air quality aims to the optimal selection of vegetation types for the urban environment for creating favorable conditions for human health.

Keywords

thermal comfort, UTCI, air quality, tropospheric ozone, leaf area density (LAD)

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