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Carbon sequestration potential of different land use as nature-based solutions

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Urban areas are responsible for significant part of total global greenhouse gas (GHG) emissions, particularly from housing and transport sectors. To limit climate change, carbon sequestration in several Agriculture, Forestry and Other Land Uses (AFOLU) activities has been recognised by IPCC as a cost-effective mitigation strategy, with potential synergistic effects. The purpose of this study is to find carbon sequestration potential of different land uses, to facilitate the use of nature-based solutions (NBS) to increase carbon storage and/or reduce GHG emissions. This study was done in Stockholm County, Sweden. Stockholm is a region with rapid growth, increasing pressure on land use changes to meet increased demands of a growing population. Using latest available land-use map, carbon sequestration potential values are assigned to each vegetation type and land-use. Areas with less than 30% cover of urban fabric have been included as productive areas in calculations. Development plans for the Stockholm region (RUFS 2050) are used to model the effect of carbon sequestration potential from future land use changes.

Results show that most carbon sequestration potential is given in coniferous and broad-leaved forest, which covers almost 60% of all green infrastructure. A total of roughly 4500 KT CO_2e can be sequestered per year given current land use. Carbon storage potential will be lost annually due to future land-use development, with accelerated losses from 2020 to 2040. Total projected carbon storage loss by 2040 is about 2300 KT CO_2e. By relocating developments from areas with high carbon sequestration potential to areas with lower potential, losses in carbon sequestration potential can be reduced by 64.5%. Rapidly growing urban areas suffer from land-use trade-offs where development needs to be weighted towards other goals, such as climate change mitigation. Urban sprawl areas show significant carbon sequestration potential, although these areas generally have a higher energy demand and emit more GHGs per resident than higher density urban areas. As such, a densification of existing urban areas likely yields a better net environmental performance, if green infrastructures as NBS are maintained. Therefore, strategies to limit development in high emission potential areas and more investment in keeping the green infrastructures are needed in future urban development plans.

Keywords: carbon sequestration potential, carbon sink, climate change mitigation, land use, nature based-solutions