METABOLIC

City of Amsterdam

Copper8

Circular building hubs

The circular tool box

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After reading this article, you will:

- Learn the definition of a construction hub
- Understand a construction hub's different purposes
- Understand construction hubs' main role in reusing materials
- Know how municipalities can use construction hubs to achieve circular objectives for reuse

Summary

For a successful transition to a circular construction economy, one important challenge is organizing efficient logistics for the processing and reuse of secondary materials. Supply and demand do not always match time, location, quantity, and quality. This problem has sparked interest in developing physical sites where secondary materials supply and demand come together at construction hubs.

Construction hubs have a variety of purposes. As logistics hubs, they serve the construction process as a logistics point outside the city to store and distribute products. They act as a storage point for materials or as a collection and trading point for released and leftover materials from individual construction projects and construction companies, including upcycling and processing so that materials are ready for a new purpose. This physical infrastructure also includes digital infrastructure, such as digital marketplaces that bring together the supply and demand of circular building materials. Municipalities can conduct a leading role (as initiator) in the development of construction hubs and a facilitating one (by making space available). Numerous pilots will test the added value, usefulness, and necessity of construction hubs in the future.

Definition:

"Construction hubs are a way to better organize flows of goods between parties. This leads to fewer transport movements and therefore less congestion and better air quality in the city or region. Materials come together here, are checked and temporarily stored before being bundled and transported to the construction site. (...) Smart use of materials promotes circular construction (and demolition). Possible reuse of materials in local construction projects should be part of the construction logistics schedule. It must be possible to use materials that have become available elsewhere, but locally and quickly. Otherwise, upgrading waste streams won't be worthwhile." (TNO)

(TNO)

Recommendations

- Always explore the need for a construction hub by existing processes and parties that focus on reusing materials. After all, a construction hub is a means and not an end in and of itself. Perhaps storage, transfer, and processing of materials can also be facilitated via the current chain.

- A physical construction hub will always have to align with the digital organization of information flows that assess the quality of materials, where and when they become available, and where they can be reused (for example, through a digital marketplace).

- Regarding furniture discarded on the street and other materials and objects from the public space, the municipality uses its own construction hubs, together with additional adjustments to municipal processes, aimed at further facilitating the reuse of materials.

- The municipality can support construction hubs initiated and managed by the market by finding a location to operate.

- Continuing to learn from existing and planned construction hub initiatives is a vital way to gain experience in organizing an optimal hub and to ascertain the added value of construction hubs in different contexts.

Substantive deepening

The purposes of construction hubs

Physical construction hubs can be roughly divided into three forms:

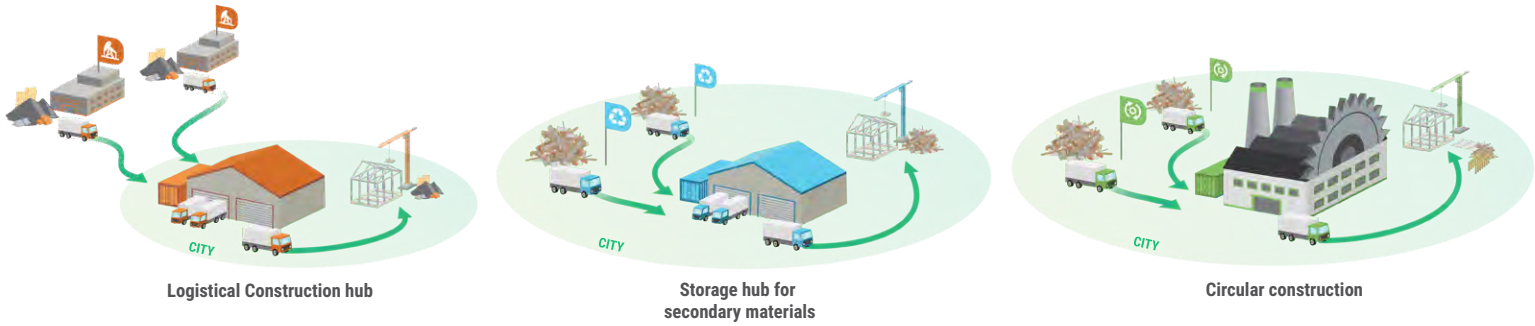
1. The best-known and most-used type of hub is the construction logistics hub, which serves as a logistics point outside the city for the storage and distribution of construction products to serve the construction process. Experience has shown that this type of hub provides an efficient supply to the construction site which in turn leads to cost savings. However, its primary purpose does not always align with circularity principles, because it does not focus on the supply logistics of secondary materials. The Amsterdam Construction Hub is one example.
2. The second type of hub serves as a storage hub for secondary materials. Since materials are in general not immediately repurposed, or because project schedules do not match, they need to be temporarily stored. This can be somewhere within or outside the city. Examples of this in Amsterdam are the Materiaalbureau at Theemsweg and De TOP/ Noodstort.
3. The third type, the circular construction hub, is a collection and trading place for released and leftover materials from individual construction projects and construction companies. Here, the materials are upcycled and prepared for a new purpose. The future Amsterdam Logistics City Hub is an example of a circular construction hub.

