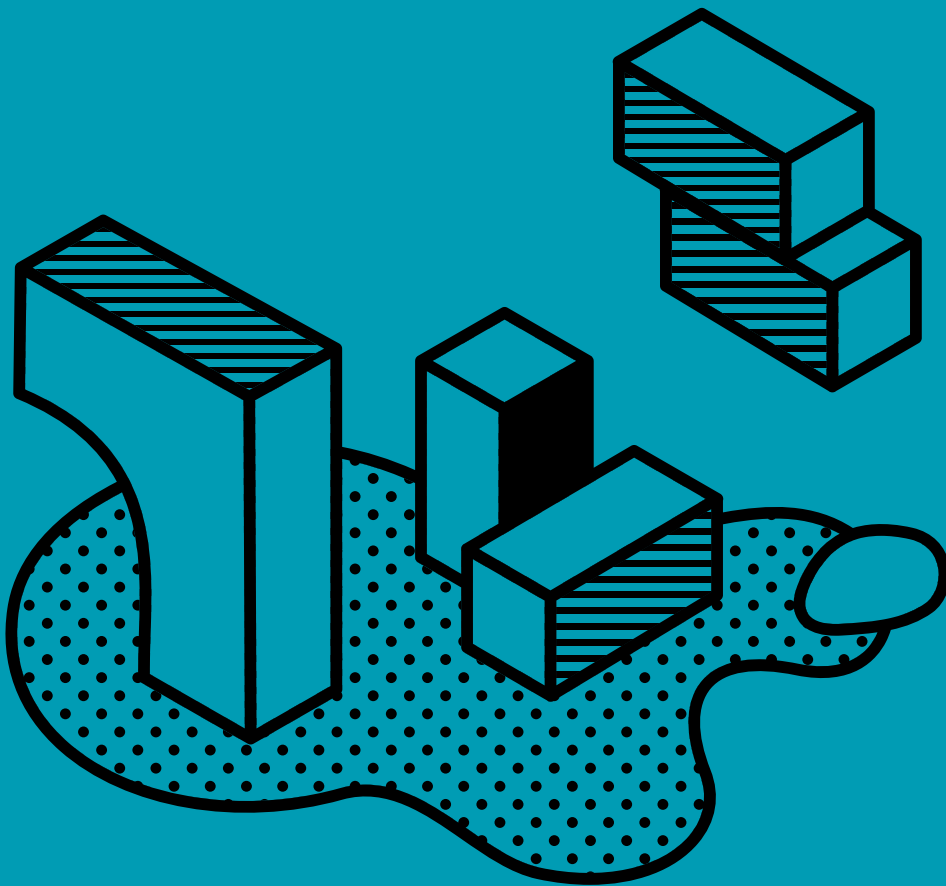


# Designing Brussels Ecosystems

Metrolab Brussels MasterClass II



Bernard Declève  
Geoffrey Grulois  
Roselyne de Lestrangé  
Andrea Bortolotti  
Corentin Sanchez Trenado  
(eds)



Metrolab series

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## Circularity

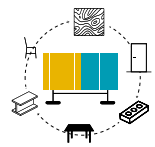
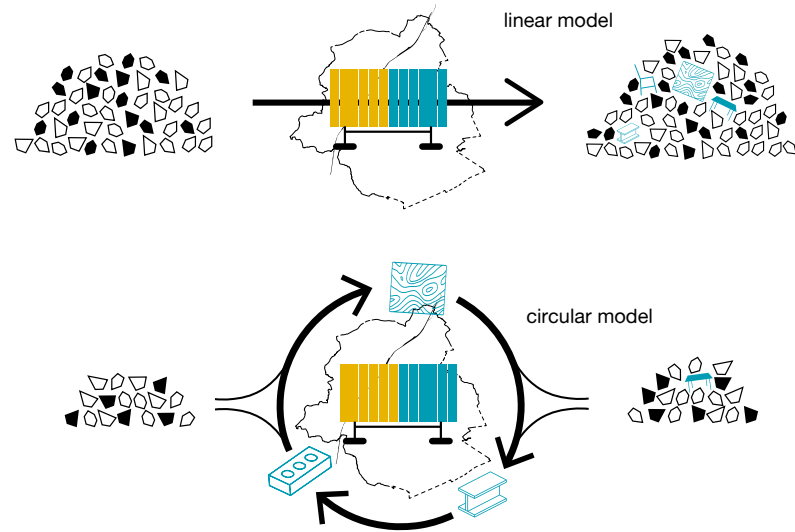
# Territorializing Circular Economy in the construction sector

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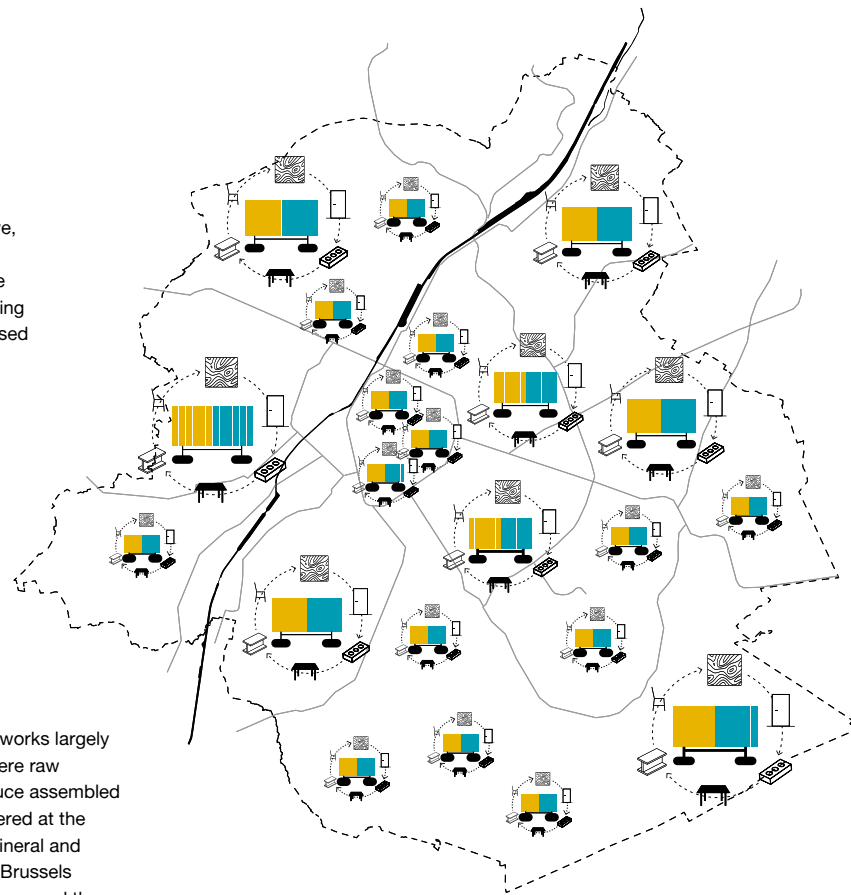
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**2.239**  
Kt/year raw materials  
25% of all incoming flows into  
the Brussels Region

**2.422**  
Kt/year waste  
35% of all outgoing flows from  
the Brussels Capital Region



In a more circular perspective, each construction site can be considered as a mine, the materials of the buildings being dismantled, recycled or re-used



The construction sector still works largely with an economic model where raw materials are mined to produce assembled materials hardly to be recovered at the end of their lifecycle. The 'Mineral and construction' flows entering Brussels represent 2.239 kt/year per year and the waste of it going out of the capital reaches 2.422 kt/year

