

CITY without SAND

A material conscious approach for the urban construction metabolism of sand and gravel in the Rijnmond-Drechtsteden region

Urban development is accompanied with resource depletion and environmental impact of the Earth's ecosystem, with sand and gravel as the most consumed construction materials. Urban development is a major driver behind this consumption which is a challenge in regions, such as the Rijnmond-Drechtsteden, that have both a housing/urban development demand and a circular ambition.

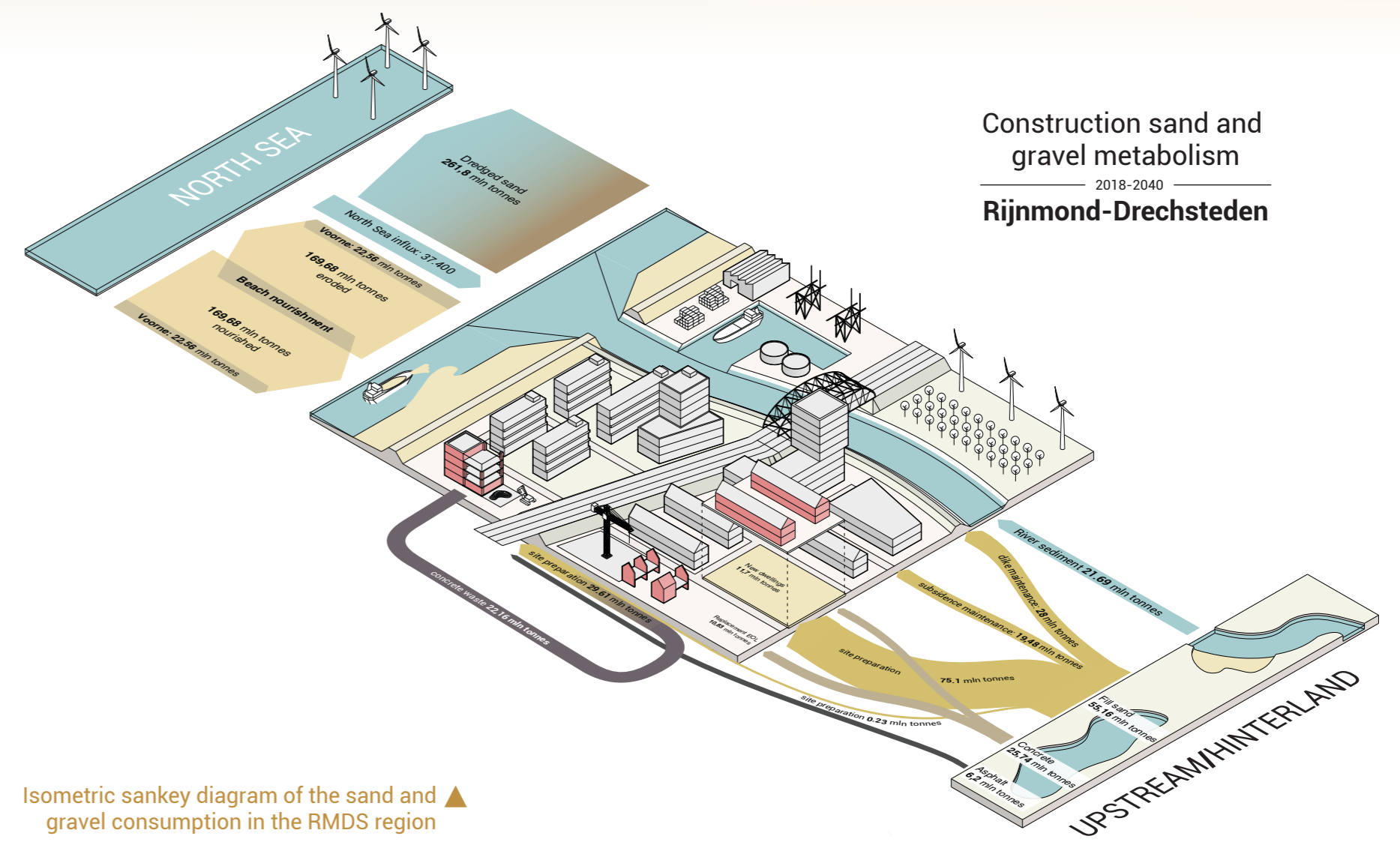
Within the Dutch context, sand and gravel are important for the construction of the urban environment in order to secure its durability, accessibility and safety. The construction ecosystem has certain conditions which drives the consumption

The research aims to find ways to reduce the demand of primary construction sand through urban design.