The dividing lines between these three purposes is not strictly defined and can partly be combined in different formats. In addition to its primary purposes, a hub can also develop other secondary activities, for example, Amsterdam Logistics City Hub is also planning to prefabricate products and offer smart logistics for both equipment and construction site workers. Other secondary activities can include setting up and maintaining a physical store for secondary materials, or providing space for exhibitions, demonstrations, and visitor centers that fulfill an educational role. It is important to remember that a construction hub and its purposes are a means and not an end, and that they must serve the needs of the regional construction chain.

The synergy between digital support for physical hubs

Physical infrastructure is crucial in order to match materials made available with a construction project requiring secondary materials elsewhere, in terms of transport and delivery, storage, and possible processing. But the digital network supporting construction hubs is equally important, detailing information about where materials become available, the condition of the materials, and a possible match in material quality and planning. Ideally, the most pragmatic match between supply and demand of secondary materials would of course be when materials are transported from the demolished structure directly to its new destination, without the intervention of storage at a hub (or stored as briefly as possible).

Figure 1: Illustration of the three types of construction hubs



Such optimal matching is only possible with insight into a material's properties (for example with a Materials Passport), an overview as to when and where these will be released, and whether these will be made available through a digital marketplace (for example on Oogstkaart and Insert). This can create a synergy in the coordination between supply and demand through digital marketplaces and even between temporary storage and quality assurance through physical construction hubs. An example of this is the digital marketplace for the public space in the Buiksloterham district, which is currently under development. More information about this digital marketplace can be found in the municipality's Approach in Professionalizing the Public Space Circular Method and the Digital Materials Hub. For more information on the role of digital models and reuse marketplaces, see the paper Digitisation in Construction.

Exploration of construction hubs by C-Creators

The C-Creators Foundation is researching how the use of secondary material can be promoted through a construction hub. The report provided the municipality with prospects for action for increasing the supply and demand of secondary material, selecting interesting material flows, the business case, and overall management. As soon as the research has been completed, it will appear on the C-Creators website and the municipality's Open Research Platform.

The municipality as initiator of construction hubs for public spaces

The municipality acts as both client and manager of public spaces and civil and hydraulic engineering projects, and it can direct a significant part of the raw material flows in these sectors. Construction hubs initiated and managed by the municipality are already instrumental in creating material cycles from public spaces and civil and hydraulic engineering projects.

Current hubs, land banks, and recycling centers can be used to temporarily store materials and prepare them for reuse. A suitable site can be designated, whenever there is a need for an additional hub due to capacity shortages in existing hubs or if transport distances are too long.

A location close to the area development projects or urban transformation is favorable to reduce transport distances. In turn, departments such as Space and Sustainability or Engineering can also proactively explore the need for a construction hub in the event of new area development projects or urban transformations.

