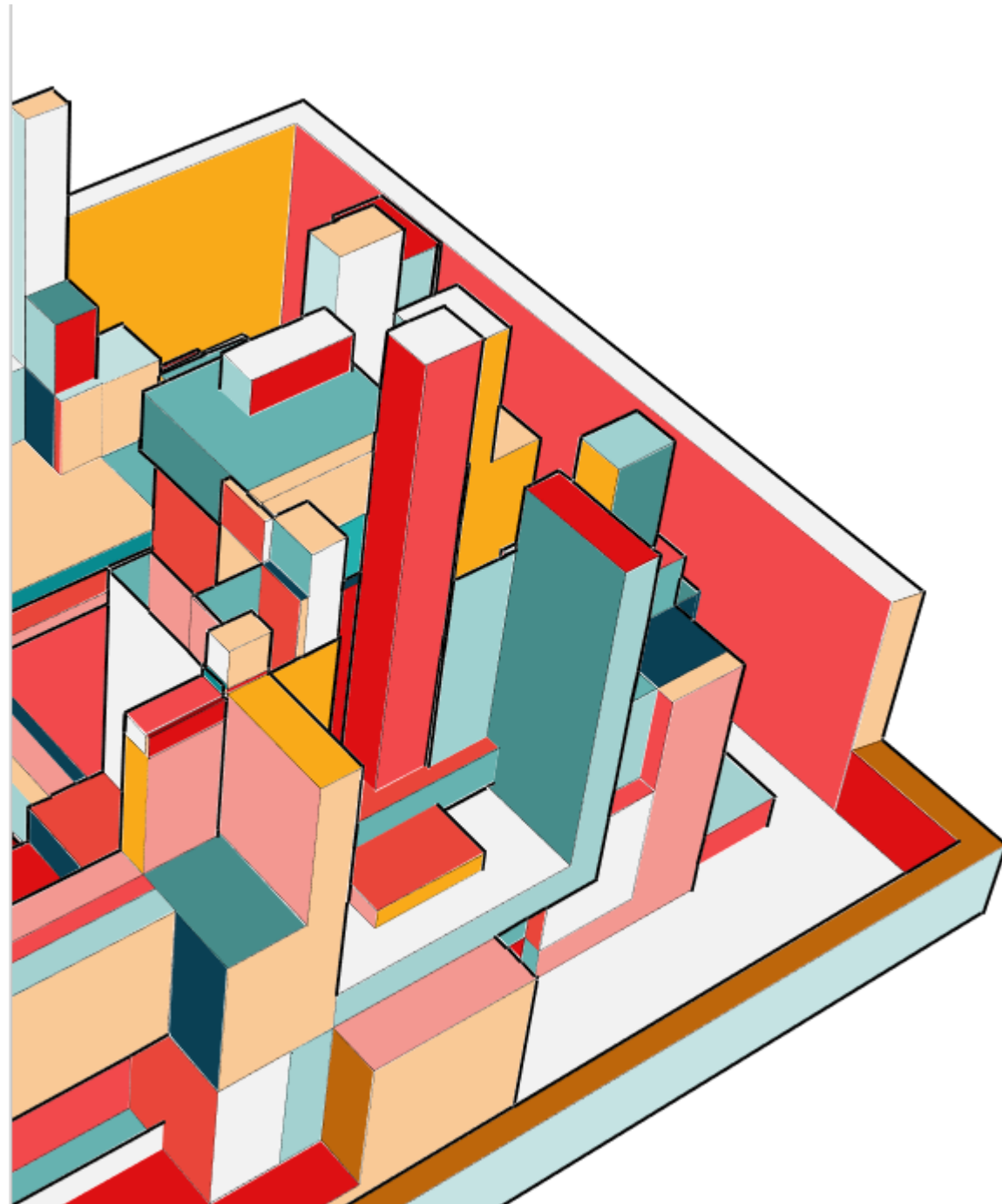


Challenges and opportunities for material reuse in the construction & demolition industry in Zuid-Holland and the role of Blockchain



Introduction and research relevance: More than 50% of the global population is currently located in urban areas. The Netherlands is among the countries with the highest population density. In 2017, 80% of its population was living in urban areas. By 2050 the Netherlands will need between 300'000 and 1.6 million new homes. Construction & demolition (C&D) is characterized as a resource-intensive industry and among the largest consumer of natural resources. This industry generates 50% of the total waste produced on earth. From this perspective, the C&D industry is a significant contributor to sustainability and will be a key industry to transition towards circular economy (CE) principles. The Netherlands has set very ambitious circularity targets for this industry. The Government's Real Estate Agency and Rijkswaterstraat must become fully circular by 2030. Circularity principles address the entire life-cycle of goods and resources, including waste management practices. The objective is to keep resources within closed loops and at their highest level of utility without losing their technical and economic integrity. As of now, 88% of waste generated yearly by the Dutch C&D industry is currently down-cycled for road backfilling purposes, 1-3% is currently reused or up-cycled for high-value practices and the remaining is incinerated.

Research approach: The objective of this study is to identify the challenges characterizing recovery and reuse practices in the C&D industry in Zuid-Holland and make a preliminary assessment on whether Blockchain (DLT and Smart contracts technologies) can be suitable for addressing them. The methods employed for conducting this study blend desk research with qualitative research (semi-structured interviews) and employ a decision-making framework to assess the use of Blockchain technology.

Results and Conclusions: The results indicate that the materials and construction elements considered more interesting by the market concerning reuse and recovery are **bricks, steel profiles** and **window/door frames**. The decision-making process driving their reuse and recovery is company-specific and differs significantly across firms. In general, the data required for assessing the feasibility of reuse and recovery for construction elements are:

-> Material composition of new and old buildings -> Supply-and-demand specific information (volume and timing) -> Technical specification -> Quality-related data as well as market prices.

Challenges characterizing reuse and recovery practices identified through this research are:

- 1) Construction and demolition activities and asset management practices are asynchronous and separated by large time gaps.
- 2) Data management practices are inconsistent and not harmonized or standardized among companies.
- 3) Digital asset management tools (such as BIM), are employed by large companies only and their use on a national scale is neither standardized nor compulsory.
- 4) Accuracy and reliability of data for driving decision-making are poor. Intra-project and intra-firm data sharing are therefore not possible.

A Blockchain system which integrates smart contracts and distributed-ledger-technology (DLT) can partly address and tackle these issues. To address them fully, however, Blockchain technology must be combined with an asset management tool like BIM for making the solution consistent and scalable at an industry level which in turn requires the implementation of national and industry-wide data management protocols and standards that would harmonize the collection, management and distribution of data across the C&D industry. The Netherlands, unlike other EU member states, has, at this point, no government-driven digitalization strategy in place and is rather opting for a market-driven transition.

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