

# FLU

*Fluctuant low-impact urbanism*

## **Fluctuant low-impact urbanism**

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## Abstract

Concerned with the recent trends in urban regeneration, this thesis aims to explore alternative scenarios for reclamation of the post-industrial legacy. The processes of constant socio-economic and morphological transformation within the urban environment is set as a subject for a wider outlook and research, informing the strategy for a particular precedent of metamorphosis in a section of Podil district, shaped on the verge of industrialization in Soviet Kyiv.

Addressing the issue of status quo economic development, this project intends to alter the perspective on the complex nature of industrial Podil revitalization. Reacting to the essential qualities of the neighbourhood and ongoing transformation processes, the strategy outlines potential areas for low-impact interventions driven by cultural-creative industries, local communities and activists.

The study of the architectural precedent looks into the digital discrete discourse and attempts to take ironic stance on the avant-garde computational practices by injecting meaning into the discrete parts by having them reflect the contextual specifics and cultural values.

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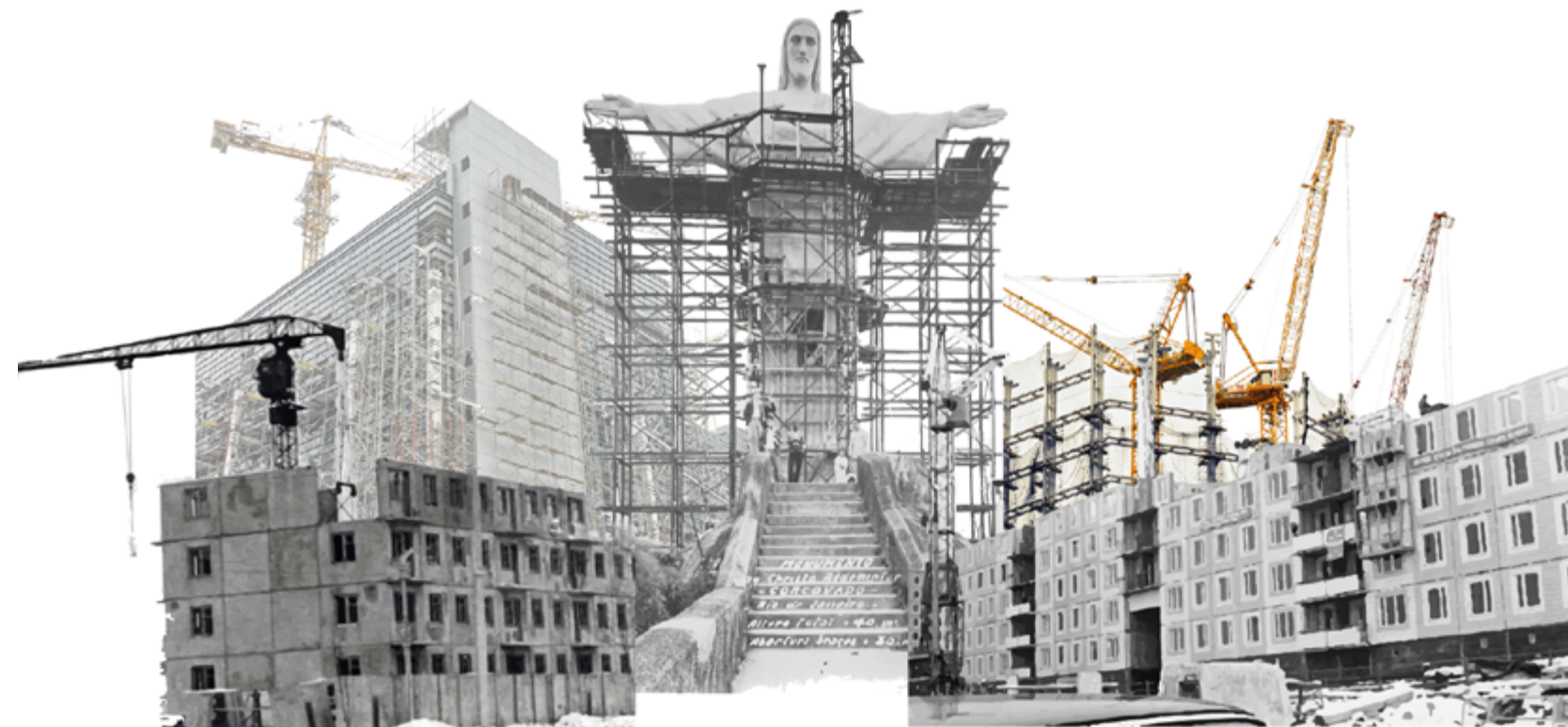
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## **Discourse and Context**





## Constant transformation

Architecture is never constant. The character of stability and monumentality is relative to the human's subjective perception of the built environment. The processes that lead to erection and abolishment of structures are embedded within architecture itself, making it a procedure rather than a product of a certain activity.

The ratio of embodied energy to the utilitarian value the building performs determines the degree of its adaptability to other anthropogenic and environmental processes. Therefore, more integrated and flexible architecture will require fewer resources for every next response to the metamorphosis affecting it.

The technological progress tends to accelerate exponentially, driving transformation that makes it much harder to predict the amplitudes of building lifespans. Such uncertainty and volatility are becoming the base conditions for establishment of new architectural processes. In this case, a building designed to become the material for its future iterations will leave less expansive traces on the urban fabric and environmental footprint, and receive less resistance from its precarious futures.



Dnipro UA

1000m



Kyiv UA

1000m



Prague CZ

1000m



Milan IT

1000m



Liverpool GB

1000m



Cologne DE

1000m

## Precious brownfields

Technological progress and economic development can have unexpected imprints on behavior of urban fabric. The areas neglected in the period succeeding the industrial revolution became the subject for a new cycle of transformation with new opportunities and challenges. The current pandemic crisis and market volatility will most certainly be projected onto another wave of metamorphosis of urban organisms.

The post-industrial sites within close proximity to urban cores became a scarce recourse in developed and rapidly growing urban areas. While the cities that failed to revitalize their brownfields in ast decades posses an extremely valuable asset - a room to accomodate new cycles of neverending transformation that is only going to accelerate.



Kyiv central urban core

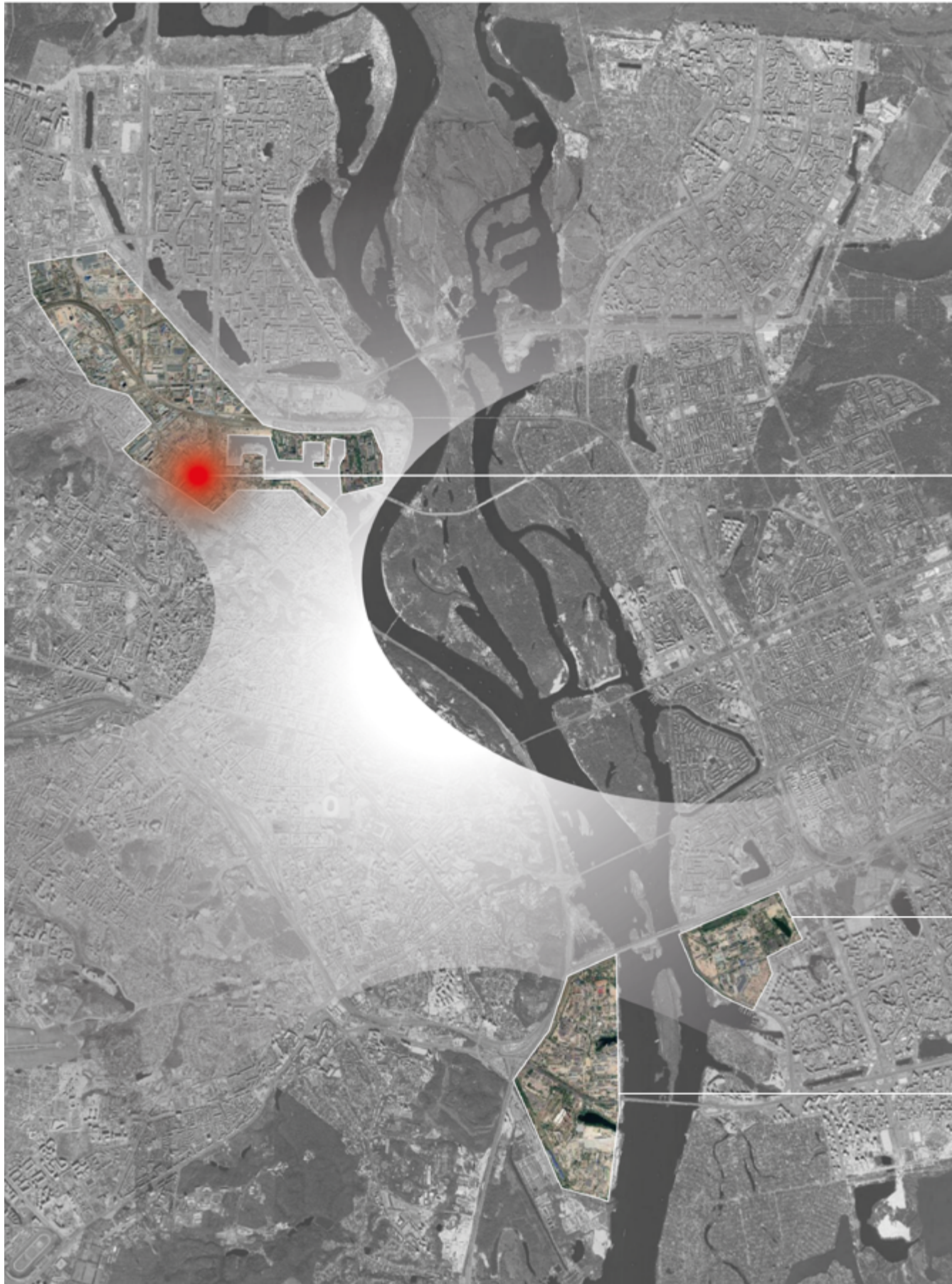


Source: Kyiv General Plan, 2020



## Kyiv, Ukraine

- Peripheral European capital
- Highly centralized metropolis
- Cultural and spiritual centre
- Rapidly growing built area
- 5,5 million agglomeration
- No ethnical segregation
- Distinct underground culture