## Introduction

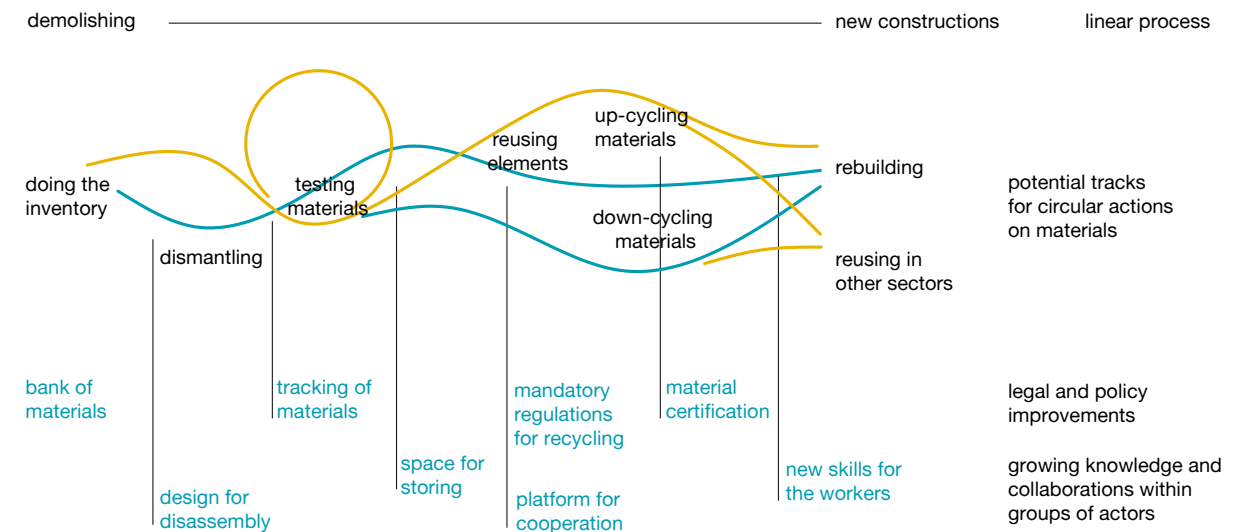
Due to constraints on the availability of resources, it is urgent to move from a linear economy towards a circular model of production and consumption. The many definitions of circular economy (CE) all revolve around the idea of 1) closing material cycles and 2) increasing resource efficiency (Moreau, Sahakian, van Griethuysen and Vuille, 2017). Circular economy is a blooming research topic and policy objective across the world, for instance in Brussels with the PREC. Still, there is a need to assess the effectiveness and impact of CE policies and initiatives at the level of regional ecosystems. There is a risk of CE becoming only a container concept, encompassing various conflicting practices and discourses and making it meaningless in practice. In the traditional linear economy, capital flows are transformed into material flows, seeking profit by building new elements in physical space (Harvey, 1976). As an example following this argument, the demolition of buildings is epitomic of the linear production and consumption economy.

Steering the transition towards a CE, it is vital to look at the management of material flows and the organisation of space and labour in the construction sector. When applying circular strategies in this sector, it should be underscored that circularisation is not a sufficient criterion if the intensity of material flows is not reduced (Arnsperger and Bourg, 2016). In assessing the territorialisation of CE strategies for the construction sector at the regional level, we apply the concept of a hotspot: a physical parameter (urban plot, block, and district) that is key in the spatial organisation of future regional flows (Kampelmann and Athanassiadis, 2018). The scale of this spatial parameter requires an analysis that extends beyond discussing 1) flows of urban metabolism to 2) the spatial structure in which these flows are embedded in, as well as 3) the socio-technical regime that governs them (Broto, Allen and Rapoport, 2012). Controversies surrounding intensity, spatial structure, and socio-technical agency are relevant in the practical context of designing strategies to improve material circularisation in the regional ecosystem (Kampelmann, 2018). A three-dimensional analysis is better for the complexity of implementing CE strategies, which is as much a material issue — related to technical expertise and manual know-how — as it is a governance issue — an ongoing negotiation and creation of new business and governance models. The former requires increased sharing of knowledge across sectors, whereas the latter presumes a shift in the logic underlying these models.

## Ecosystems & situations

We addressed two potential hotspots in Brussels, the Ixelles former Barracks (Usquare) and the Northern Quarter (NQ), whose scale and stakeholders differ. Both sites are planning large-scale reconstruction and regeneration, and are intended to become more vital mixed-used neighbourhoods. Usquare is a publicly managed project, the result of a collaboration between two universities, with the purpose of renovating an early 20th century military complex. It will be developed as a test site for the application of CE in the construction sector. The project translates into an innovative and interconnected cooperation of stakeholders, as opposed to 'closed' independent activities, because stakeholders are trying to cooperate and collaborate at every stage of the process. This means the site has a clear CE strategy and already carries out concrete circular actions. Work on this site is experimental and time consuming, but more materials are reused and recycled. Usquare's relevance lies not so much in quantity of material flows, but in the fact that it is considered a 'niche practice', which is analysed in terms of a governance model, and in how the players interact throughout the design and reconstruction process, in order to steer a transition towards interactions at the scale of the 'socio-technical regime' that is dominated by market parties in the case of the NQ (Geels, 2011). In a context of public supervision and EU funding, there is no business model at Usquare, which can be translated to a model that encourages private players to adopt CE strategies. This is all the more surprising that local experiences such as ROTOR have existed in Brussels since 2000s, proving a capacity to integrate the principles of CE into a local and successful economic model (Ghyoot, Devlieger and Billiet, 2018).

The NQ is a 1960s administrative district consisting in a series of office towers located between the Brussels-North railway station and the Canal. These towers are owned by large private corporations and state-owned enterprises. The strategic location of NQ is characterised by a multiplicity of urban regeneration projects underway in the neighbouring industrial zones. The NQ is more significant in accelerating CE application in terms of quantity of construction materials that will be circulating in the coming years, fuelling new business models and skills. However, the NQ lacks synergies between the timelines of the various construction sites and connections between stakeholders in terms of CE strategies beyond individual sites and real estate properties. Both Usquare and NQ are missing a strong link to a contractor, which is needed to perform a central function not only in the execution, but also in informing the design process and coordinating the creation of the new kind of labour that is needed. Another essential component that is lacking is the cross-sectoral exchange regarding the future purpose of materials beyond the construction site.



An economic transition also involves a transformation of disciplines pertaining to the actors involved in the construction process and their interaction at different stages. There is the need to radically rethink the relationships between actors that are present in the current material economy, from a less individualistic and compartmentalized process towards collaboration between the sectors that perform a part of the process.



Heritage



Inventory

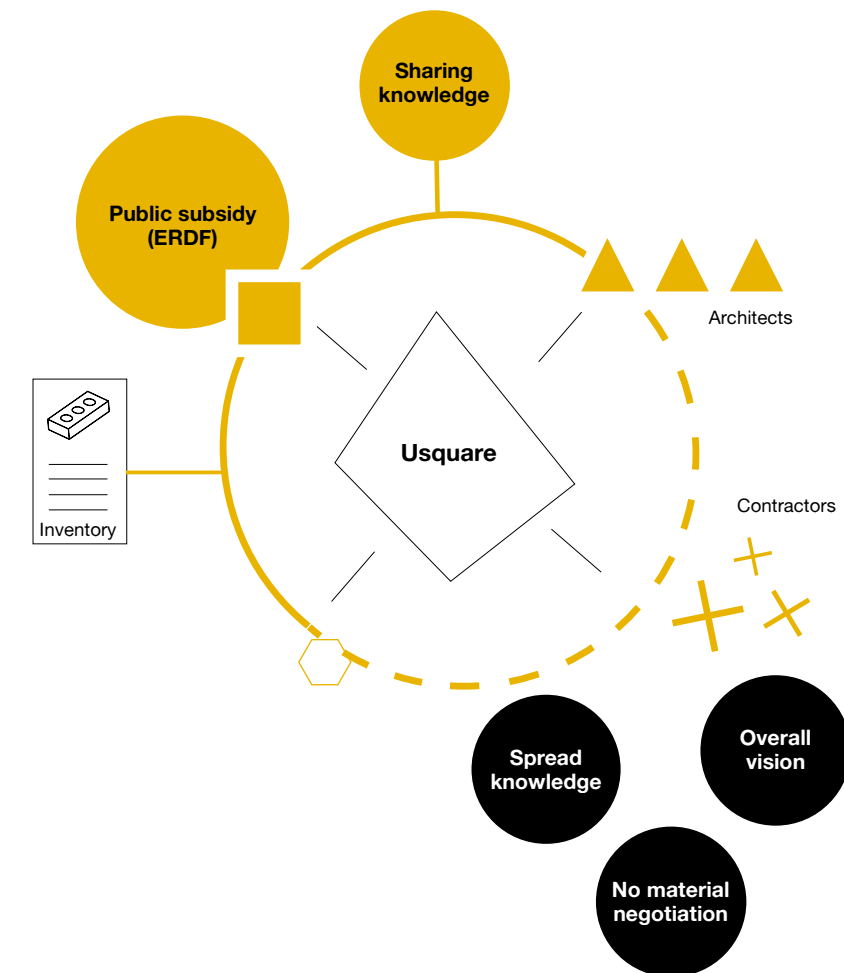


Assortment



Quality

Usquare has a demonstrative value for CE application in construction. Maintenance of buildings is one circular action. For other buildings the regeneration or demolition is preceded by an inventory of all materials, following circular actions in cooperation with industries and contractors. Part of the site is temporarily used as material bank during construction. A significant amount of bricks is reused on site, unusable bricks have influenced architectural design of the staircase using granite made from crushed bricks.



