Science for Environment Policy
DG Environment News Alert Service
European Commission

26 April 2012

Carbon storage of urban green space estimated

For the first time, researchers have applied a carbon footprint analysis to calculate carbon sequestration by an urban green space. Their results indicate that urban green space can act as a carbon sink, but its design and maintenance influence the amount stored.

Cities strongly influence the carbon cycle and emit large amounts of CO_2. It is possible to remove atmospheric CO_2 by sequestering it in urban green spaces. As part of the EU PLUREL[1] project, the study adopted a carbon footprint approach to assess the level of sequestration of a recently created green belt in Leipzig, Germany.

The green belt is 2.16 hectares in area and about 600 metres long. It is partly planted with dense blocks of trees and partly open land. The study assessed CO_2 sources and sinks throughout the life cycle of the green belt project, assuming a 50 year lifetime. It did not include carbon involved during the growing of trees in nurseries, or the carbon stored below-ground because there is a lack of consensus on how to estimate these values.

The carbon footprint was estimated according to three life cycle stages: construction, maintenance and storage in trees. Construction emissions were those caused by transporting trees, workers and equipment, as well as emissions from planting. Maintenance emissions arose from pruning, thinning of trees for safety, grass cutting and transporting workers and machinery for maintenance. This includes the removal of dead trees (including transport) which are then turned into wood chips, the transportation of grass clippings to a recycling plant and the clearing of the root zone with a trimmer. There was no fertilization of the site and only irrigation in the case of extreme drought. The amount of carbon stored in the trees themselves was derived from rates of tree growth and mortality. As well as the current green belt design, alternative scenarios were modelled to determine major influences on carbon emissions and inform decision-making.

Emissions from construction were estimated to account for 4.8 tonnes of CO_2 per hectare, mainly from transport (33%) and excavating holes for planting (47%). Emissions from maintenance after 50 years ranged between 2.57 tonnes of CO_2 per hectare (in the case of minimum tree growth and low mortality) and 4.71 tonnes of CO_2 per hectare (in the case of maximum tree growth and high mortality). Greater tree growth and high tree mortality increases emissions because more maintenance is needed for the upkeep of the growing trees and to remove those that have died.

The carbon stored in trees varies with growth and mortality, but maximum growth and low mortality stores large amounts of carbon at 226 tonnes of CO_2 per hectare. Only 38 tonnes of CO_2 per hectare are stored with minimum growth and high mortality.

In total, when the emitted and stored carbon are balanced against each other, the footprint ranged from 29 to 218 tonnes of CO_2 sequestered per hectare depending on level of mortality and tree growth. The study indicated that this amount would increase if there was ground cover that requires no mowing, such as ivy, and an optimum number of trees that require no thinning, and would decrease if the space was an open park design. Lawn without trees would make the green space a source of CO_2.

To put the footprint into perspective, mitigation of all emissions from residents of the local district for 50 years would require a total area of 14,800 hectares, which is roughly 50% of the city area for just 1.5% of the city population.

1. Peri-urban Land Use Relationships - Strategies and Sustainability Assessment Tools for Urban-Rural Linkages (PLUREL) was supported by the European Commission under the Sixth Framework Programme. See: www.plurel.net

Source: Strohbach, M.W., Arnold, E. & Haase, D. (2012) The carbon footprint of urban green space - A life cycle approach. *Landscape & Urban Planning.* 104:220-229.

Contact: strohbach@eco.umass.edu or michael.strohbach@googlemail.com **Theme(s):** Climate change and energy, Urban environments