### **Podil industrial zone**

One of Kyiv's deprived industrial zones which borders a culturally significant historical and vibrant neighbourhood. Highly fragmented urban fabric and large amount of underutilized or abandoned (sometimes ruined) buildings present a lot of opportunities for economic regeneration and establishment of new connections between surrounding localities and the city centre.

### **Pozniaki industrial zone**

### **Telychka industrial zone**





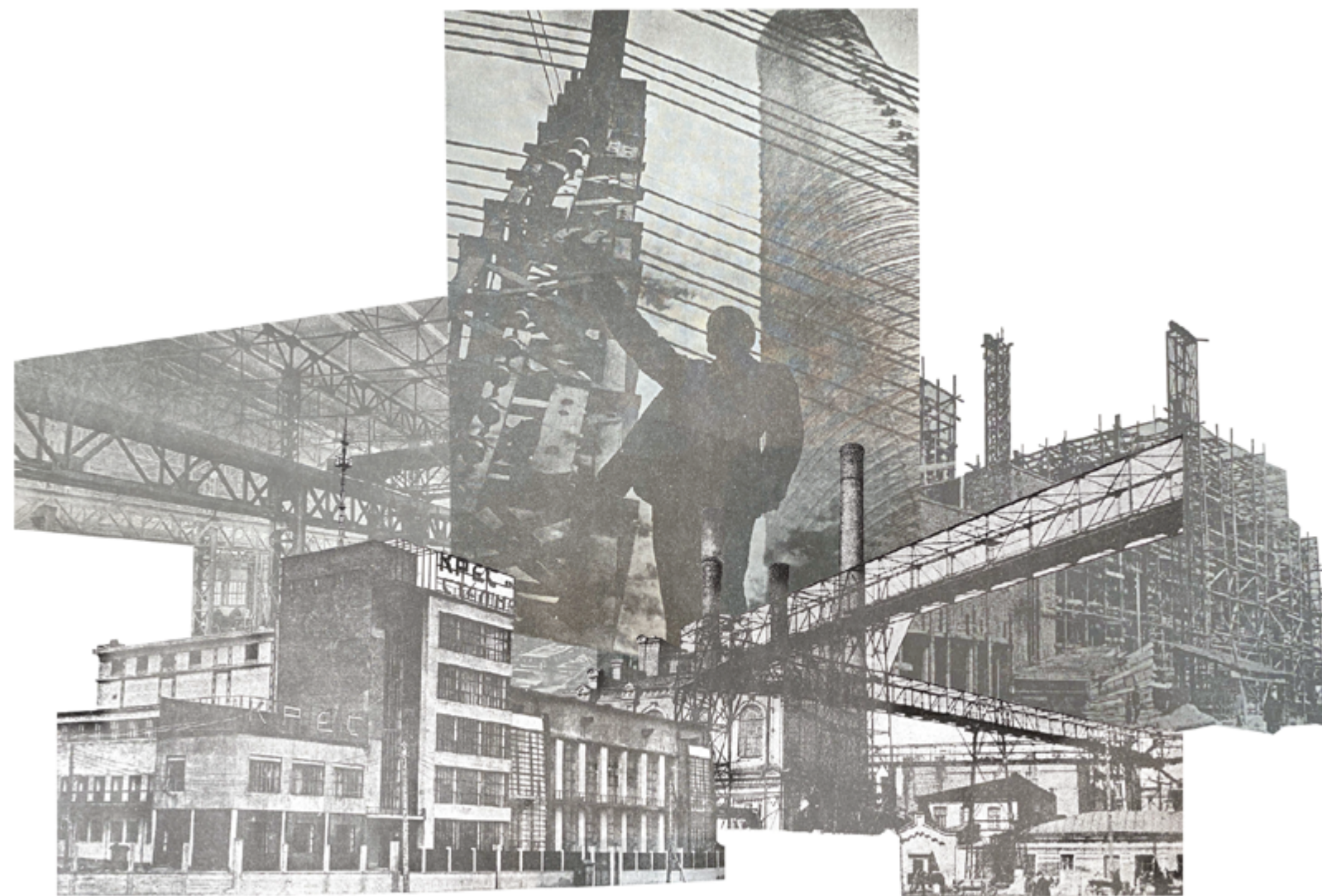
Podil within other industrial areas

## Soviet Legacy

The territory of post-industrial Podi was mainly formed during the Soviet period. The concept of a factory-centric city was successfully implemented for the development of the entire section from historical Podil to Pochayna (Petrivka). Concentration of enterprises in industrial districts, convenient for manufactures connections with natural resources and the railway and separation from housing worked for utilitarian purposes and industrialization.



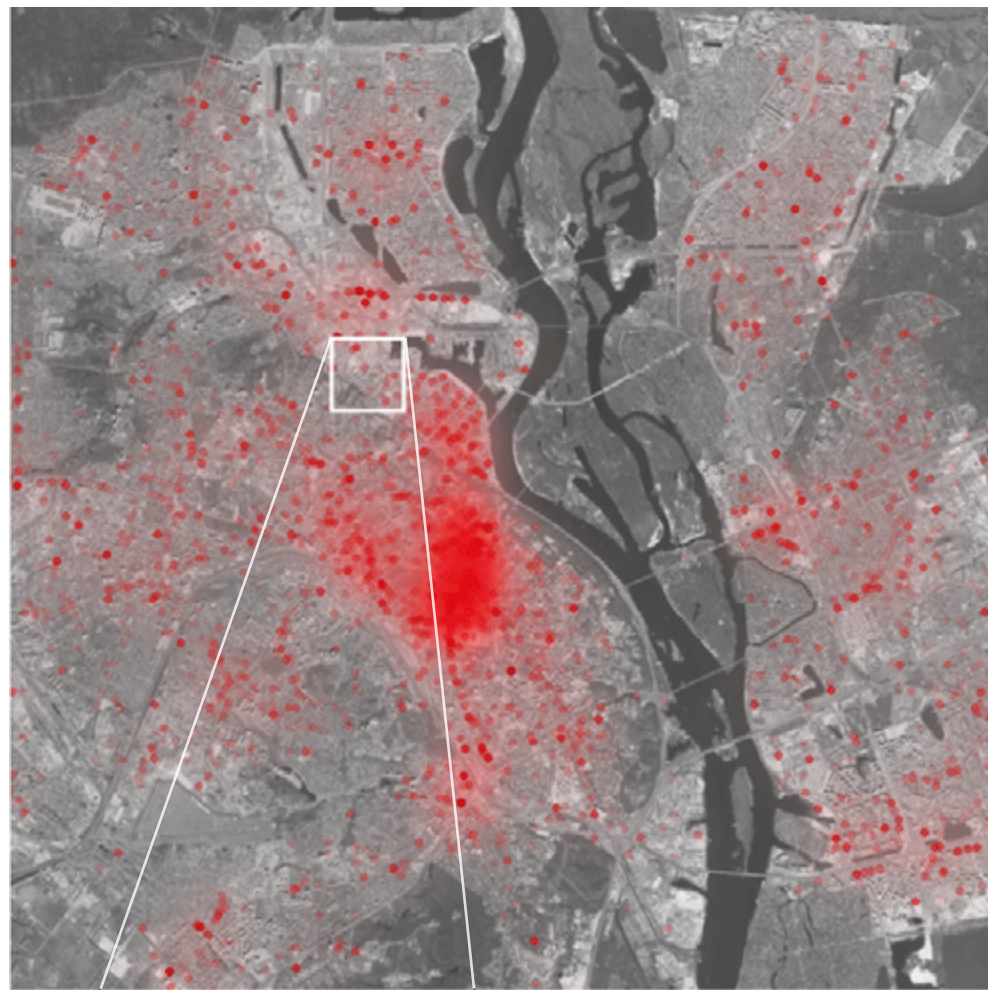
First Soviet Kyiv master plan of 1936



## Industrial Past

After the collapse of the USSR, production in this area started to decline. Nowadays, out of more than 10 initial enterprises there are three factories and several workshops left.

