❖ ENVIRONMENTAL SUSTAINABILITY AND CIRCULARITY FOR INDUSTRIAL BIO-BASED SYSTEMS

Soil physical properties, infiltration and CO_2 emissions across different land use in an urban area of Zagreb, Croatia

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Abstract
Urbanization unstoppably affects land use diversity in cities. Land use changes increase soil degradation and modify land use characteristics, negatively affecting the soil ecosystem services. These changes are associated with soil quality deterioration, which is often visible through elevated flood risks, and the poor capability of soils to act as CO2 sinks, which threaten human wellbeing and social and economic development. The objective of this work was to assess the effect of land use and soil management practices on urban and peri-urban soils in Zagreb (Croatia). The soil properties studied were bulk density (BD), soil water content (SWC), mean weight diameter (MWD), water-stable aggregates (WSA), infiltration, and CO2 emissions. Eight samples were collected at depths of 0–10 cm in winter, spring, summer, and autumn in 5 different land uses: forests – natural Que rcus robur (FOR), grasslands – semi managed (GRASS), abandoned agricultural land – afforested (AFFOR), cropland (CROP) and a grass-covered apple orchard (ORCH). Land-use and season effects differed significantly ($p < 0.05$) at all studied soil properties. The results showed that SWC was significantly higher in GRASS than in other land uses. Cropland land use had significantly higher compaction (BD) than other land uses, whereas FOR had significantly lower compaction. Significantly higher compaction was noted during the summer than during other seasons. The MWD has the next trend: ORCH>GRASS=AFFOR>CROP>FOR. MWD was significantly higher during the winter due to freezing and thawing processes than in other seasons. FOR showed significantly higher WSA values, while CROP showed significantly lower WSA values than the other land uses. GRASS and FOR land obtained a significantly higher infiltration than CROP, AFFOR, and ORCH. Soil CO2 emissions registered significantly higher values during autumn and spring than in winter. The results show significantly lower CO2 values in CROP land use than in the other areas. Finally, CO2 emissions were significantly higher in GRASS than in other land uses. Such results indicate that land uses with intensive agricultural practices decline soil quality and flood retention capacity in peri-urban areas.