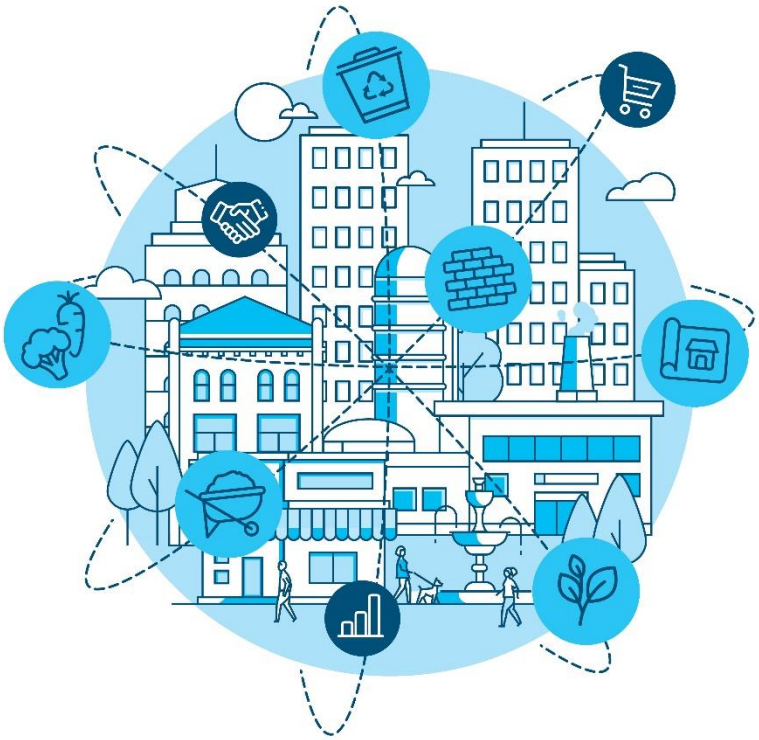
CDW Replication Package 7

Circular soil handling

Capital Region of Denmark | ICLEI Europe



Circular soil handling

Natural soils have important ecosystem functions, including filtering and storage of rainwater, moderation of temperatures, CO2-storage, and hosting of plants and organisms. The environmental and economic impact of excavated soil is massive, as the amounts of soil excavated for construction often surpass the amounts of CDW. However, early soil management and geotechnical investigations can reduce the amount of soil that has to be excavated. Furthermore, if excavated and treated correctly, soil may be used for a wide range of purposes of considerable value. Circular soil handling can replace other raw materials and substantially reduce cost and CO2-emissions compared to transporting truckloads of soil.

This Replication Package enables the identification of possible actions for circular soil handling at different stages of the construction process. It contains a roadmap that supports the implementation of sustainable soil management in the municipality or in a specific construction project; an instrument for predicting future excavated soil production in the municipality within the next 12 years; and a methodology for on-site soil reuse covering both guidelines for sustainable on-site soil management, as well as assessment of reuse potential of the excavated soil. The Replication Package also describes the use of the soil instruments in demonstration actions in Roskilde, Høje-Taastrup and Bodø.

This replication package on Circular soil handling is part of a series of nine replication packages, developed by CityLoops. The replication packages address specific actions within the circular construction value chain and how they relate to the work done in CityLoops. The replication packages aim to give cities an in-depth overview of the main elements to consider during each specific step of a circular construction/demolition project. A list of all replication packages can be found here.

Recommendations from lessons learnt

- The tendering of construction projects should include soil balance on-site: It is often possible to dig up less soil and to use the excess soil on-site for multiple purposes, benefitting biodiversity and cutting CO2-emissions and costs for transporting excavated soil.
- To minimize environmental impact, it is important at an early stage of the project planning to consider how earthwork and construction may be adapted to avoid or reduce disturbing, excavating and relocating soil.
- If generation of excavated excess soil cannot be avoided, on-site soil reuse should be maximized. On-site soil reuse will reduce the environmental impact related to transport and ex-site dumping of soil.
- The municipality should evaluate possibilities for soil balance early in urban planning processes, and if needed designate an available nearby storage place.
- The roadmap for soil handling in municipalities (see the instrument described below) creates an overview for municipal management, decision makers and employees by

identifying stakeholders and roles – making it clear to all who is doing what, and making it possible to estimate the workload in meeting the chosen objectives. It makes it easier to pinpoint which departments play the important roles and helps secure knowledge transfer if people leave the project.