In the use of a construction hub for public spaces, a number of processes within the municipal organization can contribute to the optimal repurposing of materials and products. The municipality can then gain insight into the materials that will be released as a result of maintenance, refurbishment, and demolition and make these available through, for example, a digital marketplace environment. The next step for the designers of public spaces is to design based on the available materials, after which the actual reuse must be secured in the project specifications. The municipality then has the practical task of inspecting whether released materials meet quality requirements and possibly storing them until they can be used at their new destination, for which a construction hub is ideally suited.

The municipality as a facilitator of construction hubs

In addition to the public space, many area development projects and new construction, along with demolition of residential and non-residential buildings, are taking place in the city as well. The municipality's direct influence on the flows from this sector and the infrastructure required for creating cycles is limited and will mainly be carried out by the market. Nevertheless, we can see that the municipality plays a facilitating role in the development and use of these types of construction hubs. The municipality contribute to the development of a construction hub by assisting in finding available plots at a suitable site.

Case study 1

Concrete Hub, Schiphol Airport

VolkerWessels and Schiphol Airport are jointly establishing a construction hub at the airport to reintroduce into the supply chain materials that become available after demolition, such as asphalt, concrete, metals, and electronic components. Concrete is the largest flow and also the largest financial driver. The installation of a mobile concrete mixing plant on-site minimizes transport distances and costs.

With zero waste as the goal, the high-value reuse of material is not always attainable, but waste is prevented. Since transport distances are significantly reduced by an estimated 15,000 km, this also cuts a great amount of NOx, CO2 and particulate matter. The concrete hub also saves a large amount of time at customs, because there are no material-related formalities to settle.

Noteworthy points:

- Emission reduction through smart hub placement reduces transport distances.
- The savings in the transport of materials (especially concrete) emerges as the biggest financial driver.

Case study 2

Amsterdam Logistics City Hub

The Amsterdam Logistics City Hub is being built at Ankerweg in the Westelijk Havengebied district of Amsterdam, a collaboration between VolkerWessels Bouwmaterieel and Beelen. Of the ten-hectare site, two hectares are designated for the Bouwhub construction hub and will expand at a later stage. The location on the water and near the ring-west motorway eases the transport of material, equipment, and people.

In addition to VolkerWessels and Beelen, all parties, such as builders and suppliers, can use the facilities. The BouwHub coordinator therefore emphasizes that "parties should not compete with each other, but jointly discover a new approach that results in cleaner and safer operations, while reducing the use of primary raw materials". When building materials cannot be reused directly on site, they can be prepared for high-value reuse at the BouwHub construction hub. The collaboration between Beelen and VolkerWessels provides expertise in the field of high-value recycling and the coordination of a logistics center.

Noteworthy points:

- The hub promotes working together on a new approach instead of competing with each other.
- It is managed by parties with experience in a coordinating role and in the reintroduction of materials into the cycle.

Pilots and learning

Experience will have to teach us what the optimal organizational form of a construction hub is and pinpoint its added value. Continuing to experiment and trying things out in practice is essential, as these current programs in Amsterdam demonstrate:

- **De TOP/Noodstort (De Heining) is a land bank and hub for public space located in the Westelijk Havengebied district managed by the Municipality of Amsterdam. At the site, baked pavement stones are cleaned, among other activities.**

- **Materiaalbureau on Theemsweg is a materials hub for Amsterdam's public spaces. This hub is managed by the municipality of Amsterdam.**

- **Bouwhub Amsterdam in the Westelijk Havengebied district provides efficient logistics of new materials to construction sites in the MRA.**

- **The Amsterdam Logistics City Hub in the Westelijk Havengebied district is an initiative of Beelen and VolkerWessels Bouwmaterieel. The hub serves as a logistics center for materials, equipment, and construction site workers.**

- **The digital materials hub in the Buiksloterham district serves as a circular hub for Amsterdam's public spaces.**

Footnotes

1 Amsterdam Logistic City Hub, Building, available at: https://www.amsterdamlogisticcityhub.nl/gebouwinformatie/

2 Vastgoedmarkt (2019), Increasing diversity in city hubs, available via: https://www.vastgoedmarkt.nl/beleggingen/nieuws/2019/12/steeds-meer-verscheidenheid-in-cityhubs-101150058