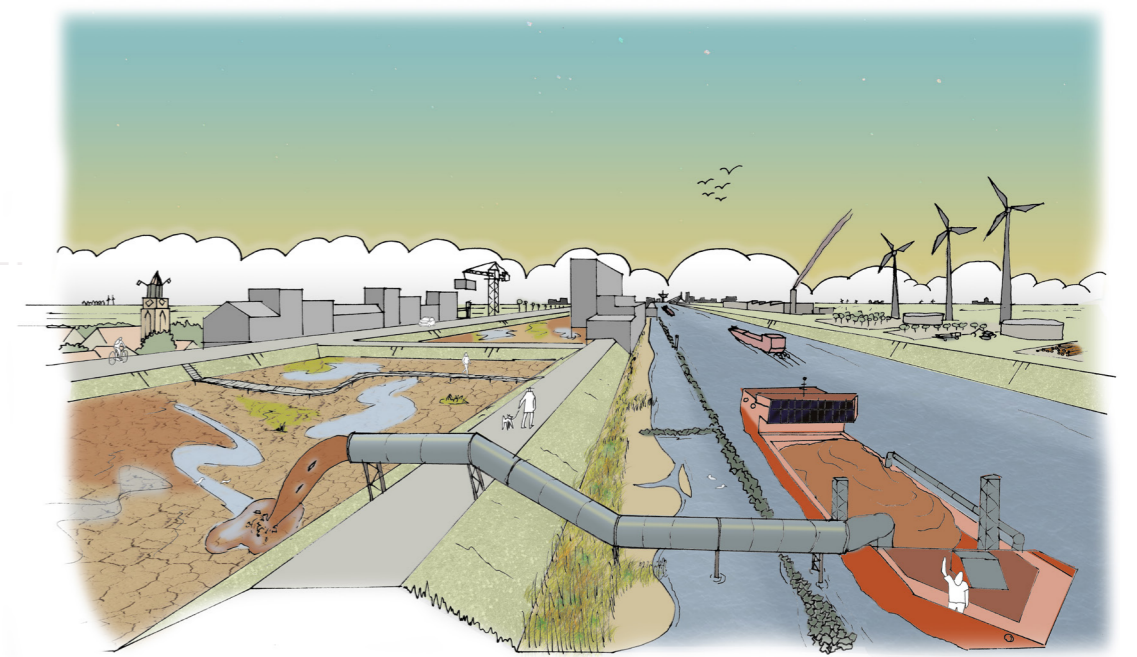
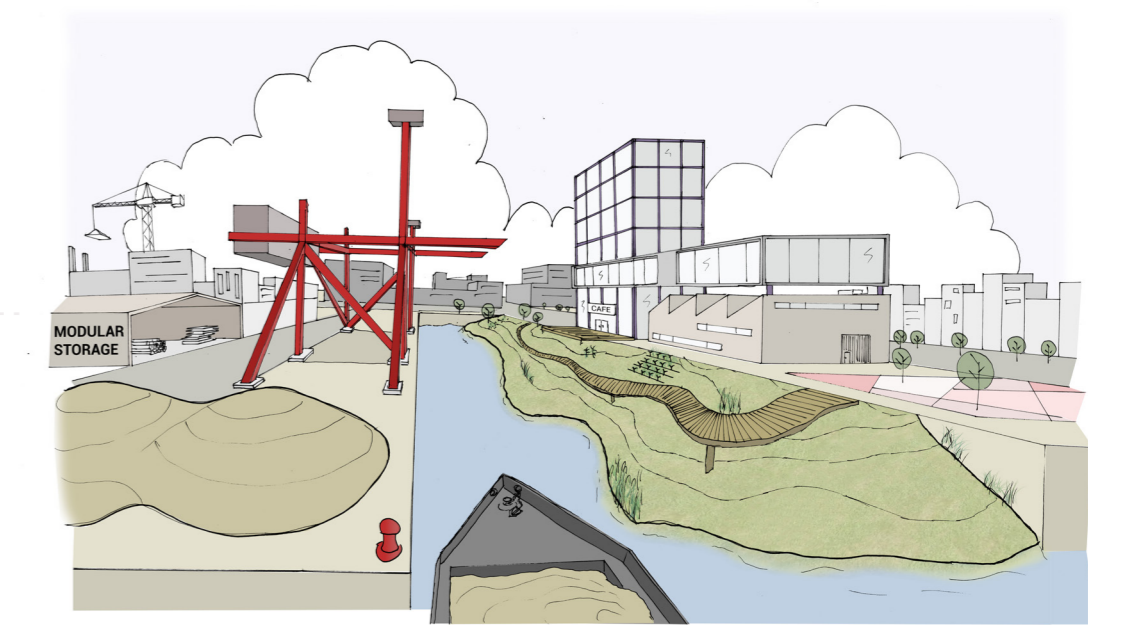
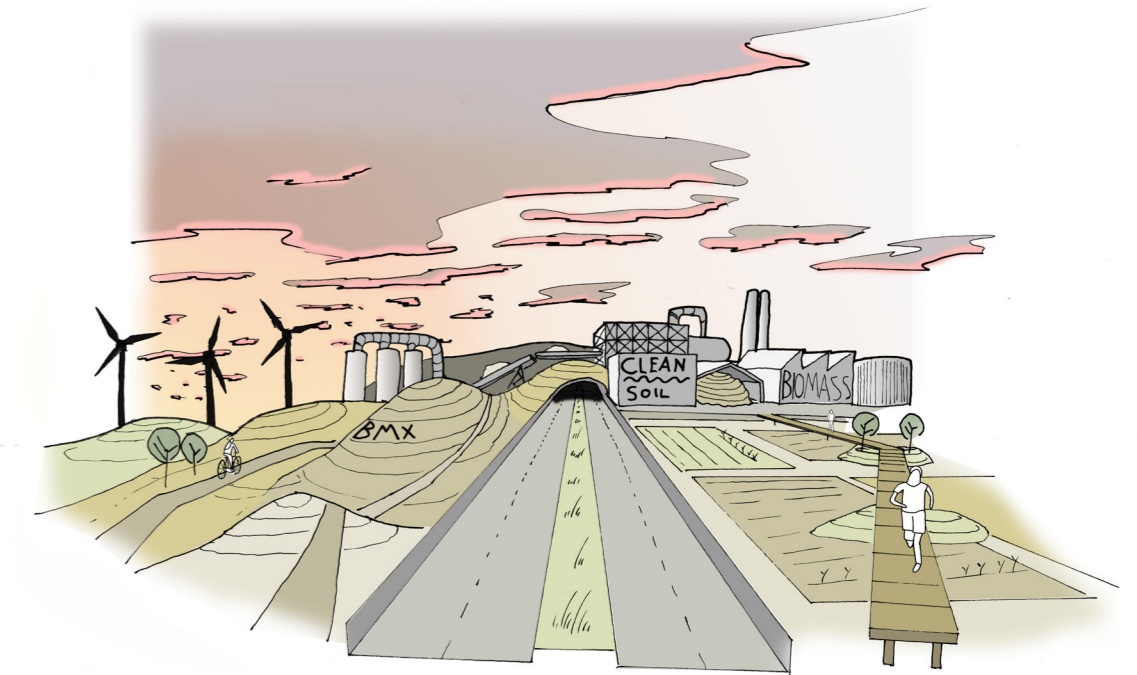