It is important for the application of CE at this site the cohesion of different actors, before execution and designing a plan. Namely, the formulation of a common vision on CE, and clear strategies by the universities, architects and landowners, leading to a back and forth dynamic between the possibilities (circular actions) and the design (plan) made by architectural firms. The three architectural companies – all specialized in a different domain – have worked together on a holistic vision for the site.





Port industry



Vacant space

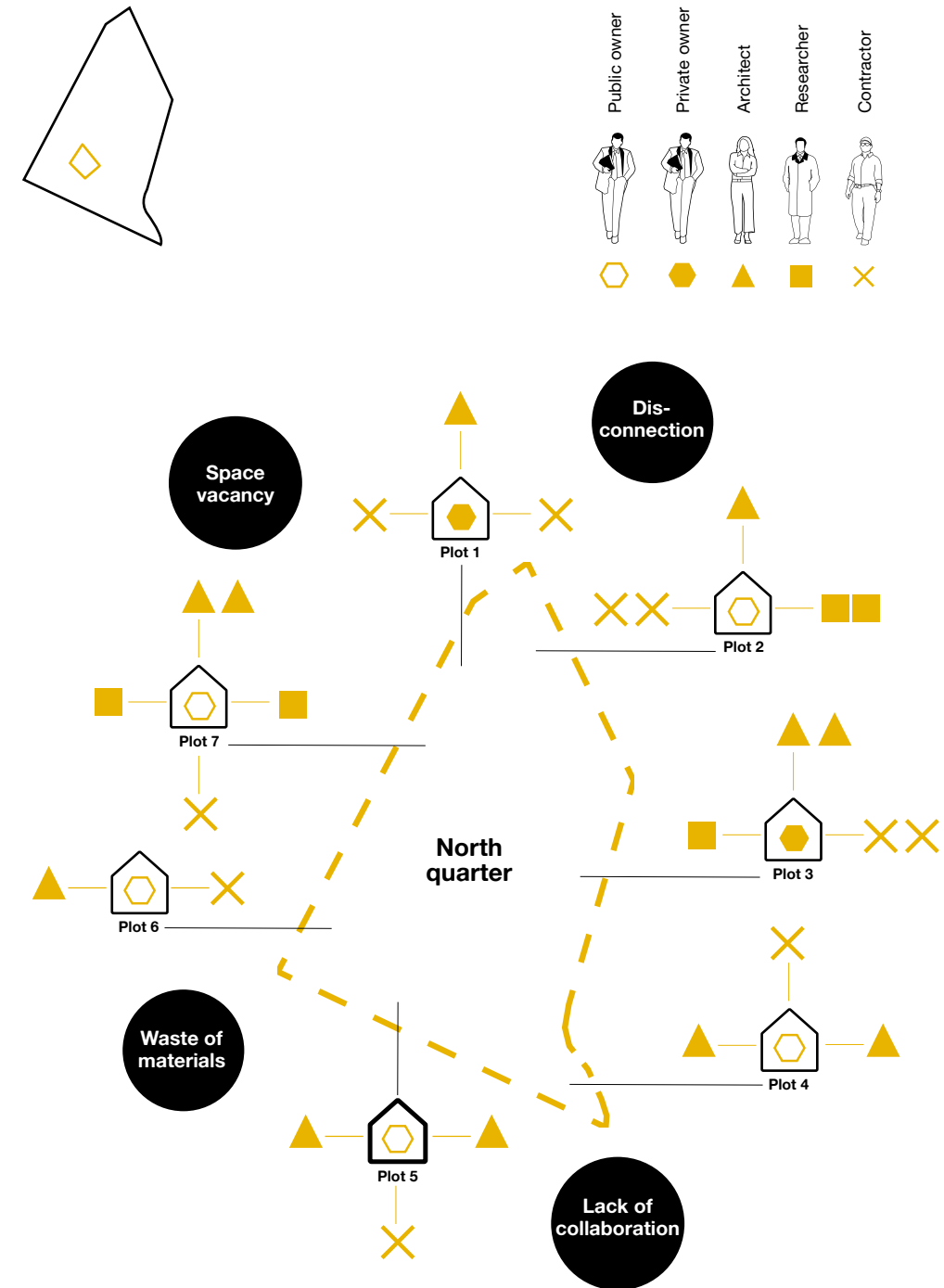


Inadequate storage



City in process

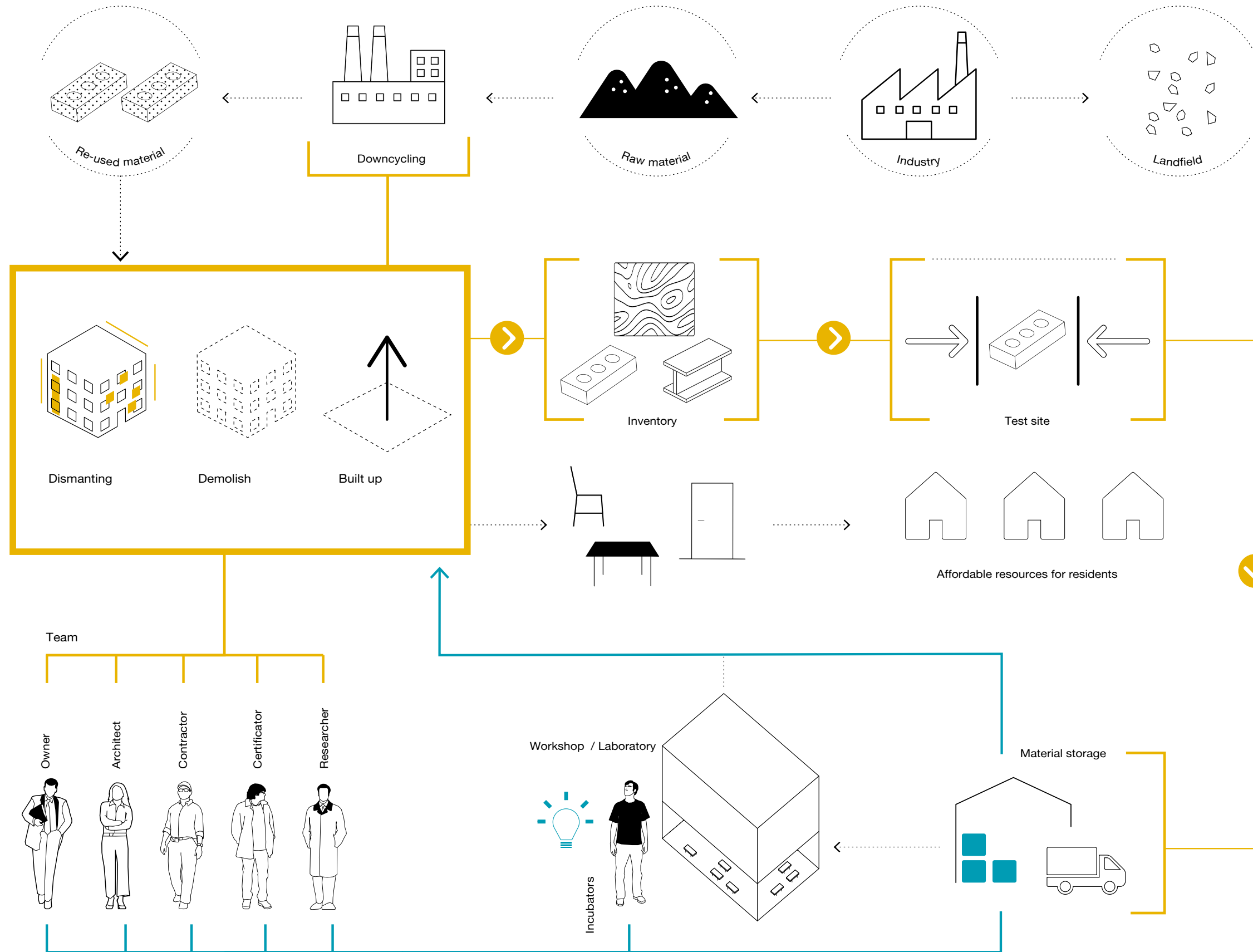
The monofunctional administrative high-rise district – 1.6 million m<sup>2</sup> (618,000 sq. mi.) of offices – with a significant number of vacant offices, poor quality of public spaces and a lack of basic amenities and services at the ground floor underlies the need to rethink the value of this district for the city of Brussels and reinvent its urbanity.