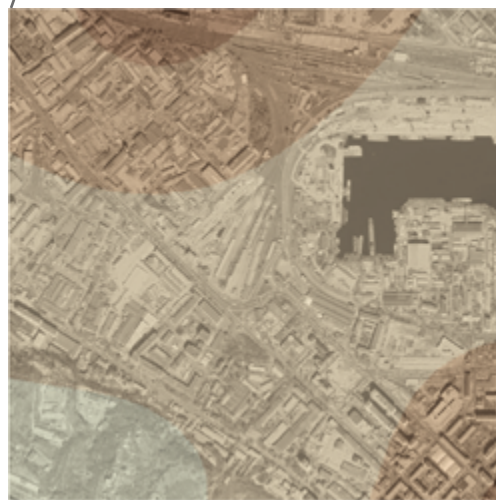




**Enterprise concentration intensity**



Source: 2gis Enterprises Database, Kyiv, Ukraine, 2015  
Scale: 1:100 000



**Enterprise amount per 5 km<sup>2</sup>**

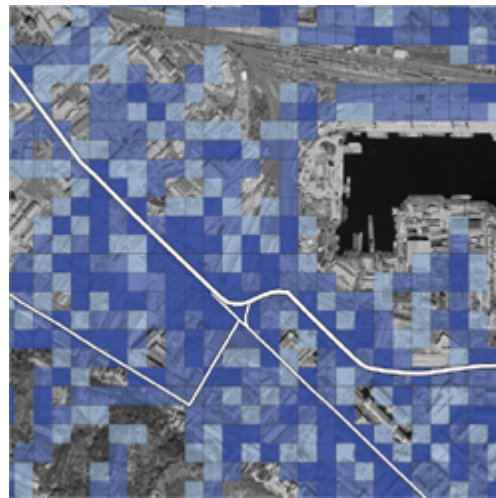
- 75+
- 50-75
- 25-50
- <25

Scale: 1:40 000

## Area within the city

The subject area is a deprived post-industrial locality in immediate proximity to the extensive urban core. During the economic decline major enterprises left the district or went bankrupt. Nowadays small businesses are scattered around the locality alongside with remaining factories and informal cultural institutions.





Source: OpenStreetMap, 2021



Source: OpenStreetMap, 2021



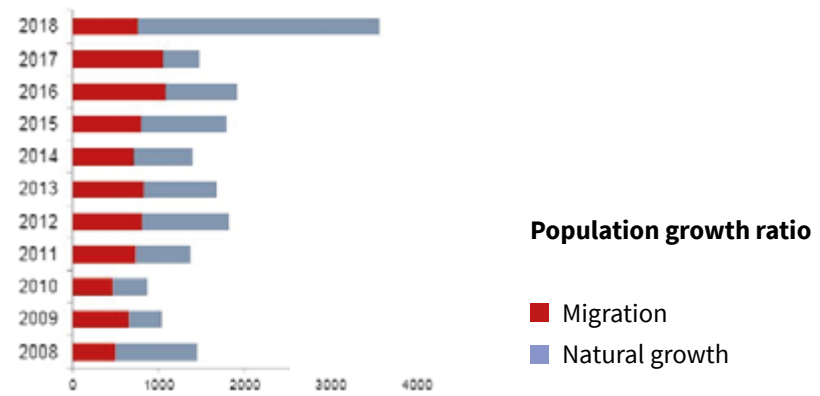
Source: Strava.com, 2021

Scale: 1:40 000

## Infrastructure Analysis

Once an important commute node, post-industrial Podil remains a well-connected district within 15 minutes drive from the city centre. Kyrilivska and Kostyantynivska streets perform as main arterial streets with busy automobile and industrial traffic. The vacancy of large number of abandoned plots are used as free parking. Businesses specialized on logistics and automobile services benefit from such car-centred conditions.

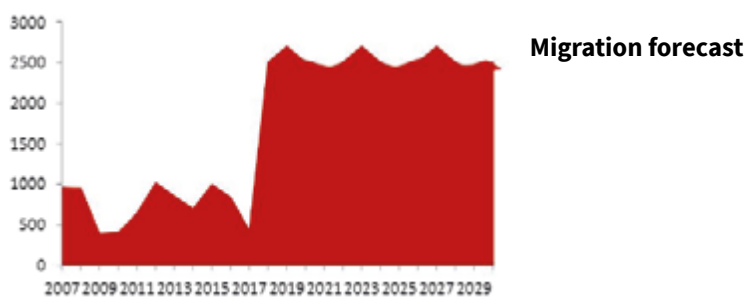
The tramline on Kyrilivska street and Tarasa Shevchenka metro station are vital elements of Kyiv's public transportation, although fragmented and illegible urban fabric decreases pedestrian accessibility and overall permeability of the area.



Source: ISEK Podil, 2019



Source: ISEK Podil, 2019



Source: ISEK Podil, 2019

## Demographics

Characterized as up and coming neighbourhood for young, active and creative people, Podil attracts more and more new residents year to year. Highly heterogeneous population forms unique and vibrant social fabric.



**Respondents** (100 active middle-age respondents with high education)

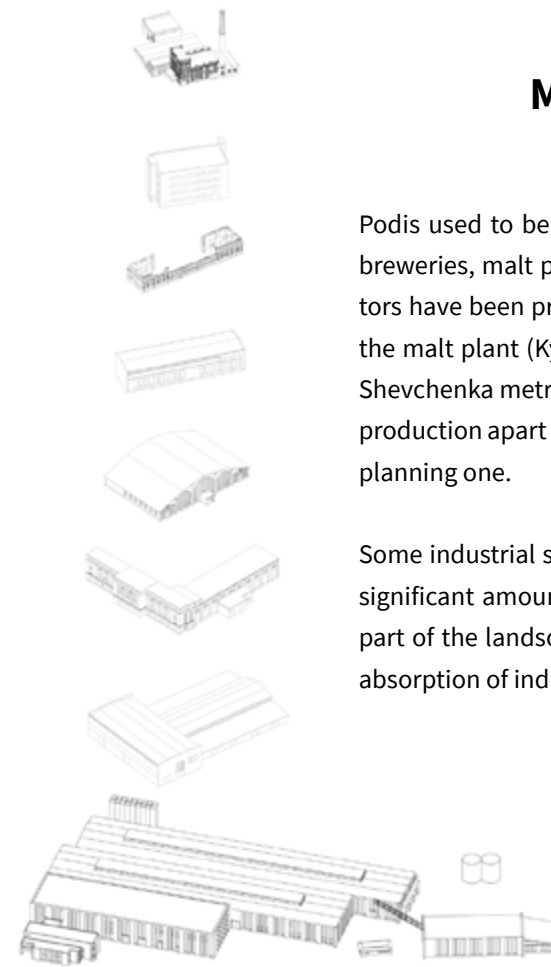
## Development agenda survey

This survey is part of a graduate student independent research project of Maggie Dunne, a graduate student at Massachusetts Institute of Technology, in collaboration with Urban Curators and Saga Development.

Majority of the participants expressed frustration with the high number of vacant lots and opposed the tendency of post-industrial historical sites being developed into high-rise buildings that disrupt the skyline and urban tissue of the neighbourhood.



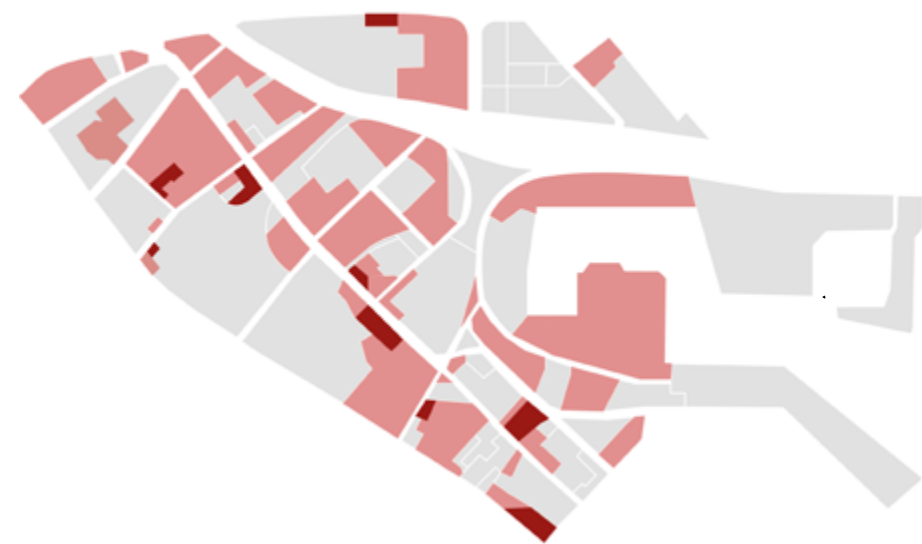
Source: PostPromPodil  
Scale: 1:20 000



## Morphological landscape

Podil used to be the center of food industry. In memory of this, there are breweries, malt plants and only a few mills left. Since Soviet times 4 elevators have been preserved: grain elevator (Naberezhno-Luhova), the ruins of the malt plant (Kyrylivska, 35), “Kyivhlib” elevator which still works (Tarasa Shevchenka metro station) and feed mill elevator. Objects of this sector of production apart from architectural and historical value, often have an urban planning one.

