

OPERATIONALIZING REGIONAL CIRCULARITY:
BEST PRACTICES FROM TURKU

LAYING THE FOUNDATIONS OF A CIRCULAR CONSTRUCTION INDUSTRY



Buildings and construction consume half of the world's natural resources and about 40 percent of the world's energy. The sector also accounts for about a third of global greenhouse gas emissions. Finland's national government is calling for a reduction in construction emissions by 40 per cent by 2030, and for carbon neutrality by 2050¹.

The city of Turku is eager to develop circular construction innovations to decrease the lifecycle impacts of buildings and infrastructures and complement its carbon neutrality strategy. An area of importance for the city is the valorization of land masses, such as clean surplus masses, mildly contaminated lands and dredged materials. This case study explores how Turku is piloting a landmasses valorization project for local reuse in new earthworks.

CONTEXT

Rural-urban migration and continued urban growth will require future built environment expansion in Turku. The city of Turku is currently a part of the 6Aika national strategy, which supports cities (Helsinki, Espoo, Vantaa, Tampere, Turku and Oulu) in Finland

to advance sustainable development. Within 6Aika, Turku is involved in the CircVol project, which focuses on finding circular solutions for industrial side-streams. Anticipating the need for future residential construction, Turku is developing a solution that recycles local

landmasses and industrial byproducts to create a locally adapted circular earthworks material that could lay the foundation of the envisioned residential district Lauttaranta.

¹ Finnish Ministry of the Environment (2019) "Climate-friendly construction requires swift action". Press release, 25 September 2019. Accessible via: https://www.ym.fi/en-US/Latest_News/Press_Releases/Minister_Mikkonen_appeals_to_the_interior_51763



KEY ACTORS

The CircVol project in Turku is led by Turku Science Park Ltd., a subsidiary of the city, with support from Turku University of Applied Sciences and Åbo Akademi University. The project partners also collaborate with local regional actors specifically the city of Turku, the Turku Port Authority as well as industrial companies and local building and construction SMEs, especially earthwork experts. The wider CircVol Project includes several other national partners and is supported by the European Commission.

ACTION

The focus of the CircVol project in Turku is to create an innovative circular solution for unused landmasses, specifically clay from Turku's port that is dredged during maintenance.

The dredged clay is stabilized using industrial side-stream materials such as ash and wasted gypsum. The industrial side-stream inputs are sourced from a number of industrial factories in Turku and the surrounding region. Data collection for the project commenced in 2018 with lab and field tests taking place in 2019 and 2020.

This circular clay-based material developed by the CircVol project can be used as an alternative solution for part of the estimated 100 million tonnes of rock materials needed across Finland for construction. Adoption of this solution would limit the need for virgin material extraction as well as increase the use of local materials rather than carbon-intensive imports.

Lab tests conducted by the project's research partners ensured that the fortified material meets strict environmental standards. Results

show that the material is not soluble and is considerably cleaner than the separate input components. The re-use of the clay and industrial byproducts also ensures that these materials can be re-valORIZED to generate economic and material benefits for Turku-based businesses rather than being dumped in landfill sites. An additional circular aspect of this project is that most of the material is sourced within a 50 kilometer radius of the city of Turku – substantially reducing transport costs and related emissions.

The aim would be to use the fortified circular clay material to lay strong foundations for the development of the Lauttaranta district. 500.000 cubic meters of earthwork materials would be needed to raise the area by 2,5 meters to avoid flooding and prepare for sea level rise caused by natural variations and climate change.



SUCCESS FACTORS

- A **systemic approach to the construction value chain**, based on the reuse of multiple, locally sourced side-streams, yields environmental co-benefits and cost savings across different sectors.
- **Multi-stakeholder collaboration across the value chain** is contributing to building an ecosystem of public, research and technical actors working together on circular construction solutions in Finland. The findings of the CircVol pilot are being circulated by the Association of Southwest Finland who are using their network to educate diverse stakeholders on the opportunities of using circular materials rather than virgin resources.
- The CircVol project is being developed with **replicability** in mind. Reusing waste earth materials for construction can also be replicated in other regions, provided pre-

feasibility research and testing on the specificities of local materials used is undertaken.

IMPACTS

- **GHG emission reduction:** The revalorization of recycled landmasses and industrial materials for construction promises to decrease the need for virgin extracted material for new construction projects in the Turku region, which holds substantial opportunities for GHG emission reduction compared to traditional practices.
- **Biodiversity:** Before finding a circular use, most of the dredged clay material was dumped back into the sea near the city. While the dumped material met environmental standards, the dumping activities increased the murkiness of the water and impacted ecological balances for coastal and marine life in Turku.

- **Cost savings:** If initiative continues to be successful, the stabilized clay material developed in the CircVol project will be used for developing the new residential Lauttaranta district, generating substantial economic opportunities for the building and construction industry in the Turku region. The CircVol project estimates that this circular construction solution would save the city of Turku 7 million euro in overall economic costs. In addition, project stakeholders are confident that the project and earthworks costs could easily be recouped through the sale of land for development in Lauttaranta. Finally, the reuse of side-streams is expected to decrease waste management costs of materials that would normally have been dumped in landfill sites.



NEXT STEPS

The project in Lauttaranta is currently in the pre-construction phase waiting for an environmental permit before land preparation and earthworks can commence. The project has a long development timeline and is currently due to be completed in 2030. CirVol partners also recognize that once the permit has been granted, there will be a need to encourage increased citizen awareness and participation in the district's development.