In NQ the regeneration is privately initiated, which increases the complexity of the interaction between stakeholders and decreases the centrality of CE strategies in the planning process. The challenge is the negotiation between landowners, who pursue independent plans for their sites, with different architectural companies. There is willingness to cooperate, exemplified in Up4North, as well as a growing sensitivity to CE, but there is no overarching vision for identifying CE strategies, between the different construction sites.

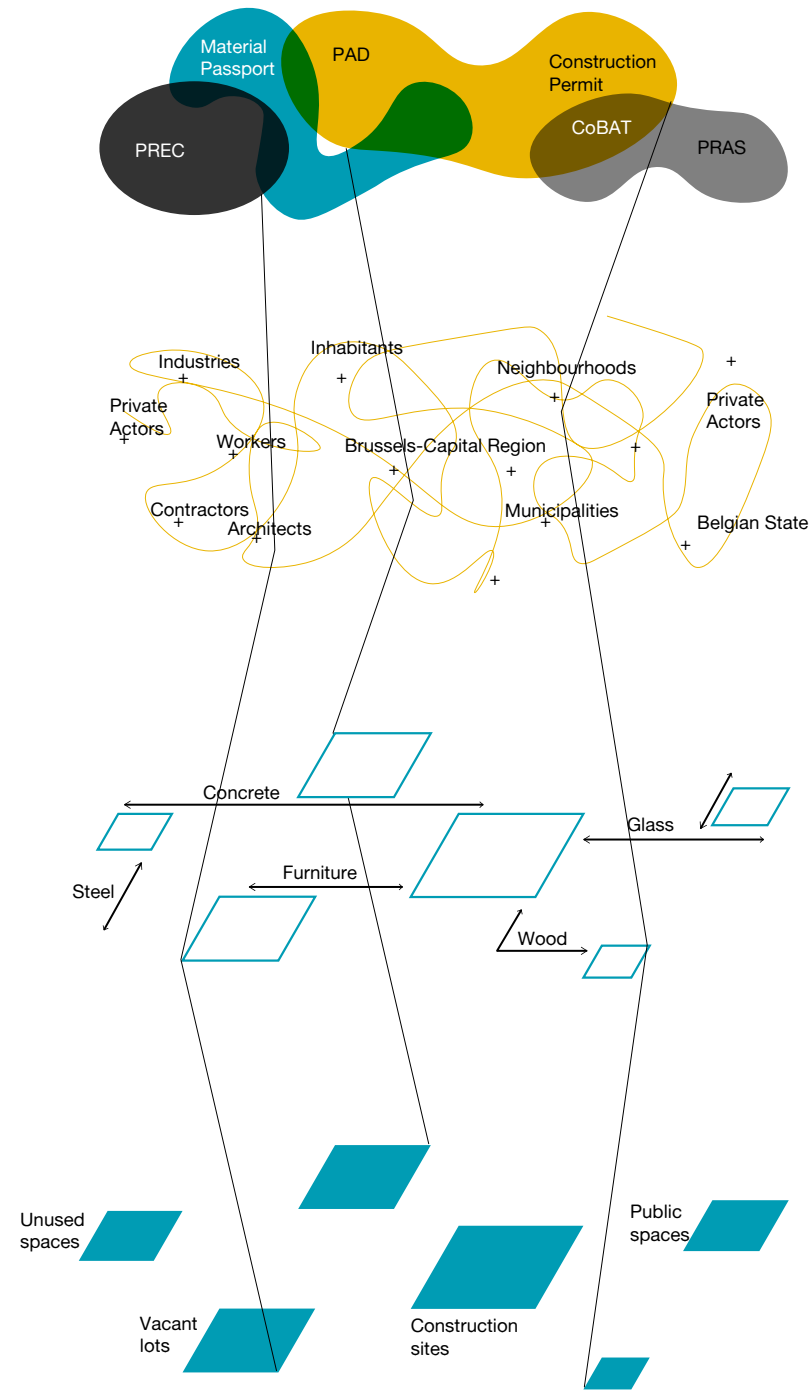
- Potential
- - - Missing link
- Weakness





A different approach is needed within the construction and demolition sector in order to consider waste materials as raw materials and the built environment as a potential mine. It is important to provide sufficient time, space and manual knowledge to plan a process which allows for inventing new circular actions along the way. The owner of a construction site should integrate a multidisciplinary team that will execute the project.

The selective dismantling of building components and materials must be preceded by an inventory of elements and materials to be broken down. With this inventory, specific circular actions can be formulated, depending on their quality and demand. The sum of these circular actions constitute a material management plan for the site as a whole.



A multi-layered platform for circular projects should respond to 1) the need for space, 2) increased efficiency of material flows exercised by a 3) decentralized network of actors with overlapping functions, giving rise to new knowledges and 4) a legal landscape – with clear regulations outlined by the PREC – to incentivize the adaptation of circular strategies by a range of actors.

**Legal and Policy framework**

Land use and policy regulations decide the actor's incentives. The PAD could be used as tool to combine the strategic visions outlined in the PREC with regulatory plans, for instance, setting a minimum standard for the application of reused and recycled materials within construction sites.

**Actors & Knowledge**

Circular actions need a different way of cooperation and linkages between actors and their expertise.

**Material Flows**

Buildings are complex assemblages of materials, composed of different construction layers, differing in terms of their life cycles.

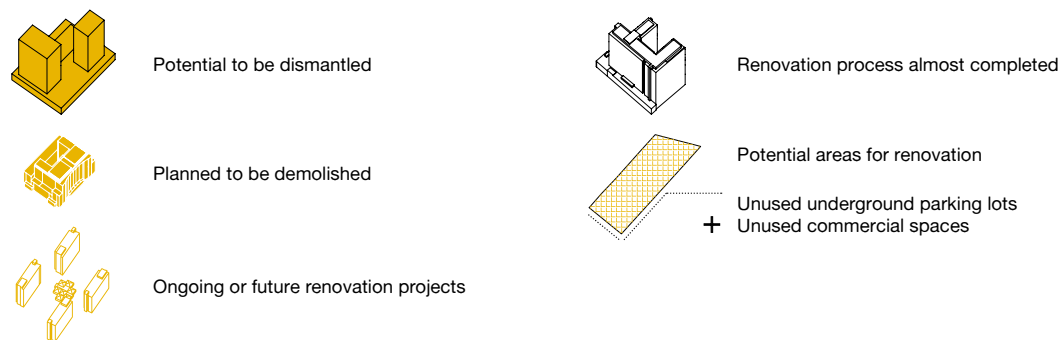
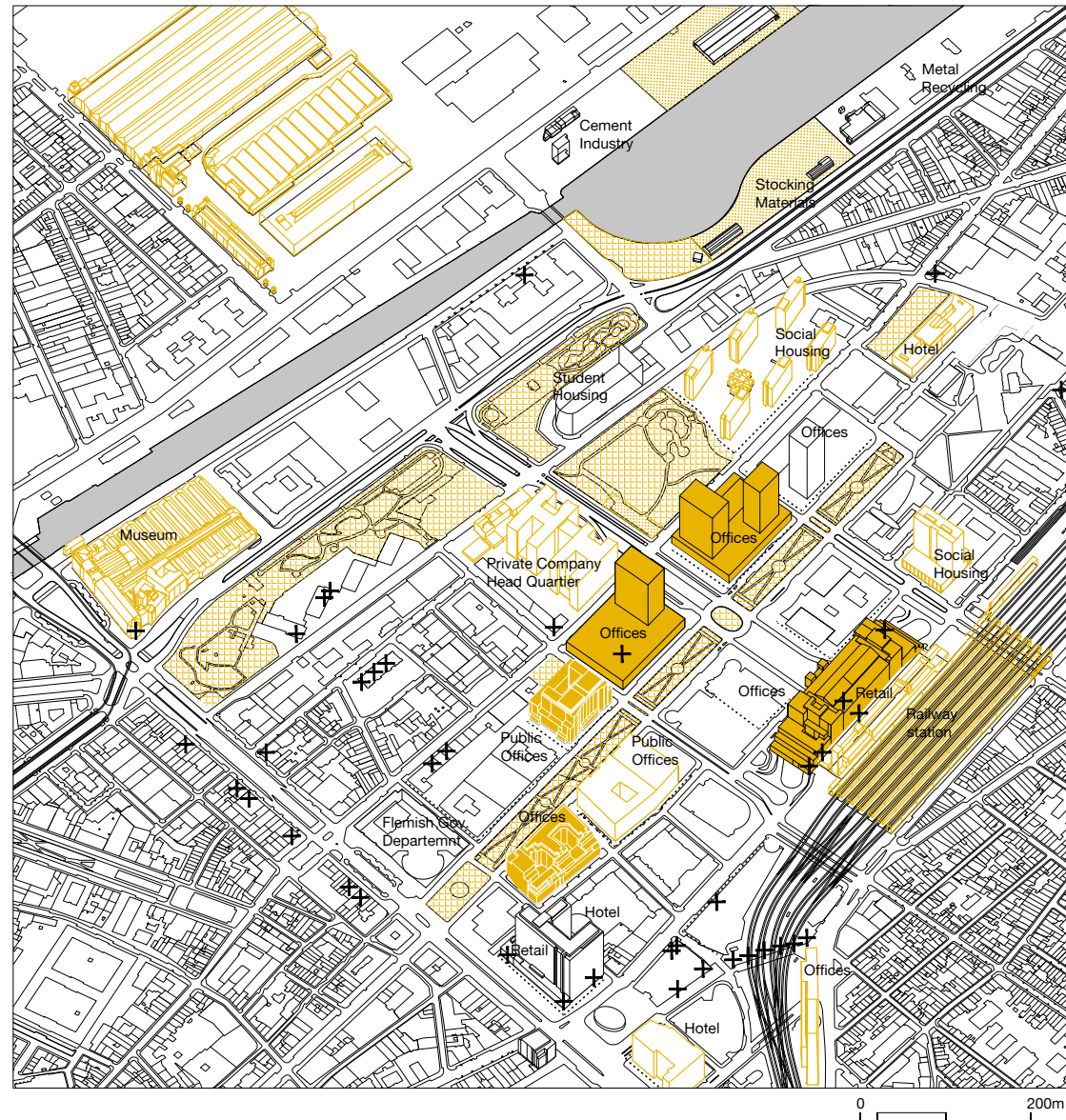
**Space**

