



Urbanization has a positive net effect on soil carbon stocks: modelling outcomes for the Moscow region

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Urbanization is responsible for large environmental changes worldwide. Urbanization was traditionally related to negative environmental impacts, but recent research highlights the potential to store soil carbon (C) in urban areas. The net effect of urbanization on soil C is, however, poorly understood. Negative influences of construction and soil sealing can be compensated by establishing of green areas. We explored possible net effects of future urbanization on soil C-stocks in the Moscow Region. Urbanization was modelled as a function of environmental, socio-economic and neighbourhood factors. This yielded three alternative scenarios: i) including neighbourhood factors; ii) excluding neighbourhood factors and focusing on environmental drivers; and iii) considering the New Moscow Project, establishing 1500km² of new urbanized area following governmental regulation. All three scenarios showed substantial urbanization on 500 to 2000km² former forests and arable lands. Our analysis shows a positive net effect on SOC stocks of 5 to 11 TgC. The highest increase occurred on the less fertile Orthic Podzols and Eutric Podzoluvisols, whereas C-storage in Orthic Luvisols, Luvic Chernozems, Dystric Histosols and Eutric Fluvisols increased less. Subsoil C-stocks were much more affected with an extra 4 to 10 TgC than those in the topsoils. The highest increase of both topsoil and subsoil C stocks occurred in the New Moscow scenario with the highest urbanization. Even when the relatively high uncertainties of the absolute C-values are considered, a clear positive net effect of urbanization on C-stocks is apparent. This highlights the potential of cities to enhance C-storage. This will progressively become more important in the future following the increasing world-wide urbanization.