Some industrial spaces have been abandoned for quite a long time. Such a significant amount of time has turned them into poetic ruins that became part of the landscape. The unique landscape formed as a result of nature’s absorption of industrial facilities has its own value.



**Land ownership**

- Private property
- Communal property
- Undefined

Source: Lun.ua

200m

## Political landscape

The land occupied by deprived post-industrial districts in majority of developed Western European cities had been private or became privatized and sold to developer companies. In case of post-socialist Kyiv, the industrialization was driven by the state; therefore, some of the large cadastre parcels accommodating former factories became communal property of the current municipal government.

The developers in Kyiv rent the city-owned land for the period of time required to complete the project and after the real estate is sold, they do not possess neither the land, not the responsibility to maintain the structure. The structures on former industrial sites can also be privately owed even when standing on the plot that belongs to the municipality.

Nevertheless, the local government still has a powerful leverage to decide who to rent the land to, or change the division of the parcels inherited from the Soviet industrial era.



**Functional conversion**

- Remaining function
- Storage and Commerce
- Creative industries

Source: PostPromPodil  
 Scale: 1:20 000

## Ongoing transformation

The proximity of Podil, which is a popular and dynamic area, has turned this “collision zone” into a place that attracts startups and initiatives through smaller rentals; electronic parties, as per the remoteness of housing and industrial aesthetics; and even some offices because of the opportunities to have more freedom in furnishing and arranging the space.





Scale: 1:50 000  
Source: LUN.ua

## Status quo development

- Too many large-scale private developments , e.g. if Rybalsky and other bringing up to 100,000 new residents
- Estimated 43,300 apartments with approximately 2,452,230 m2 of housing space
- There is no social + technical infrastructure, insufficient green spaces
- No offers for low income households
- Gated communities and social segregation

## Analysis conclusions

Trends of rapid and chaotic development in Kyiv, Ukraine, seek for short-term revenue return and lack of planning in residential and commercial projects became the setting both for the urban sprawl, and for the interventions into the existing structure of the city. Through redundant mono-functional development, Kyiv had established several densified and populous nodes highly dependent on the city center.

Such tendencies are starting to spread towards neglected post-industrial neighborhoods, which used to accommodate commuter destinations with high concentration of working places.

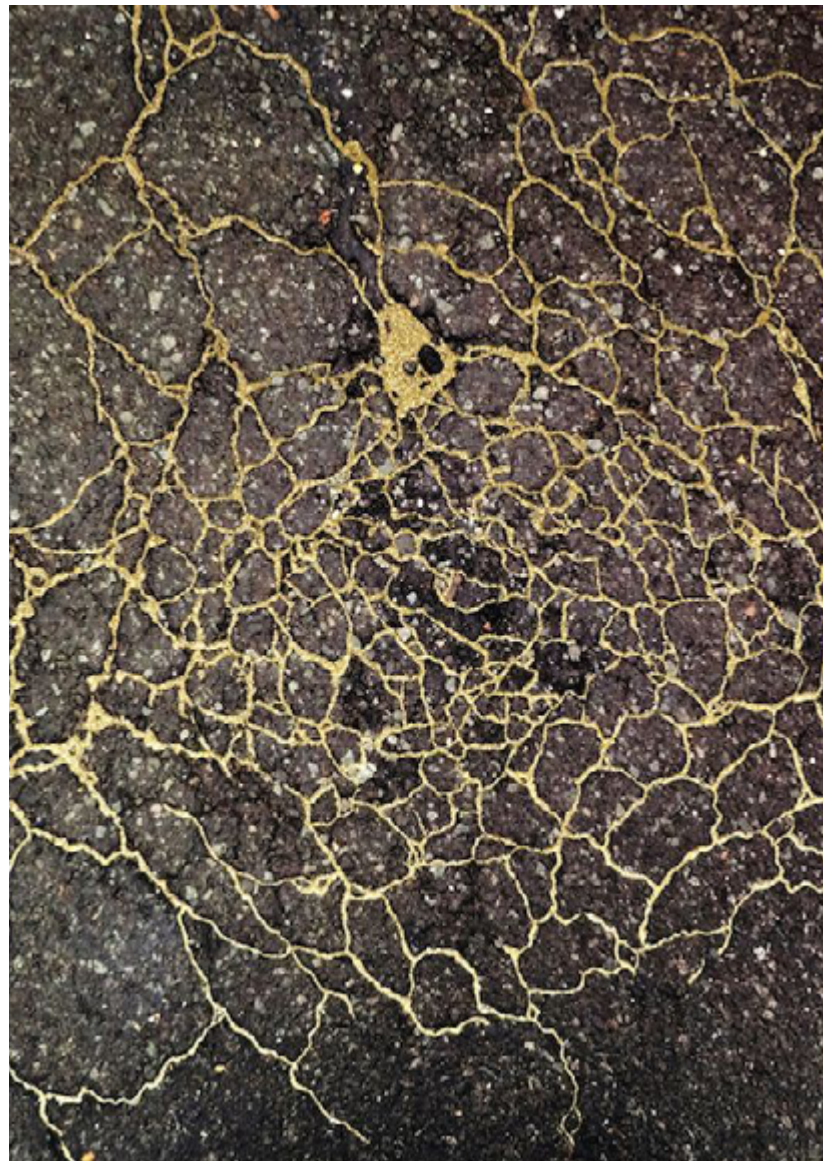
These areas present potential strategic value as semi-vacant plots in between the center and residential districts with sufficient infrastructure to host new economic opportunities and offload the flow of human capital from the congested urban core.

Without consolidated vision and functional regulations, major developers are selecting former factory sites for future residential complexes, answering the demand for housing in long-established patterns, while ignoring the social infrastructure and long-term socio-economic impact on the whole city.





## Industrial Podil Vision



'Sidewalk Kintsukuroi' by Rachel Sussman

## **Embrace the Broken**

The current public image of the locality suggests it is being largely avoided by municipal officials and investors due to its neglected and fragmented character. The 'cracks' within the urban fabric became filled with informal activities, underground culture and small enterprises seeking cheap accommodation.

This vision aims to reverse the perception of the processes happening beneath the formal outlook of politicians and developers. The informality and bottom up ingenuity of local stakeholders and urban activists presents unique values that cannot be undermined and should be reclaimed by the planning strategies alongside with the vacant land and neglected structures.



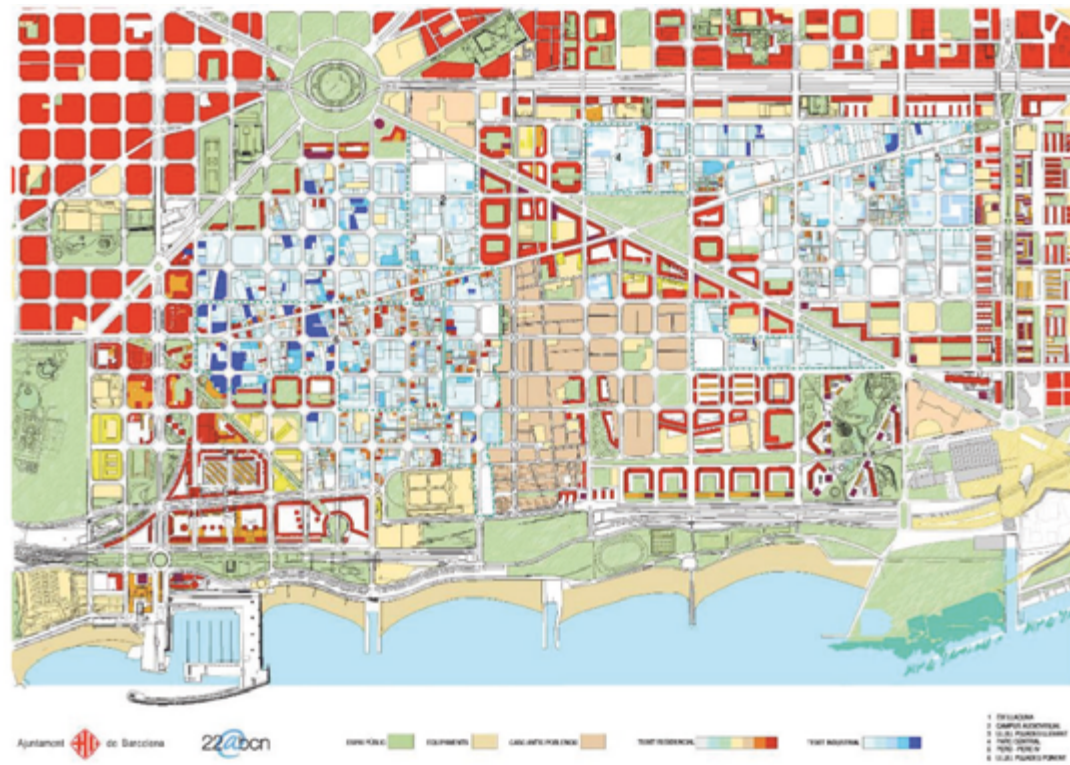


Ohio university campus

## Claiming the traces

The metaphor of the 'desired path' becoming a paved pathway is translated onto the vision for the whole neighbourhood of Post-Industrial Podil. The traces of intuitive, informal and often unsanctioned activities are viewed as valuable data for future research and integrated development of the neighbourhood. Alongside with the dynamics of functional conversions of the neglected structure, the unplanned cultural footprint should become one of the starting points for regeneration strategies.