Space is a crucial element for enabling material and knowledge exchange. CE requires a shared space (that is not only virtual) for the actors of the construction sector. Spatially, at least 10% of the project area needs to be dedicated to a 'transition zone'. This transitory multifunctional zone will perform different functions according to the stage of the construction process. Material banks – covered (parkings, tunnels) and uncovered (canal area, parcs, in situ) – will be stocking and distributing the different materials.

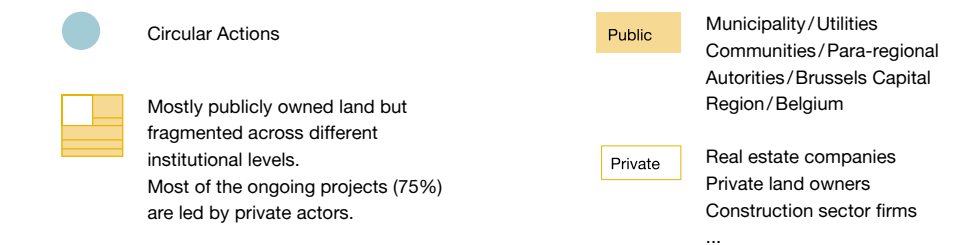
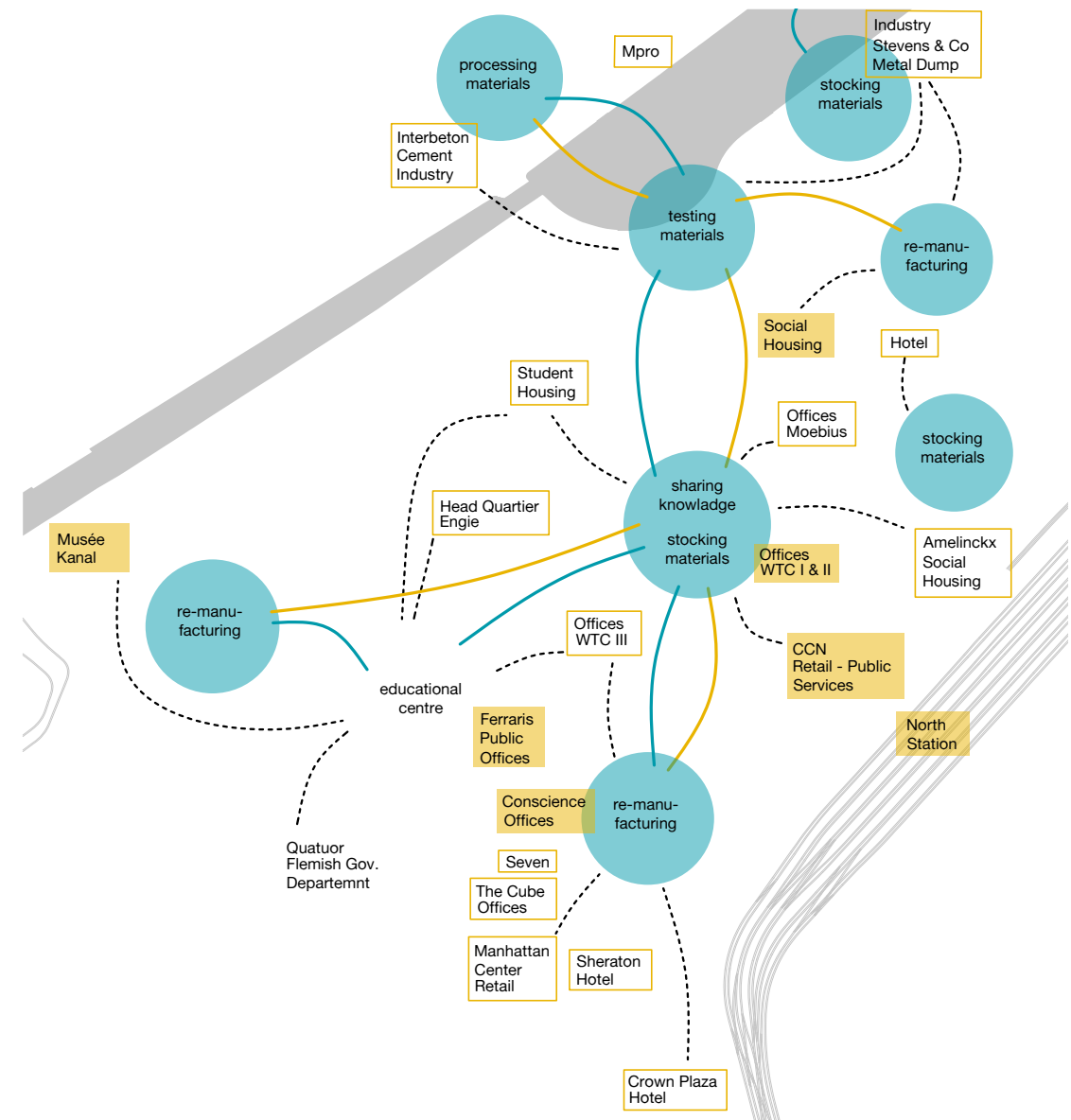
## Designing ecosystem transition

Our proposal for the NQ implements a multilayered infrastructure for the creation and exchange of circular actions. We propose to spatialise the interactions and knowledge sharing between actors in order to reach a common vision and strategies. This hotspot offers an ecosystem of accelerated interconnections and infrastructures in the NQ to steer that transition. The proposal emerges from the conviction that the knowledge necessary to accelerate both the quality and quantity of circular actions is designed, developed, and tested within a network of players in multiple sectors, rather than with a select group of technical engineers. Legal or economic regulations alone are not sufficient to radically rethink the relationships between these players in order for them to cooperate. The platform is designed to spatialise and present the different stages in the process of testing and redistributing materials. We identified the various spots necessary to collect and redistribute materials within different life cycles. Creating an active public market for the recovery of materials and components could cover the costs of dismantling, storage and resale in the long run. To this end, however, the recycled materials must be sufficiently available, attractive, and certified as suitable for reuse. We see that current CE initiatives score lower in economic terms than conventional techniques. Given the private-led development of the NQ, incentives to invest in a more complex and sustainable public process are limited. The European Commission stresses that buildings must be analysed regarding their material context in the phase before their demolition (Romnée and Vrijders, 2018). To ensure this, we suggest that construction permits only be granted to projects that conduct a material inventory — producing a ‘material passport’ for the property. This passport presumes a legal obligation to test the percentage of reusable materials in cooperation with a contractor. If a significant amount of reusable materials is used, the property owner is responsible for ensuring their future repurposing.