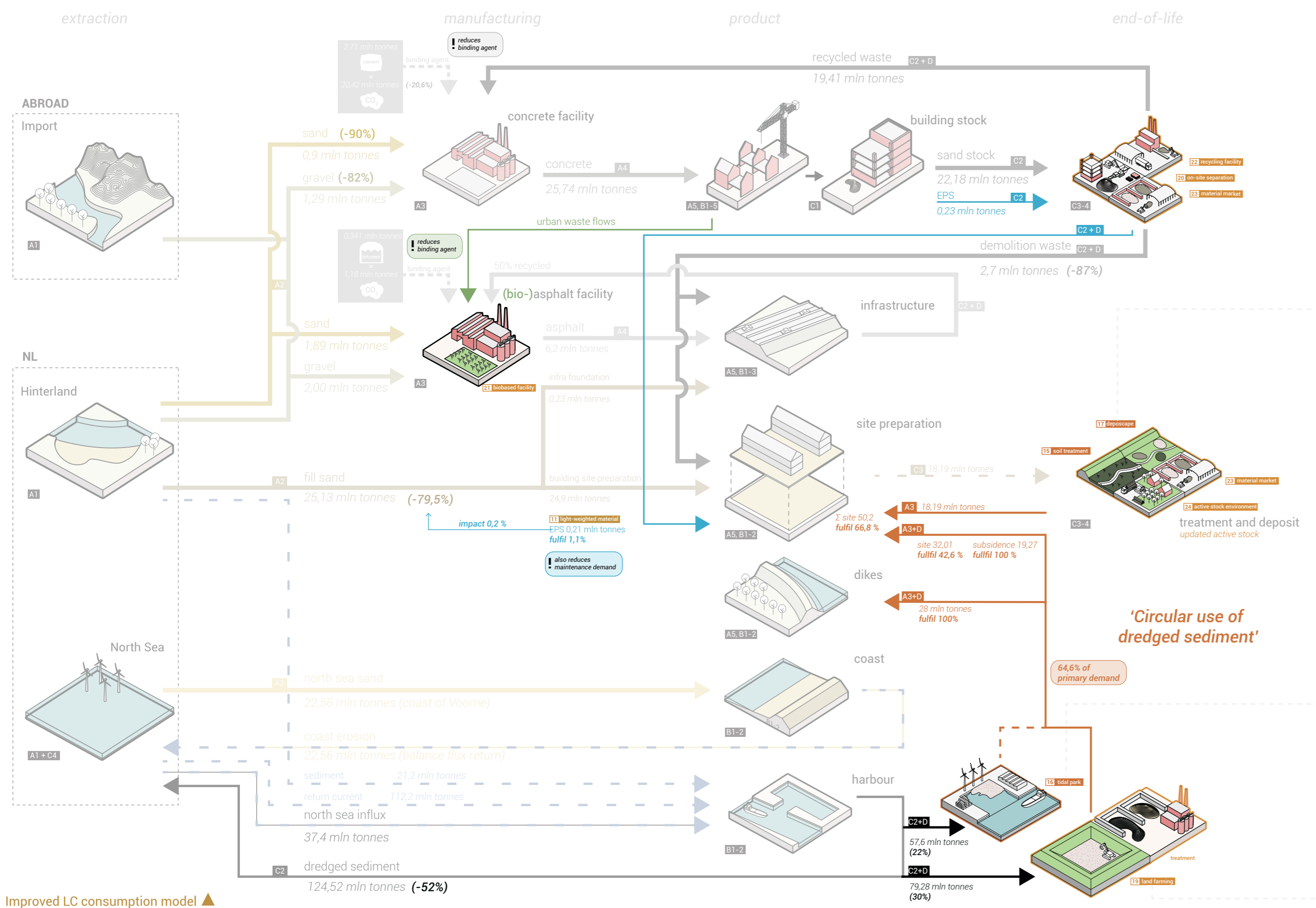
The Rijnmond-Drechtsteden region requires an enormous amount of primary material for the different construction activities but also needs to deal with a high amount of waste material which needs to be integrated in the urban ecosystem.