- The soil prognosis for urban development areas (see the instrument described below) can calculate the expected amounts of excess soil at an early stage, which makes the developer aware of the issue and makes it possible to start planning for circular soil handling, reducing the amounts being dug up and reusing as much as possible on site.
- Environmental geotechnical analysis at early stages will help the developer decide if soil can replace raw materials, e.g., using on-site soil or gravel as a road base.
- The soil prognosis (see the instrument described below) makes it possible to measure impact of circular soil handling in an urban development area: The actual amounts of soil being excavated and transported can easily be compared to the number in the prognosis, which calculates the expected amounts based on business as usual. A simple calculation will reveal how much soil the developer is able to keep on site. The CO2 calculator (see the instrument described below) will reveal the CO2 emissions saved.
- A great incentive for construction clients for reusing soil are the Danish DGNB criteria, since most points are given for reuse on site, less points are given for keeping soil within a certain distance from the site.
- In one demonstration project in Høje-Taastrup more than 90 % of the otherwise excess soil is being kept on site. The estimated amount of excess soil saved is more than 700.000 tonnes, saving more than 1.000 tonnes of CO2 – and of course a substantial amount of money depending on market prices for transport and soil deposit.

CityLoops instruments

- **Roadmap for sustainable soil management**: The roadmap is a simple interactive diagram to be filled in by the municipality. It can support the implementation of sustainable soil management by providing an overview of strategic objectives of a project, as well as identifying the stakeholders needed to achieve such objectives. The one-pager can be used to plan and support the implementation for a wide range of projects – from strategically anchored efforts to specific projects with concrete objectives. This instrument is available here.
  Bodø has used the roadmap template to make their own soil roadmap, it can be found here (in Norwegian).
- **Guidelines for sustainable soil management and assessment of reuse potential of excavated soils:** The guidelines describe how projects can be adapted to minimize impact on ecosystem functions of soil and, if treated properly, how excavated soils may be used for a wide range of purposes of considerable value. The guide describes approaches for reducing impact on ecosystem functions; maximizing on-site reuse of excavated soil; and local reuse of excavated soil. It furthermore provides an overview

of whether a specific soil type is suitable for a particular purpose. This instrument is available here.

- **Prognosis predicting future excavated soil production**: This instrument can be used to predict how much soil will be excavated in relation to construction works and urban development in a city for the next 12 years. It can be used for strategic planning at a territorial scale, or in the project planning phase for a particular construction or demolition site. This instrument is available here.
- **CO2 calculator for soil:** This instrument calculates the CO2 emissions from depositing soil or reusing it locally, thus making it easy to estimate CO2 reductions from local soil reuse. This instrument is available here.

CityLoops demonstration experiences

- **Høje-Taastrup - Circular soil handling in urban development areas**: In the area Nærheden, the developer managed to keep approximately 90% of the excess soil on-site. In another project, soil from the construction of the new city hall was used locally in Taastrupgaard. Høje-Taastrup developed and tested the prognosis for excess soil, interviewed stakeholders about barriers to soil reuse and helped develop the guidelines for soil reuse, which are now being put to use in Urban Development Plans. Read more about Høje-Taastrup's experience here.
- **Roskilde - Circular soil handling in the Musicon area:** In Roskilde circular soil handling was established in the demonstration action in Musicon. Roskilde also developed and tested the prognosis for excess soil, interviewed stakeholders about barriers to soil reuse and helped develop the guidelines for soil reuse, which are now being put to use in Urban Development Plans. Read more about Roskilde's experience here.
- **Apeldoorn - Open air soil and sand depots**: The municipality of Apeldoorn runs local open-air soil and sand depots where soil and sand are being collected, processed, inspected, labelled, and even put on display. Quantities and qualities of soil are offered and requested by actors in the construction industry, and are registered by the municipality. It is experienced that much of the soil offered to the depot of Apeldoorn is often of a better quality than expected. Read about Apeldoorn's experience here.

CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and bio-waste, where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and bio-waste, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821033.