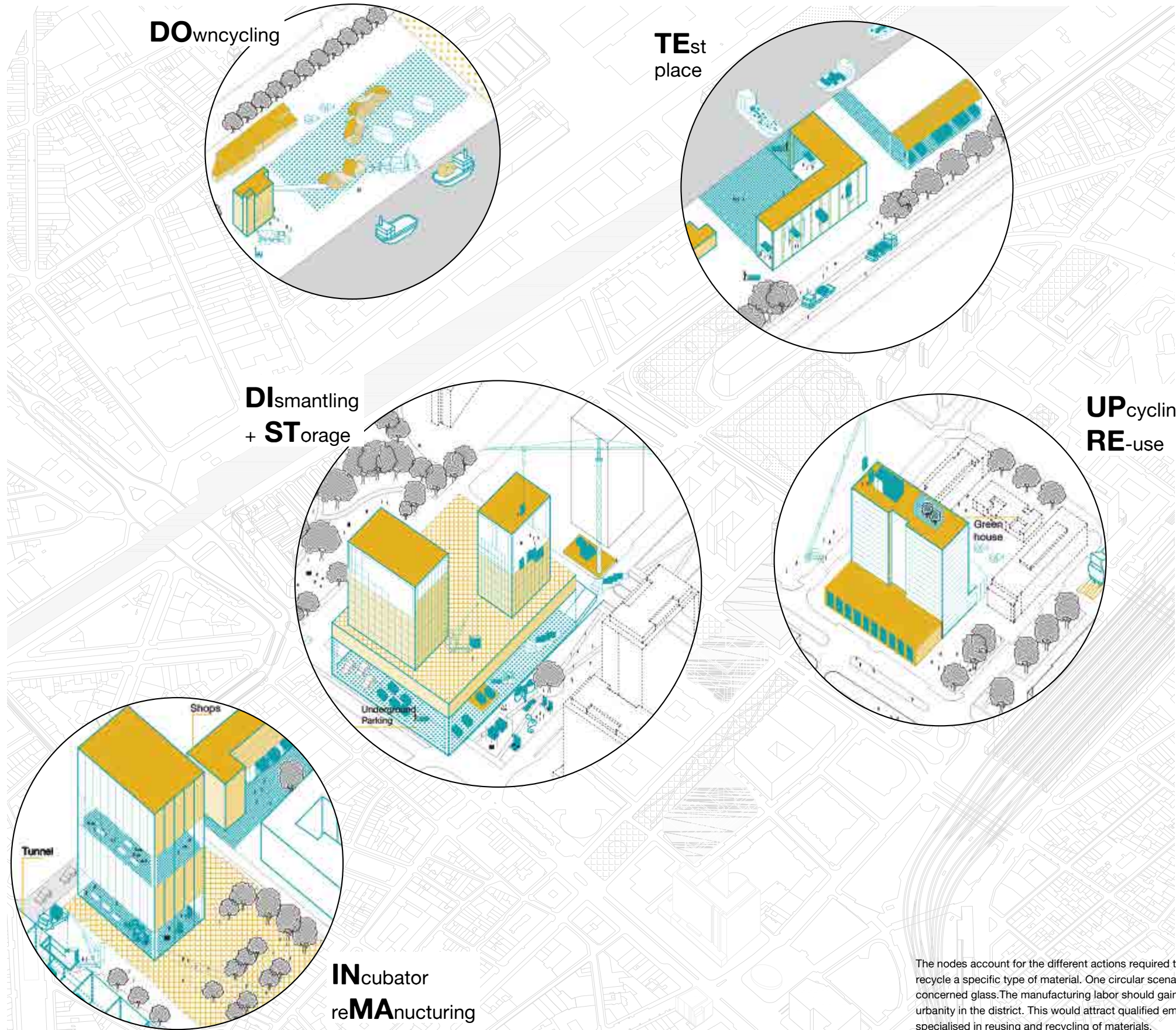
In addition to the objectives of public and private players to turn the Northern Quarter into a mixed-use office and residential district, we propose the public integration of foundational economic activities in the district, in the form of workshops that ensure a central position of manufacturing industries beyond the construction site (Bentham and al., 2013). Through remanufacturing, material flows will be managed and redistributed in spatial nodes. Through reverse logistics, the urban metabolism would be enhanced by shortening the supply chains of materials that find a new purpose on site or in other sectors beyond construction (Dowlatshahi, 2005).



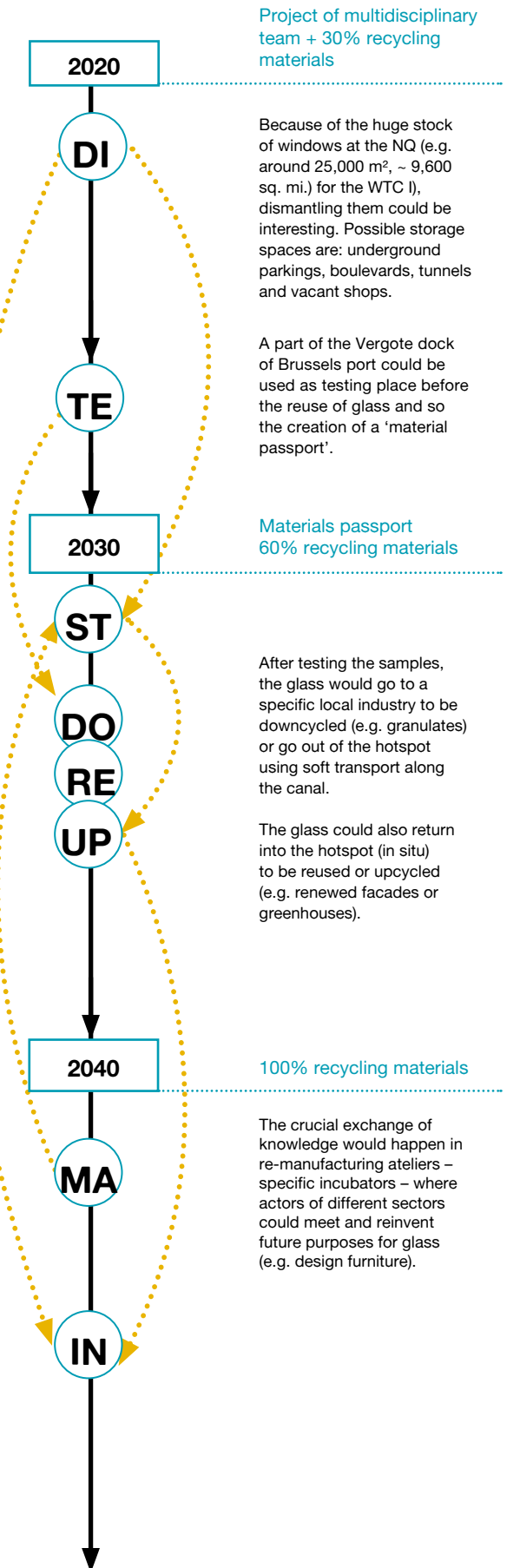
We identified several spots in the NQ as potential urban mines and spatial resources for material dismantling, redistributing, and remanufacturing. The nearby post industrial areas and the port are strategic for negotiating the convergence of spatial and economic development in this way.