In order to reduce the material consumption within the sand and gravel metabolism of the Rijnmond-Drechtsteden region, options need to be found in alternatives for the continuous demanding drivers such as fill sand for subsidence and for recycling opportunities of waste flows from dredging or demolition waste, see 'A material conscious approach for urban design' and 'Catalogue of Solutions'.

Overall, Circular sand metabolism is a multi-scalar system where regional demand and supply is embedded in the local urban designs. These improvements require new flows and supplies which results in industrial spatial transformation of environments elsewhere.



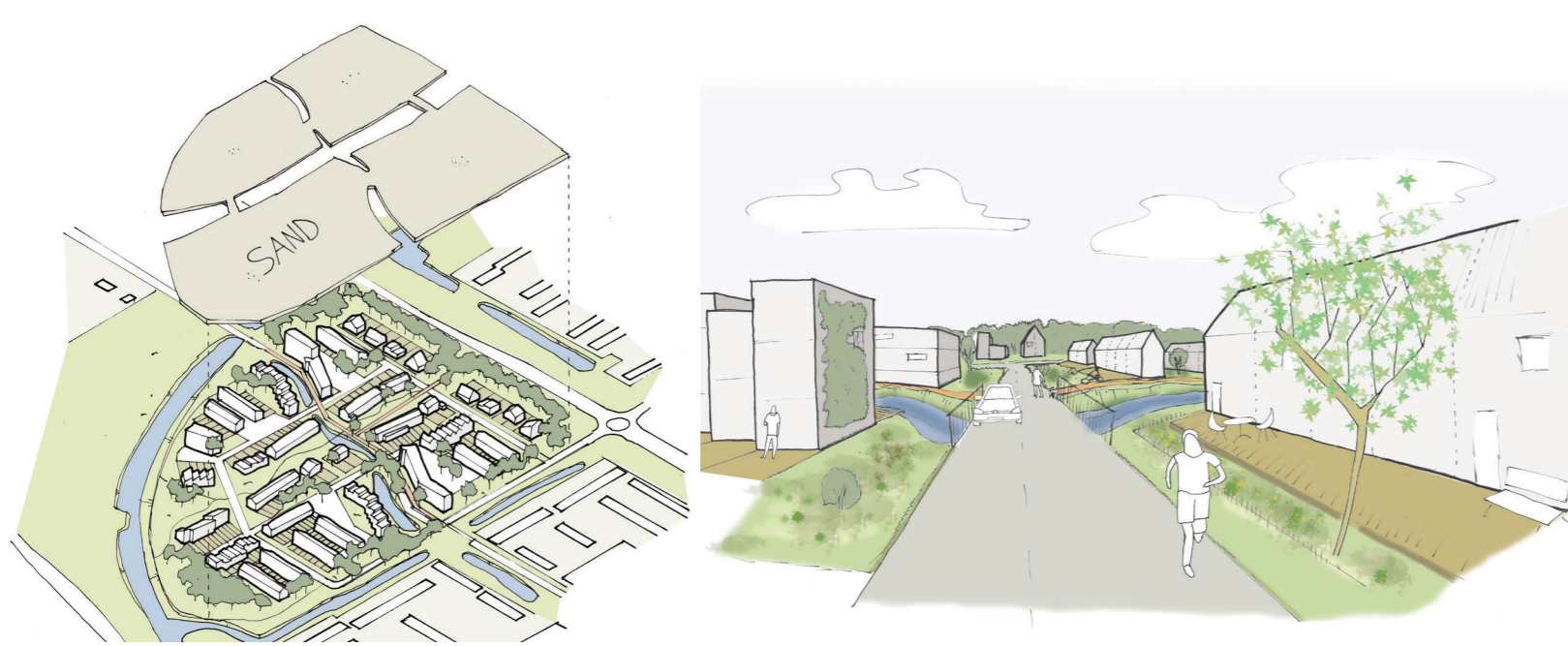
The improved sand metabolism of the Rijnmond-Drechtsteden Region