## 22@Barcelona Poblenou



Source: Ajuntament de Barcelona

## State of the art

- Promotion of entrepreneurship
- Knowledge-driven economic development
- Cluster-based approach
- Preserved industrial heritage
- Most of the gross floor are allocated to the productive activities



GIZ integrated development. Development strategies



GIZ integrated development. Land use plan

## GIZ integrated development proposal

- Post-industrial Podil remains commerce and production oriented
- Mixed use revitalisation with active commercial facades
- estimate of 4000 new residents and limiter residential development
- Integrated development involving local stakeholders

**Keep the land in communal property**

**Limit residential residential development**

**Cheap land lease for cooperatives and communal initiatives**

**Programmes for reoccupation of neglected structures**

**Public-private investment in local infrastructure**

**Reparcelisation of the former industrial lots**

## **Active conservation strategy**

The model of active conservation formulates a set of measures aimed to facilitate the processes of integrated and inclusive reclamation of the neglected land and structures along with Podil's powerhouse history. The described proposal aims to emphasise the importance of launching diversified economic activity and embracing bottom-up civic initiatives in the area in order to avert forthcoming extensive and exclusive development projects.

## Regeneration proposal

The existing socio-economic and infrastructural conditions of the Podil neighbourhood and proximity to the city center make the

Subject area a suitable site for the early stage of the regeneration strategy. Focusing on the local economic development, the proposal aims to increase the attractiveness of the deprived post-industrial locality in favour for small and middle scale enterprises. The target group includes IT start ups, cultural creative industries, light manufacturing and educational institutions.

Through low-impact and temporal interventions in the deteriorated urban fabric, the plan aims to avoid large-scale developments, postpone gentrification tendencies, but provide a landing platform for new actors to enter the area.

Formation of mixed use productive clusters is seen as the key development pattern for large parcels of land previously occupied by factories.

With the municipality agenda resisting the growing pressure from the residential sector and embracing reoccupation and repurposing of the underutilized structures and lots, and small-scale but heterogeneous private investment, the first stage of revitalization can be underway in relatively short terms.

Reparcelization and improvements in pedestrian and cycling permeability are essential for the establishment of new communal spaces and accessibility for the future commuters. Letting small-scale enterprises enter the area first, will provide opportunity for economic growth and social mobility, while also increasing the city owed land value for the future redevelopments.

Marrying cultural services with light manufacturing and IT sphere in unique post-industrial setting will result in creation of vibrant socio-economic fabric with important commute and leisure destinations.

Temporal repurposing of existing structures in the area will give opportunity for new enterprises to start growing without large investments. Within 7 years a new vision for polycentric development of Kyiv can be researched and consolidated, while a deprived area will improve its public image and gain social capital, positively impacting the entire district and similar zones around the city.

With careful and inclusive strategy involving multiple actors from diverse social layers the existing underground culture will remain thriving complimenting the economic growth.

Existing cadastral division



Reparcelisation outlook







**Karz 12 site**





## The challenge

Karz-12 site, a former automobile repair factory, is selected to accommodate the project of a temporal intervention and display the methods and values represented in the regeneration model for the area. Owned by a major developer company, the plot will be cleared out within the next several years making way for a mid-rise residential complex. The challenge of uncertainty and imminent demolition, morphology of the industrial structures and relationships between the current stakeholders are setting the conditions for the architectural precedent to showcase the potential of reclaiming and repurposing a wide range of contextual elements while reactivating the site and transforming the locality.

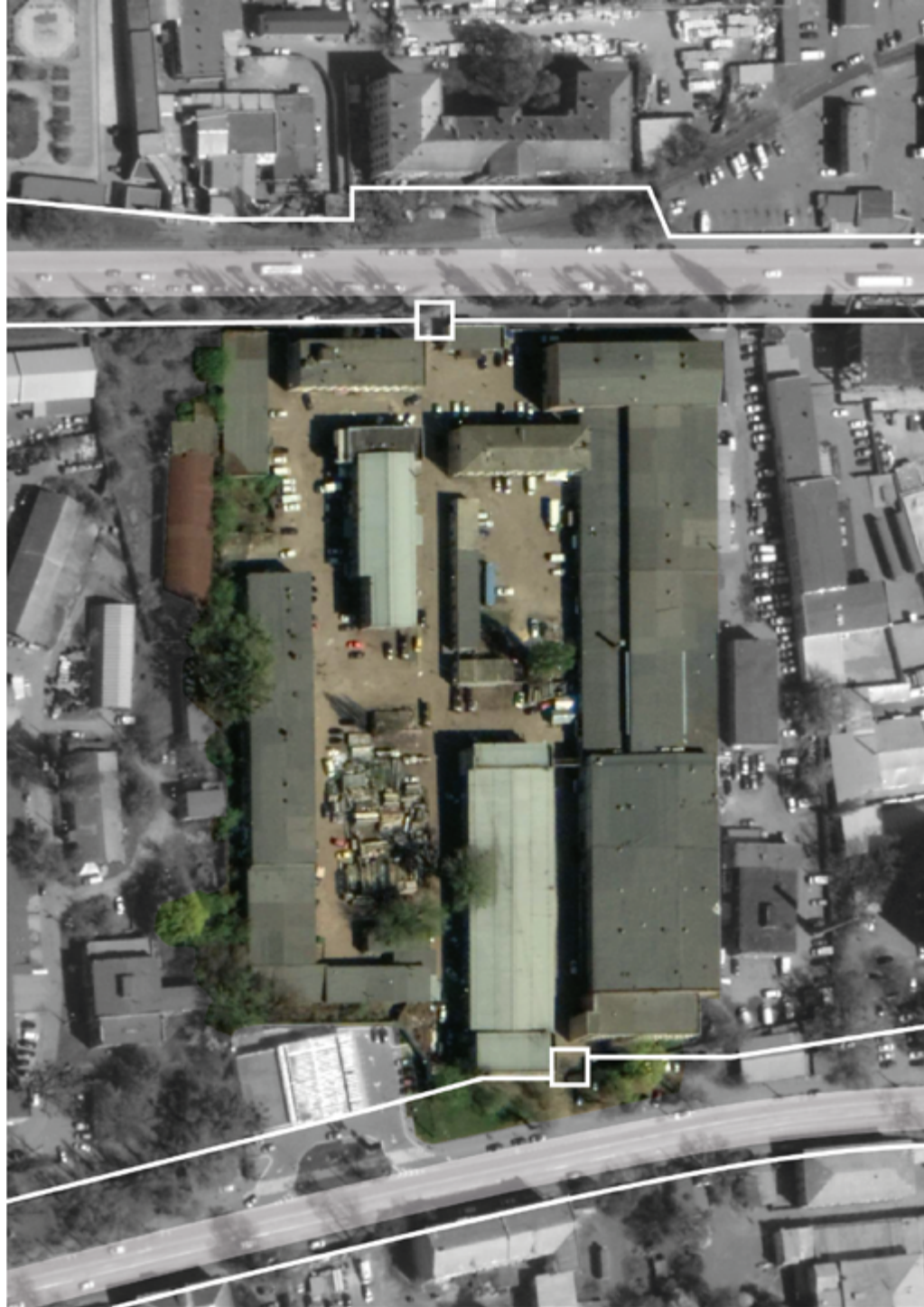




## Site situation

Public transportation is present around the site, but lacks inclusive accessibility. Large block (around 2km in perimeter) and hostile broken urban fabric remains impermeable for the pedestrian.





## Accessibility

The site has two guarded entrances on both Kostyantynivska and Kyrilivska streets. The access by car is limited, while the pedestrians may freely share the path with the automobiles. Both entrances are extensively covered with advertisements of the businesses occupying the site, but it remains unobvious how to navigate the former factory and the usual pedestrian traffic does not penetrate it. Visually hostile, it performs as a barrier despite possessing a direct connection between to major streets right in the middle of a large block.