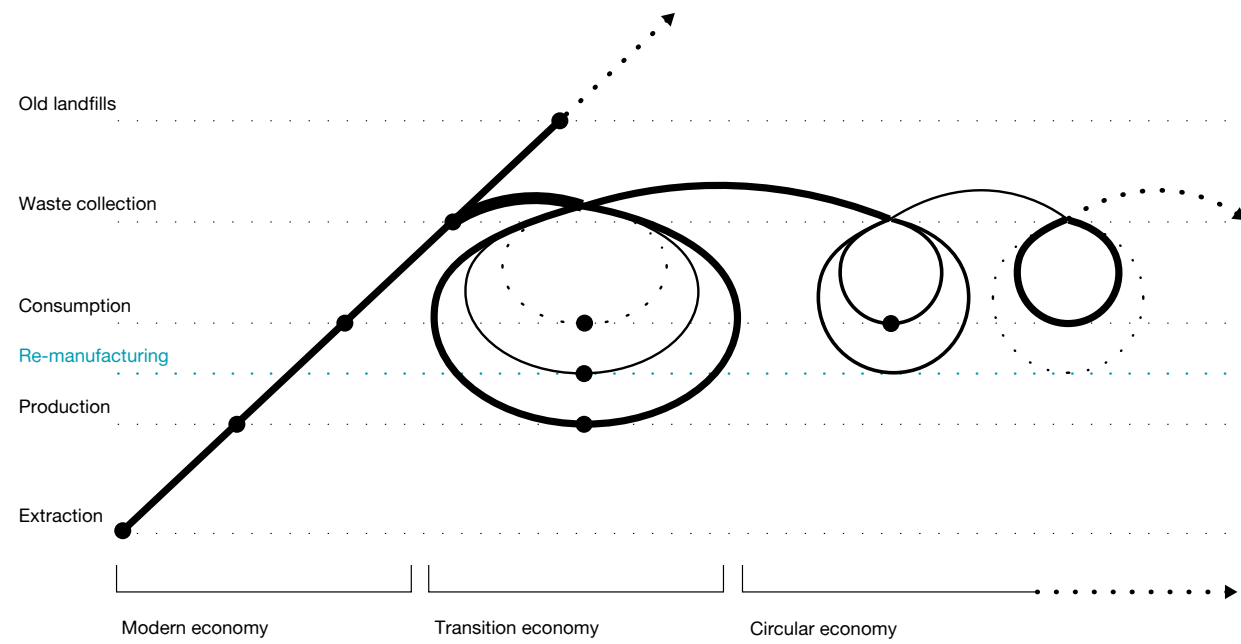
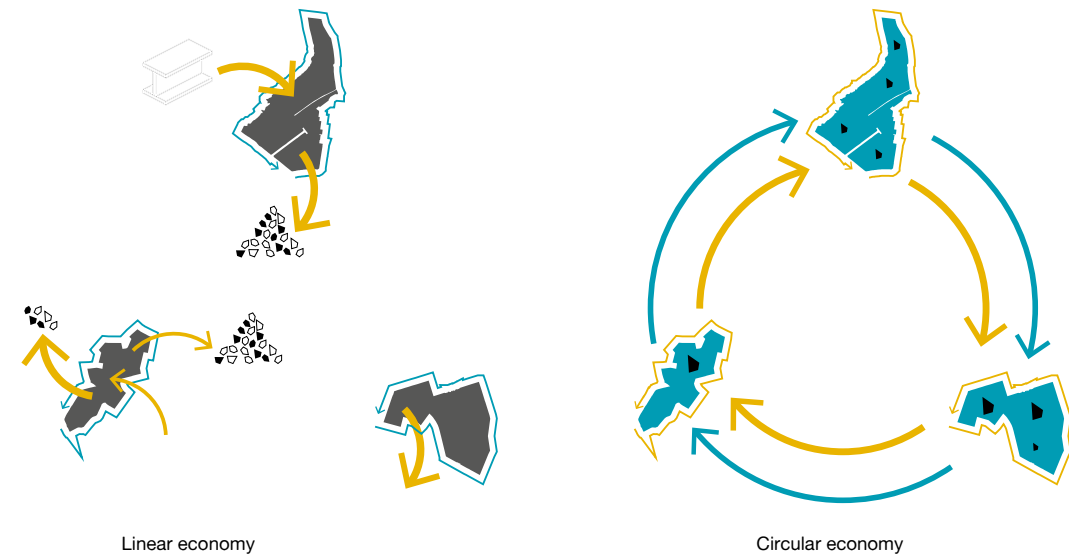


The platform stresses a needed interaction between private and public actors. Consolidated by appropriated rules, these interactions generate flows and knowledges for new circular socio-economic activities. This would reinforce and reinvent the cycles of making, dismantling, testing, storing, reusing and recycling construction materials as a part of a natural feedback loop.



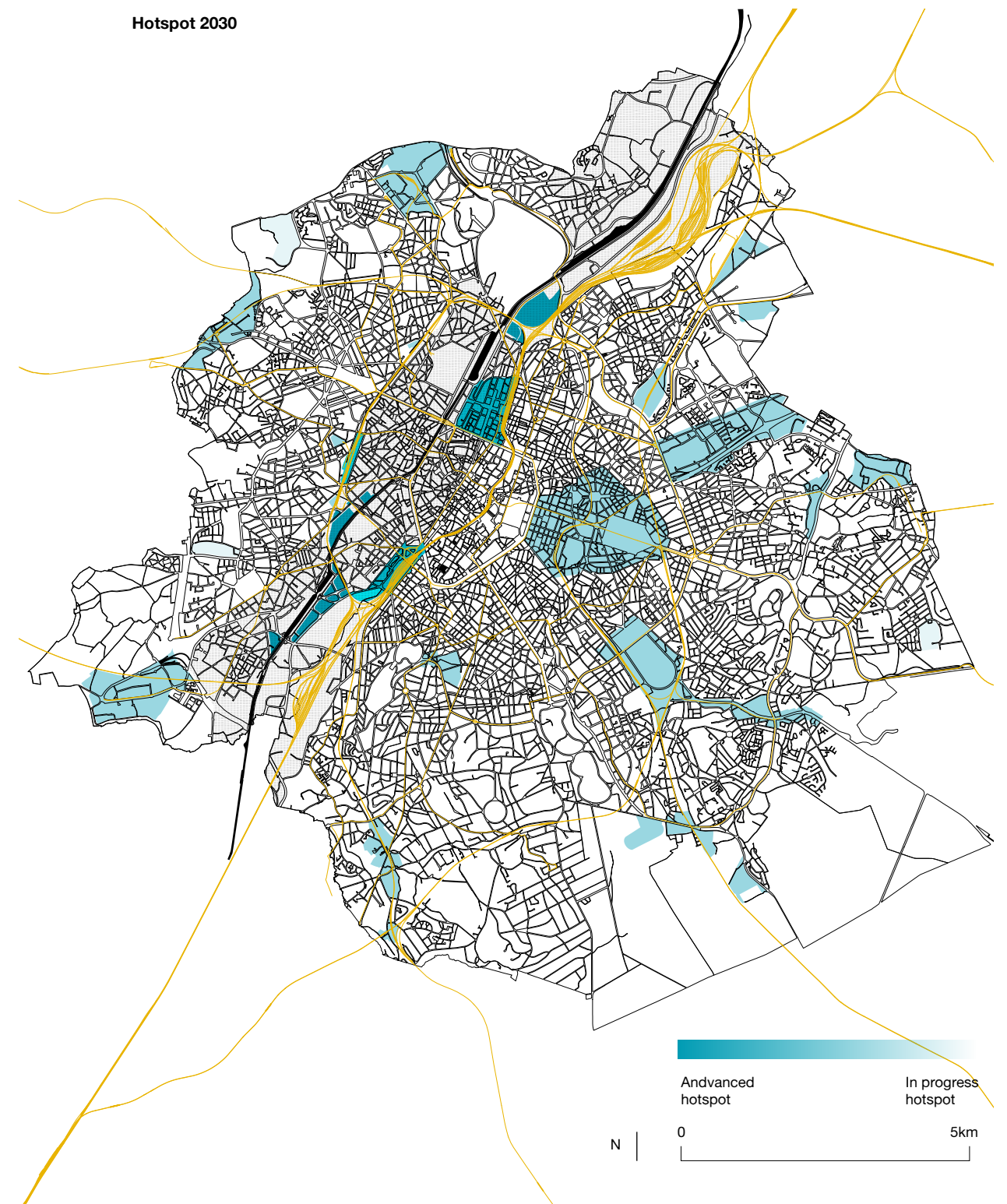
The nodes account for the different actions required to reuse and recycle a specific type of material. One circular scenario we investigated concerned glass. The manufacturing labor should gain a more permanent urbanity in the district. This would attract qualified employees, specialised in reusing and recycling of materials.





The transition phase is more time consuming, because it requires experimentation, but will result in more efficient reuse of construction materials. Following the transition phase, raw material consumption will progressively decrease, allowing the transition to circular economy.

Hotspot 2030



The hotspot is a subsystem, that participates to a larger regional dynamic where multiple nodes play a role in construction material flow management. Acceleration of the interactions with other industries and new enterprises will be the gatekeepers in this process. NQ is a strategic hotspot because of its proximity to the canal, where logistic infrastructure and spaces for manufacturing are historically present. More areas could become potential hotspots in the future, starting with those strategic areas indicated by the regional development plan.