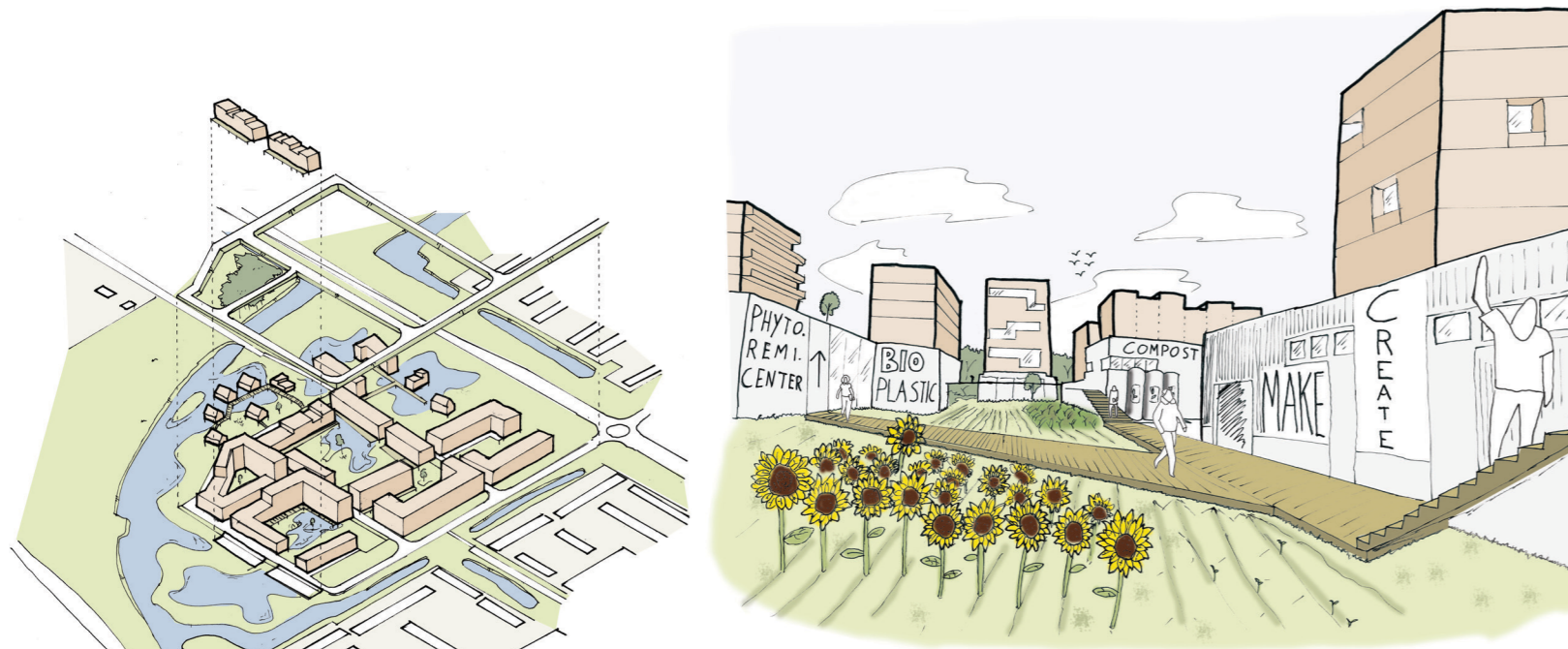
Impression of production scapes

A material conscious approach for urban design

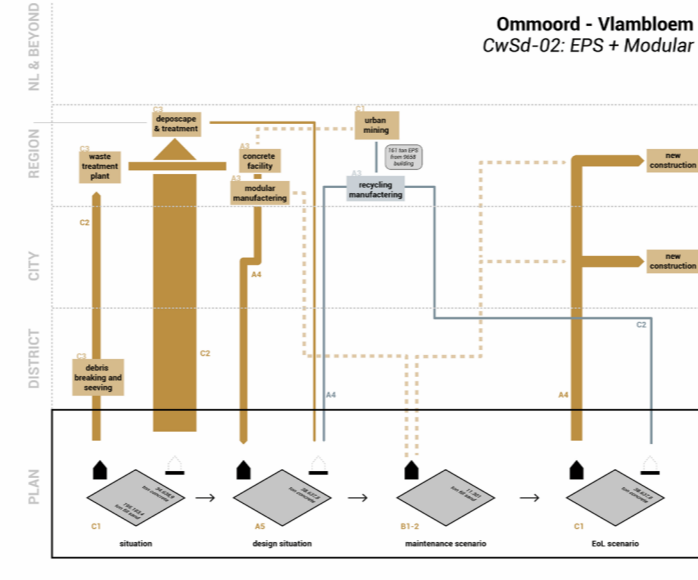