## Contingent

The overall deprived appeal of the locality did not repel a wide variety of businesses from entering a former industrial site. Cheap rent and remaining infrastructure allowed small and young companies to occupy under maintained and sometimes fully abandoned buildings.

The structures are currently owned by a developer company and are facing demolition; nevertheless, young and creative collectives alongside with rather conventional enterprises are currently sub-renting them from the temporary owner. There are more than 20 companies present at Karz12, including an urban planning firm, furniture design atelier, multiple automobile service and active entertainment business. The community had its prime moments when organizing public events and festivals, but the overall situation on the site remains segregated and almost never performed as an economic cluster.

The public realm the businesses are sharing remains neglected and unappealing and the developer was not concerned with the quality of space occupied by the tenants. The current character and qualities of the space remains a valuable asset as the public image of the future residents (developer's clients), as well as for more than a 100 people who commute there every day.





## Planned development

While the former Karz-12 plant is facing, the project for the upcoming block of flats had been developed and is waiting for the developer to negotiate the permits. The process involves multiple levels of corruption in a highly dys-functional bureaucratic system. The environmental and sanitary conditions of a contaminated post-industrial locality and proximity of large-scale functional pharmaceutical factory only appear as a barrier on paper for the developer.

The new residential complex had only been announced targeting the upper-middle class investors and appears as a flagship of the upcoming gentrification of the area. The developer neglects all the values and unexpected transformations the site had gone through since the collapse of the Soviet Union and perceives the former factory as a tabula rasa lot for short-term revenue return.



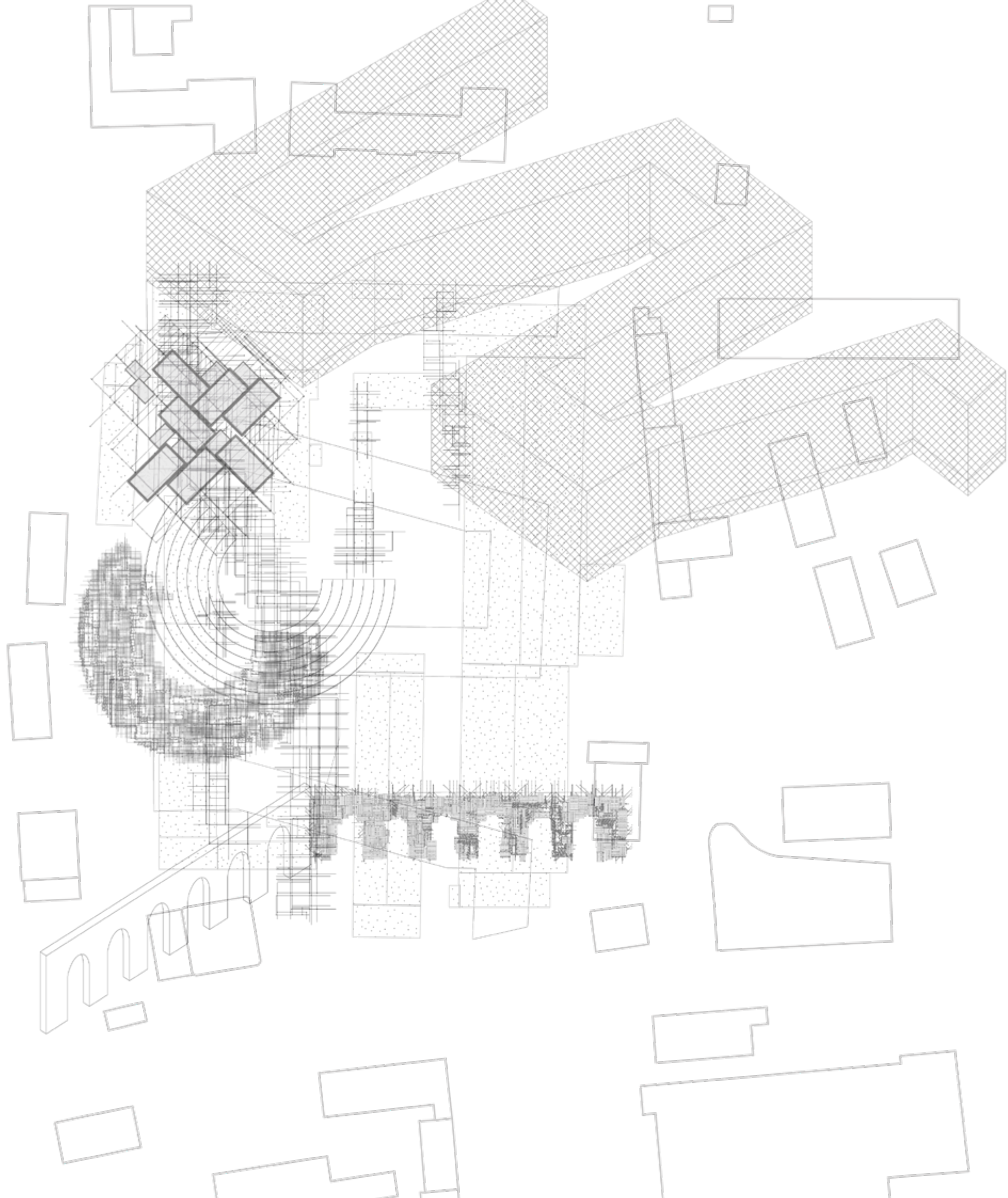
## Outlook

Real estate market remains the only stable and reliable pool for investment in Ukraine since the very start of its modern independent history. In 2021 the construction market is booming, especially in Kyiv. The densification of expansion of the city is taking an extremely dangerous turn, as the supply of new real estate exceeds the predicted population growth ratio and neglects the capacity of the existing infrastructure.

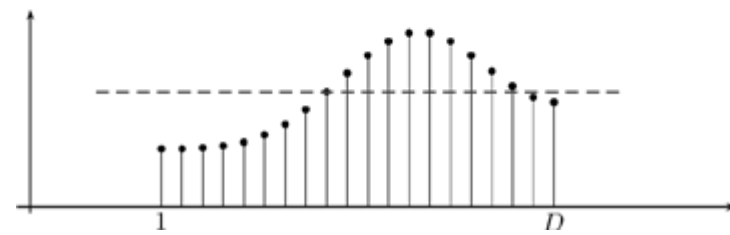
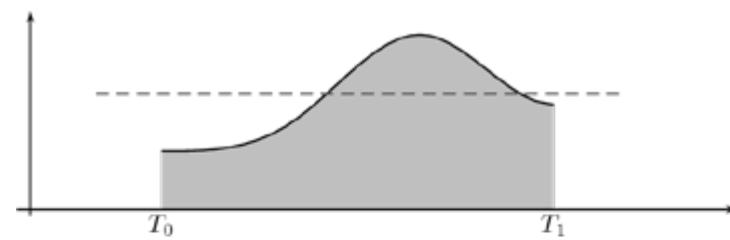
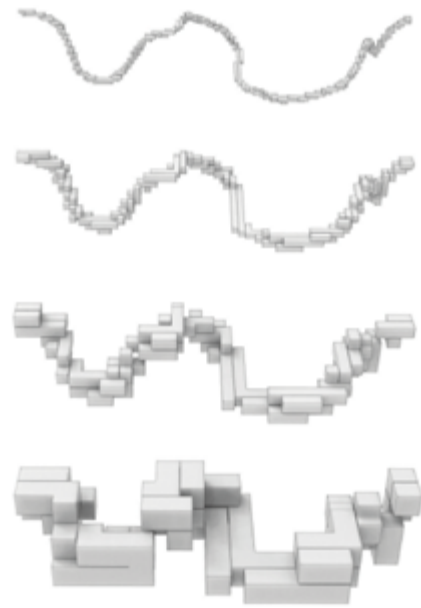
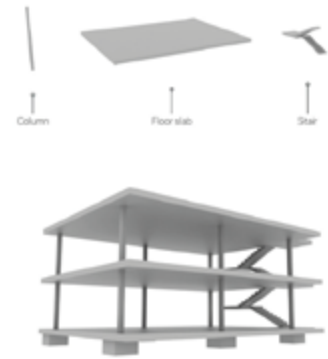
The deprived post-industrial Podil area is an obvious illustration of how strictly mono-functional bottom-up development fell in decline. The current pandemic crisis and upcoming economic precarity will most certainly destabilize the construction industry and the real estate market bubble.

This outlook suggests that the cycles of economic and societal transformation are only going to accelerate, making further development plans even more uncertain. It is impossible to estimate when the post-capitalist future might disrupt the status quo top-down realities of the real estate market, but strictly defined large-scale architectural typologies will most certainly fail to adapt to rapid metamorphosis of the contemporary city.