## Conclusion

Alice Bassan, Ophélie Goemaere, Maria Leonardi, Mae de Monchy, Géraldine de Neuville, Luca Nicoletto, Marine Spor

**We have identified various types of hotspots depending on the following criteria: 1) a strong platform of mixed and connected stakeholders, 2) sustainable logistics and infrastructure, 3) free space, 4) high quantity and quality of material flows. A hotspot is not as a closed system, but a subsystem that connects to a larger ecosystem: ‘in progress’ hotspots need ‘advanced hotspots’ to manage circular actions.**

In a transition to CE, initial costs are unavoidable. In the quest for a new business model beyond the scale of a small niche, CE has more potential when applied to large areas, significant stocks of materials, and high amounts of flows. The governance challenge involves connections between stakeholders, both private and public, pushing towards a cultural shift. However, in order to encourage a socio-technical regime dominated by the private sector to invest in CE, a coherent legislation framework is a necessity, e.g. by connecting the PAD of the NQ with the PREC. Beyond legal enforcement, cooperation between the stakeholders — inside and outside the project, at any level — facilitates CE initiatives. This means a holistic view of construction plans shared by multiple players rather than fragmented sections. This interaction should be promoted spatially, creating spaces where multiple players involved in the construction process can meet. One lead is connecting the NQ to the reactivation of Brussels’ post-industrial canal zone.

The next step is integrating CE in building design. Materials and building structures need to be designed in order to avoid issues related to reuse or recycling after dismantling. Anticipating the future of new buildings will lead to a ‘repair-based’ economy, and circular actions will become more efficient. The workshops in the hotspot should produce this knowledge, in the long run, by designing solutions with convenient assemblages and right materials. Redefining the ground space in the NQ for these foundational functions is a necessity: production workshops will ensure a continuous circulation of materials that have a shorter life cycle (e.g. furniture and surface materials). Such activity is compatible with CE and takes care of a reinvented urbanity in the NQ, with a multiplicity of functions. In the context of limited urban space and resources, the question of whether to rebuild after demolishing should remain a serious consideration in order to reduce the intensity of material flows.

### References

- Arnsperger, C., & Bourg, D. (2016). ‘Vers une économie authentiquement circulaire: Réflexions sur les fondements d’un indicateur de circularité’. *Revue de l’OFCE*, 145(1), 91-125.
- Bentham, J., Bowman, A., de la Cuesta, M., Engelen, E., Ertürk, I., Folkman, P., ... Williams, K. (2013). ‘Manifesto for the foundational economy’. (CRESC Working Paper No. 131). Retrieved from Centre for Research on Socio-Cultural Change website <http://hummedia.manchester.ac.uk/institutes/cresc/workingpapers/wp131.pdf>
- Broto, V. C., Allen, A., & Rapoport, E. (2012). Interdisciplinary Perspectives on Urban Metabolism: Interdisciplinary Perspectives on Urban Metabolism. *Journal of Industrial Ecology*, 16(6), 851-861.
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24-40.
- Ghyoot, M., Devlieger, L., Billet L., & Warnier A. (2018). *Déconstruction et réemploi: comment faire circuler les éléments de construction*. Lausanne: Presses polytechniques et universitaires romandes.
- Harvey, D. (1976). Labor, Capital, and Class Struggle around the Built Environment in Advanced Capitalist Societies. *Politics & Society*, 6(3), 265-295.
- Kampelmann, S. (2018). ‘On the circularisation of territorial metabolism’. in G. Grulois, M. C. Tosi, & C. Crosas (Eds.), *Designing Territorial Metabolism: Barcelona, Brussels and Venice* (pp 41-53). Berlin: Jovis.
- Kampelmann, S. & Athanassiadis, A. (2018). *Évaluation du programme régional en économie circulaire de la Région de Bruxelles-Capitale*. Retrieved from [https://issuu.com/ulb34/docs/20181002\\_evaluation\\_du\\_programme\\_r\\_](https://issuu.com/ulb34/docs/20181002_evaluation_du_programme_r_)
- Moreau, V., Sahakian, M., van Griethuysen, P., & Vuille, F. (2017). Coming Full Circle: Why Social and Institutional Dimensions Matter for the Circular Economy. *Journal of Industrial Ecology*, 21(3), 497-506.
- Romnée, A., & Vrijders, J. (2018). Vers une économie circulaire dans la construction Introduction aux principes de l’économie circulaire dans le secteur de la construction. Retrieved from <https://www.cstc.be/homepage/index>.



## Stakeholder insights – IRISPHERE

Mathieu Depoorter, Marc Renson

**The IRISPHERE programme, coordinated by citydev.brussels, seeks to boost the development of the circular economy in the Brussels-Capital Region. Its ambition is twofold: help Brussels companies improve materials cycles, and reinforce cooperation between companies at the regional level.**

Applying a tried and tested methodology, the IRISPHERE team provides individual or collective guidance in order to identify, assess and seize economic opportunities between companies on a local scale.

The IRISPHERE programme is led by a broad consortium of Brussels players who are circular economy pioneers. The consortium consists of citydev.brussels, EcoRes, Lateral Thinking Factory, Greenloop, BECI, La Ferme Nos Piliifs, Bruxelles Environnement, Bruxelles-Propreté, the Port of Brussels, the Communauté Portuaire Bruxelloise, and hub.brussels.

In parallel with the setting up of the Brussels Ecosystems MasterClass and in collaboration with the Chair in Circular Economy, IRISPHERE has been looking into reusing the glass panels from the World Trade Centre 1 & 2 buildings (WTC1-2), in Brussels' Northern Quarter.

This synergy aims to avoid recycling the 600 tons of double glazing that cover the towers when they undergo major renovation work in 2020. The goal is to find ways to give a second life to this specific material on a large scale, with 5,000 copper-tinted double-glazed panels. The project requires calling upon many different players in order to study its technical and economic feasibility, dismantle the panels, transport them, store them and install them for their final use.

The challenge of this synergy is to find added value, in terms of either money or differentiation, both for the owner and the new user. We are looking into large-scale operations because our idea is to find a new use for flows of reclaimed double glazing in general. The first use we have studied consists in reusing the panels in other buildings. Unfortunately, the technical specifications of glass produced in 1971 no longer meet current energy performance standards. A second possible use is in large greenhouses used to grow vegetables (at least 1 hectare, ~ 2.47 acres). This idea was considered on a space belonging to IDEA (Mons). However, based on feedback from experts (glazing installers, produce specialists, glass manufacturers), this solution is not suited to productive greenhouses.

The difficulties encountered when looking for ways to reuse the WTC buildings' glass panels illustrate the social, technical and economic barriers, within the construction industry, that prevent the emergence of a truly circular economy. In this regard, these difficulties echo the discussions held during the MasterClass on the issue of sustainable transition in socio-technical ecosystems.





## Stakeholder insights – Usquare

Martin Casier (project leader), Victor Ooghe (researcher in circular economy), Laurence Hendricks (assistant project manager)

**The Ixelles barracks are a large space that has a rich historical and architectural heritage and features a wide variety of construction materials. Transforming them from a single-function site closed off from the city to a venue open to all requires that especial attention be paid to respecting the place’s history. In addition, rehabilitating such a large area in a city necessarily raises important questions related to the optimisation of resources and spaces and the new ways in which we build, inhabit, work and collaborate.**

This makes the Ixelles barracks especially well-suited to experimenting with various aspects of the circular economy. For instance, for the process to respect the venue’s heritage, it must take care to reuse existing materials. It used to be possible for a transformation project to confront the site’s heritage, but the current approach of reuse is more geared towards architectural integration and preservation.

In terms of circular economy, the goal is to reuse as much material as possible on the same venue, taking into consideration the buildings’ history. In line with this idea, the architectural approach consisting in preserving existing volumes and spaces is the most circular and the most respectful of the venue’s heritage.

Reusing existing materials requires a solid comprehension of their history, how they were made, their technical characteristics, and how they are used. This makes it possible to study the most viable solutions based on a hierarchy of values ranging from keeping the space unchanged to recycling the original materials for new uses, and including reusing them for other phases of the project.

Usquare’s ERDF-funded project follows this approach and attempts, to the largest extent possible, to keep the building and its materials unchanged, reuse part of the materials (e.g. repurposing outdoor glazing panels into indoor glass partitions) or recycle them into new materials (e.g. crushing slates and bricks into terrazzo).

In order to encourage this dynamic, a team of researchers (BATir-ULB, SECO) is working hand in hand with the project owner (ULB-VUB) and the team of architects (BC Architectes, EVR, Callebaut Architectes, VK and others). This collaboration will let them not only develop new working methods (circular specification, resource management plan, physical and digital platforms to exchange materials, etc.), but also document their work in order to reuse and adapt it to other similar initiatives in Brussels. During the Metrolab MasterClass, we have investigated — together with the study group on circularity — the potential for reuse and recycling of the construction materials used in Brussels’ Northern Quarter. As the group has demonstrated, it is important that all players involved in construction and in reusing materials be included in the reflection process.