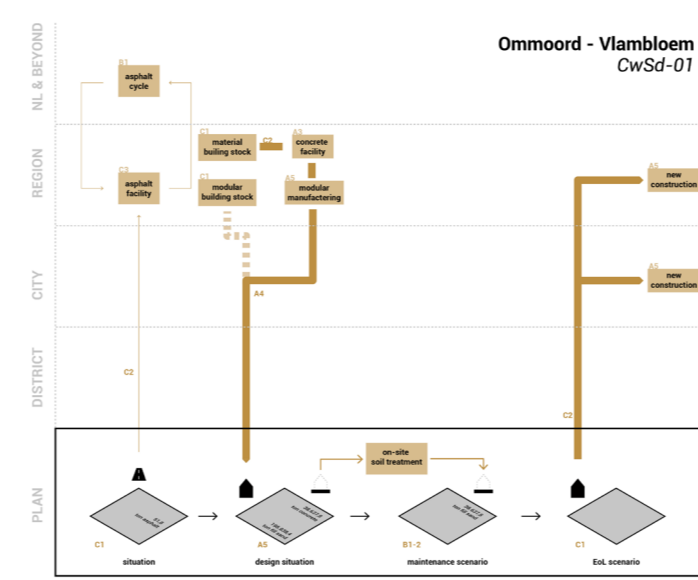
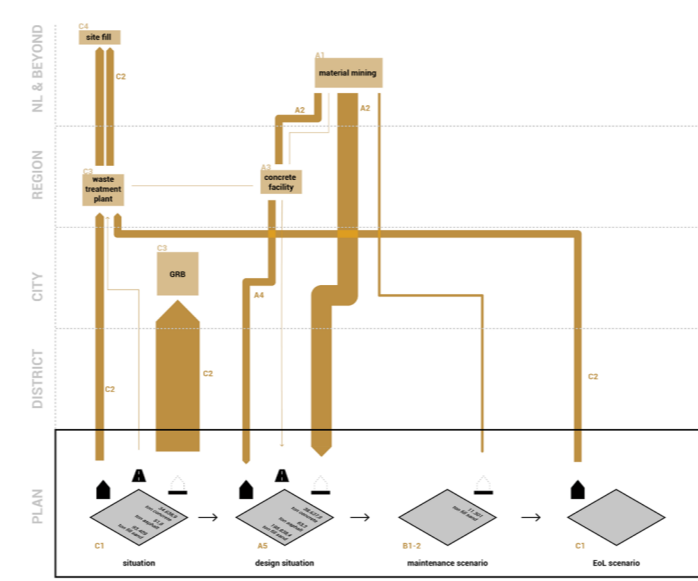
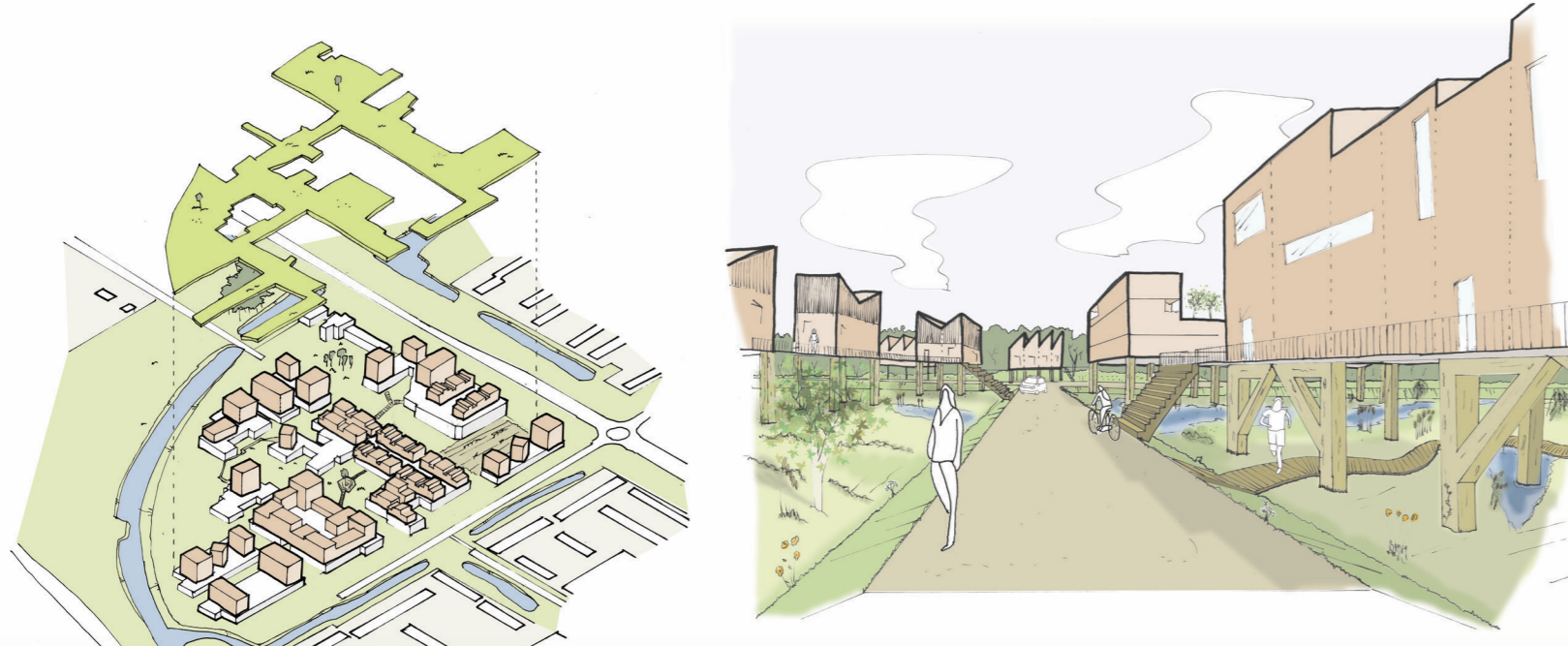
Business as usual