## Architectural Precedent



## Discrete Architecture

Discrete digital architecture is evolving in response to the trends of computational automation that is starting to transform the design and construction industries. The parametric continuity of architectural form established in the 90s is now being challenged by the discrete continuity, which emphasizes the organizational rules of the bits and parts, rather than unified surface flow. The part or the voxel is sterilized from conventional architectural meanings and is intended to be read as a regular digit of the aggregation. Each iteration of such computational assembly is defining the overall form of the structure, while the elements gain meaning by playing a particular role assigned by the algorithm.



### Concept diagram

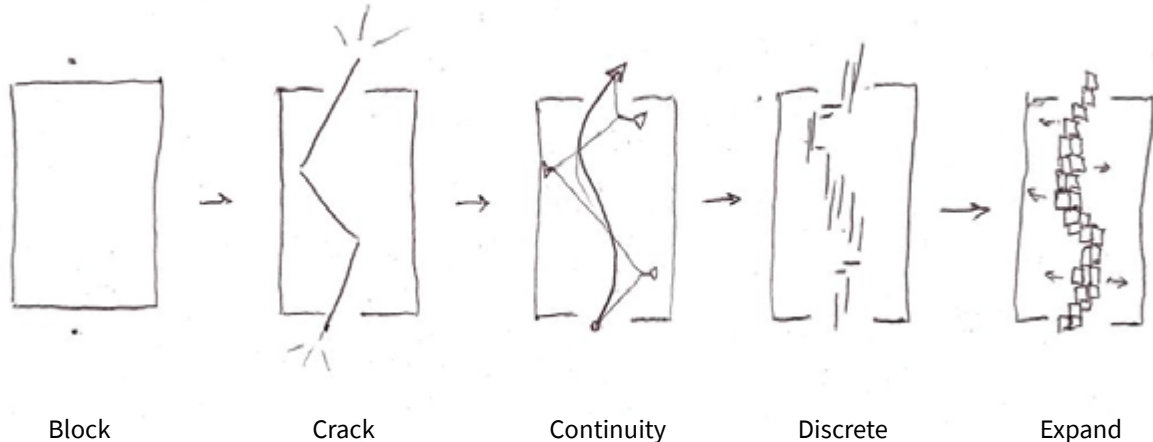
The sketch is describing the sequence of notions applied to the previously described site.

The Block, as a large and impermeable part of broken urban fabric is being cracked open in order to reveal the processes that had "contaminated" it.

The flow of new activity and traffic within the crack is expressed through continuous quality of Greg Lynn's parametric curve.

The content of the traffic flowing the channel is described through the discrete parts of the continuous curve.

The parts evolve and continue to populate the site and expand in multiple dimensions and directions.



The part?



Steampunk pavillion by Fologram, Igor Pantic, Soomeen Hahm Design



Discrete part by Gilles Retsin

## Discrete parts

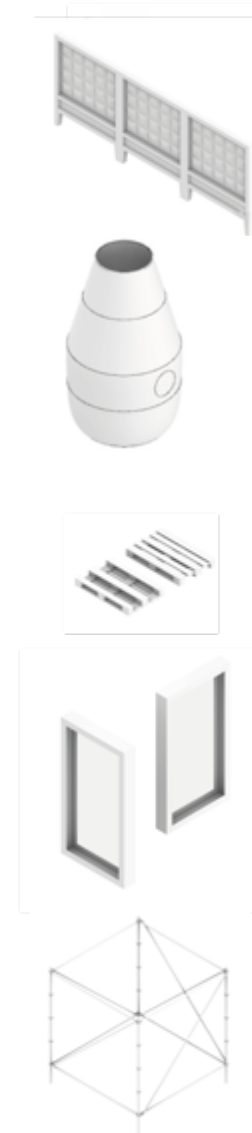
Clean and sterile, 'lab-grown' parts of the digital discrete architecture are a subject of the contemporary discourse on the topic. Designed to reflect the current trends of automation in the construction industry, they often remain ignorant of the potential context.

## Cultural context

The culture of informality in the public realm, self-built structures and additions to the buildings are widely spread around Kyiv. Unprecedented amateur architectural solutions and use of reclaimed materials and items are driven by economic deficit and public ingenuity. Often viewed as parasitic and distasteful, they present an extremely valuable cultural layer of the given situation and can potentially be encoded in the future planning and design solutions.







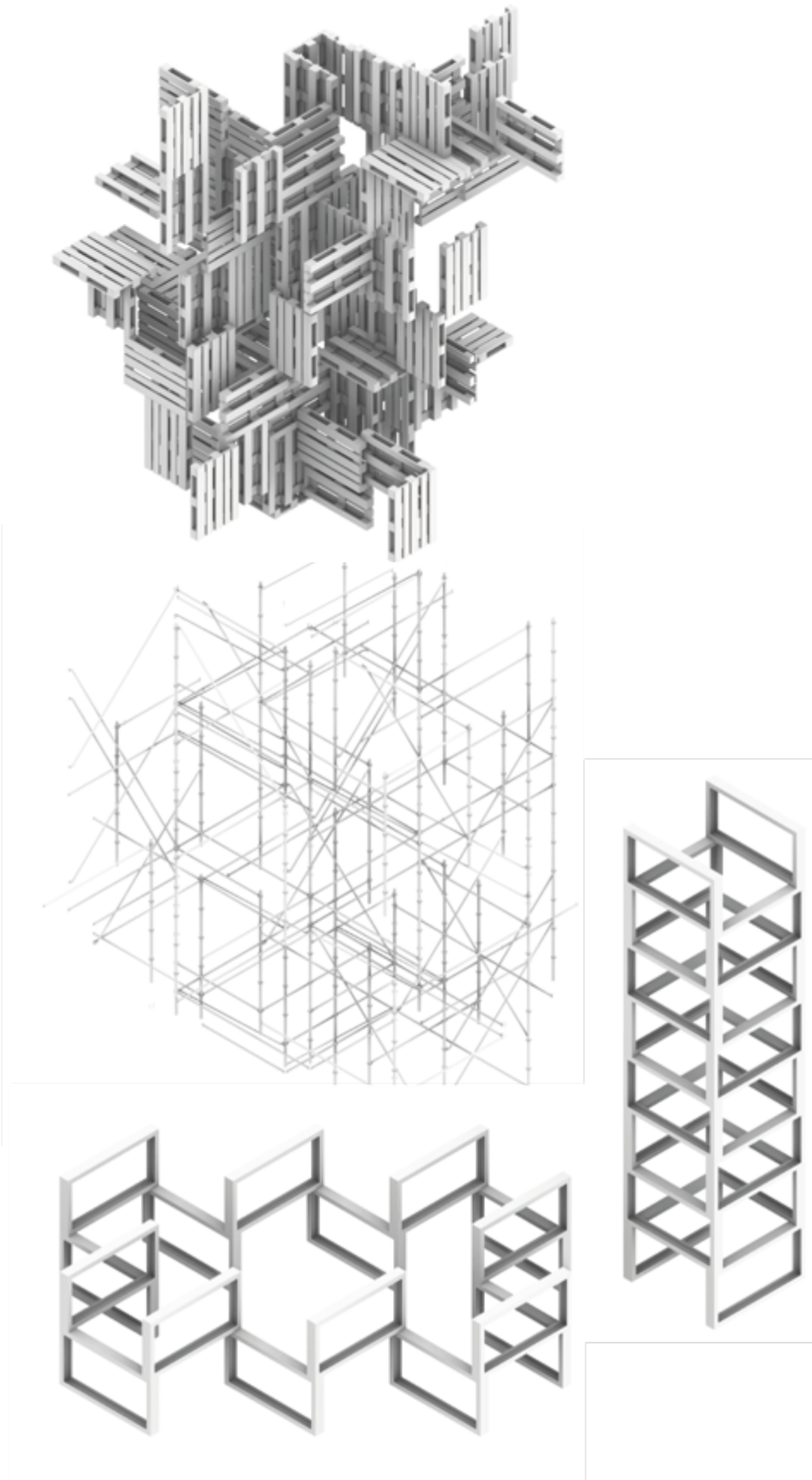
## Immediate site context

The interspaces within neglected post-industrial areas are often filled with debris and abandoned structural elements. The Karz12 site happens to have a pile of used **billboards** and countless other items.

The concrete **PO-2 fences** blocking new potential routes through the site are almost symbolic within the post-Soviet urbanscape, as they were mass produced and used in wide variety of public buildings.

The less obvious, but the most important layer of site context is the upcoming construction of a housing block. The elements of construction infrastructure such as **scaffolding**, **concrete mixers** and **cranes** also carry a strong character of transformation and expansion.