Improved design: 01

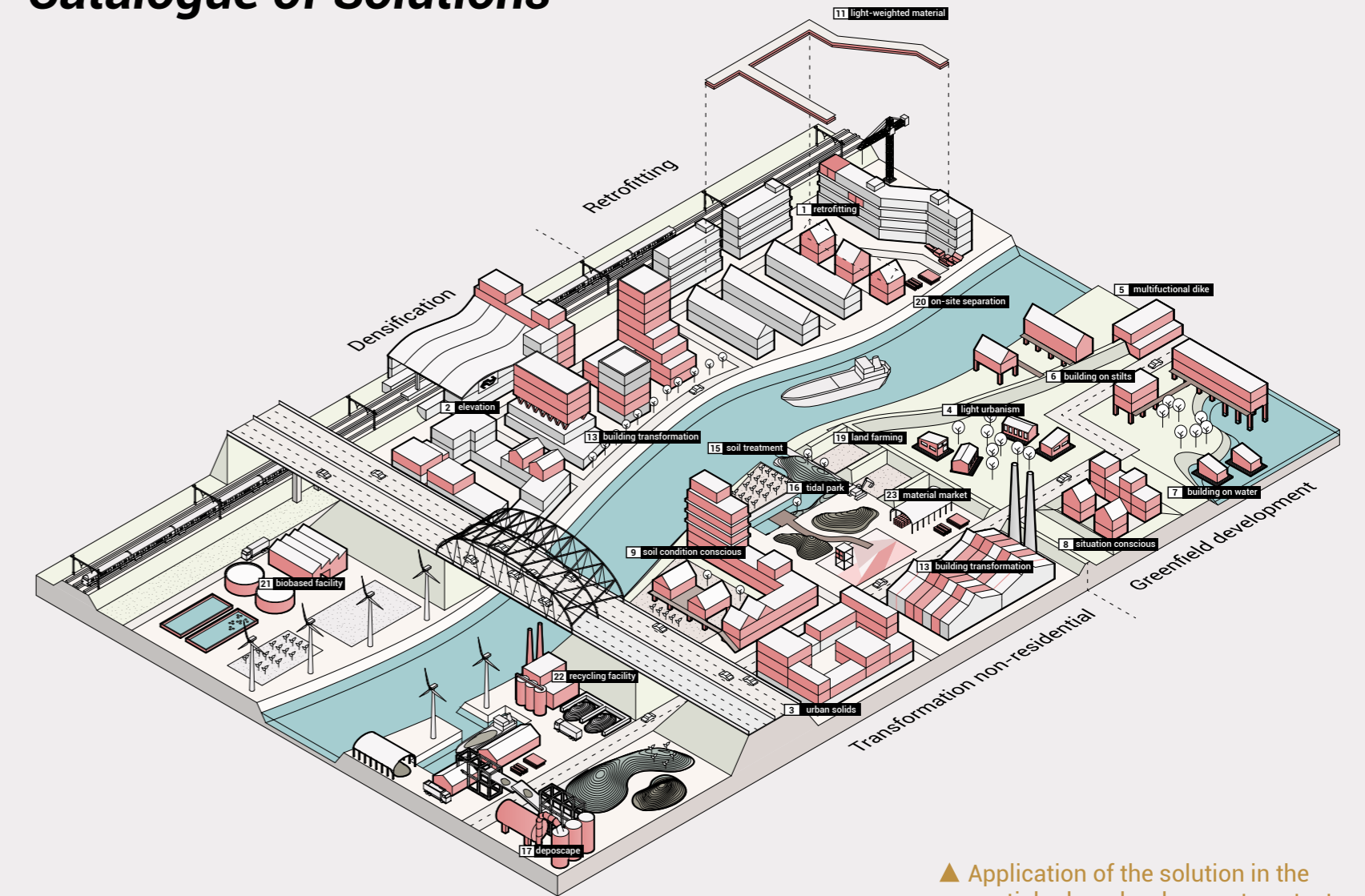


Improved design: 02



Examples of material conscious design approach
Examples of sand-sensitive solutions

Catalogue of Solutions



Material conscious approach for urban design integrates the four stages of a construction process from the life-cycle perspective (situation, construction, maintenance and end-of-life) with its related material consumption for each construction where the material efficiency strategies will be applied on; prevention, reuse, recycle. A crucial tool is the TM-LCA scheme which clarifies the material consumption of a design.

Spatial intervention regarding material consciousness are integrated in the Catalogue of Solutions where each intervention contributes to a material efficiency strategy within the construction ecosystem. These intervention relate to the conditions within the sand and gravel metabolism

The designs seek to reduce material demand, reuse structures or recycle material through spatial solutions where each design option has an different spatial, systematic and environmental impact.