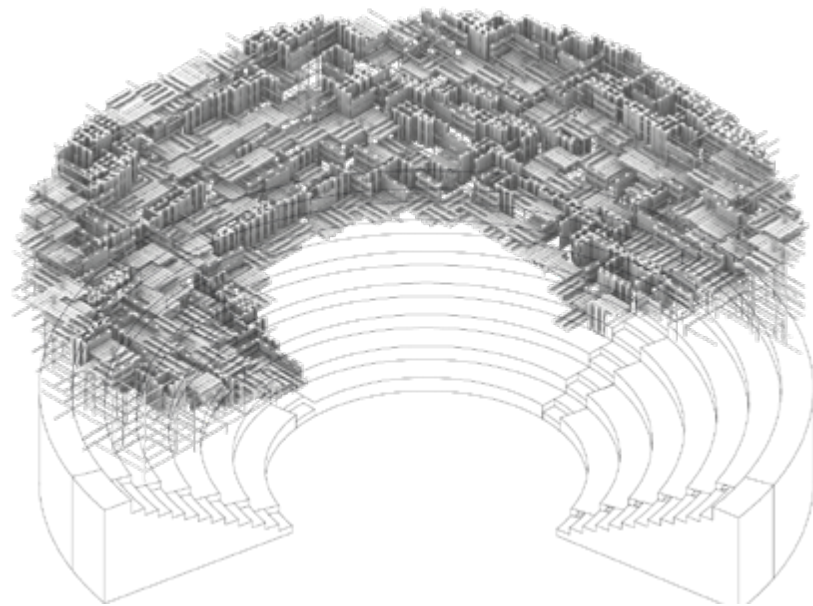




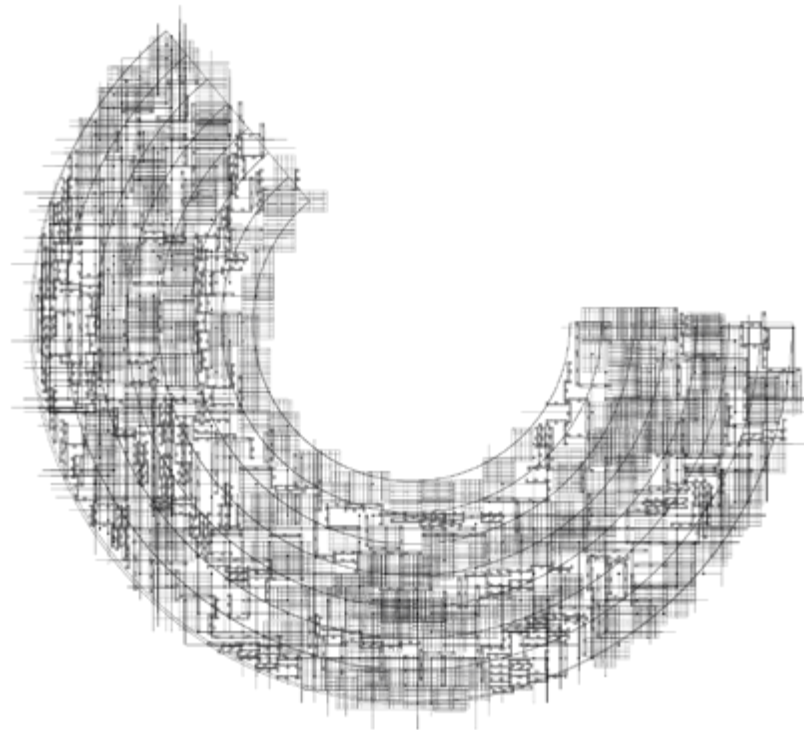
## Context-driven discrete parts

The bits and pieces collected from various dimensions of the physical and cultural context are implemented in the aggregations of discrete architecture. The algorithmic solution present possibilities for illustrating continuous and ever expanding structures infiltrating and feeding on the objects and meanings found derived from the situation.

These iterations illustrates the attempt to find an architectural typology that will evolve and expand within the cracks of neglected urban environment, expand and contract, and accommodate diverse public programs in a universal manner.



NW isometric view

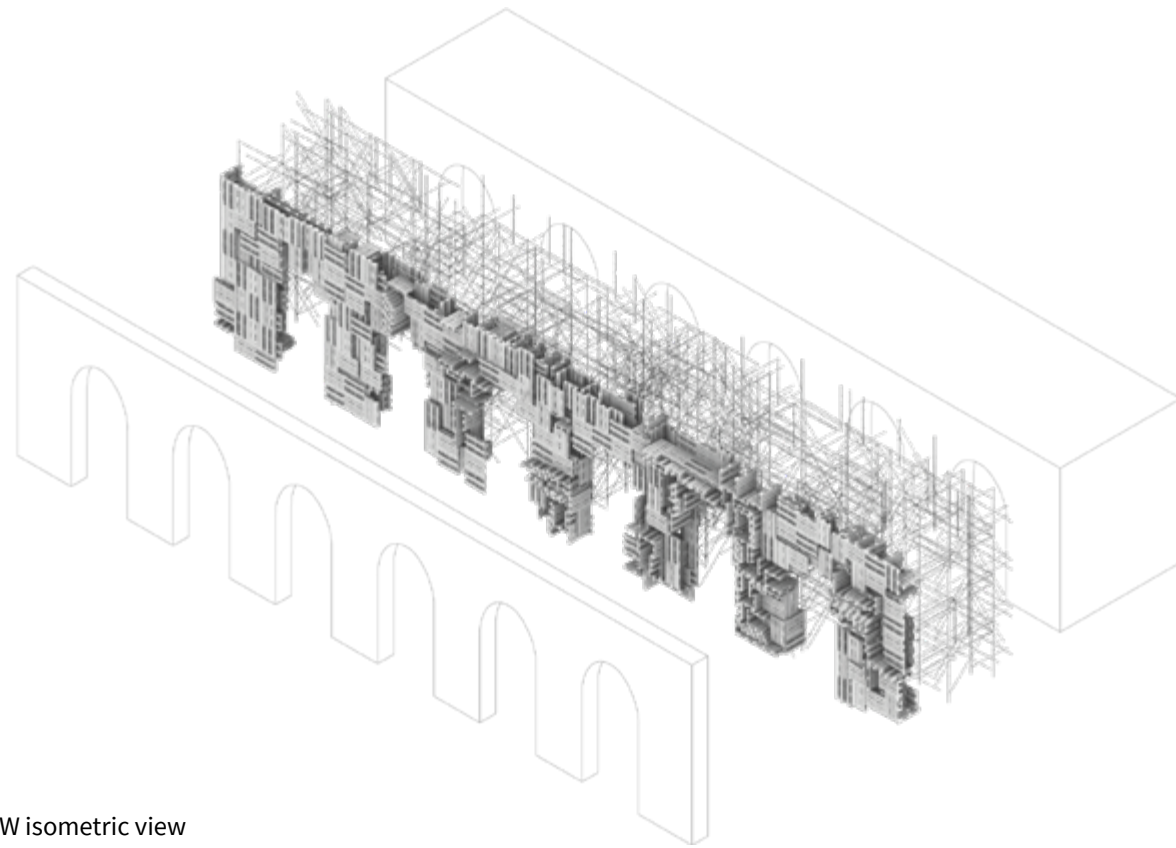


Top view  
Scale: 1:300

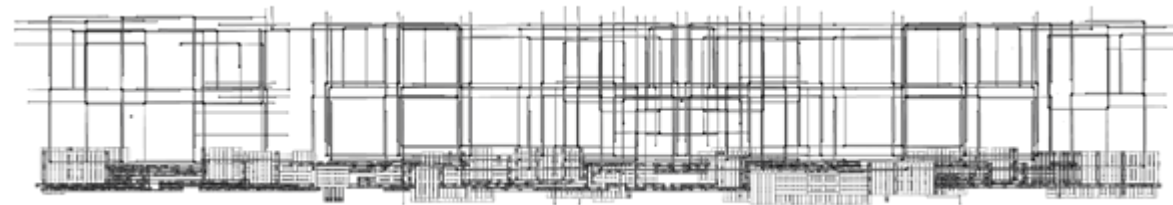
## Amphitheatre scenario

The symbolic meaning of the classical amphitheatre is interpreted by the discrete structure generated from reclaimed wooden pallets and scaffolding to become a central gathering and event space at the heart of the site.

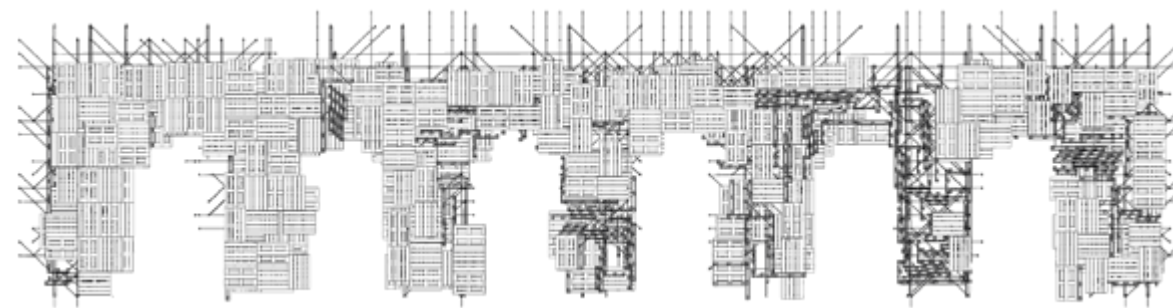




SW isometric view



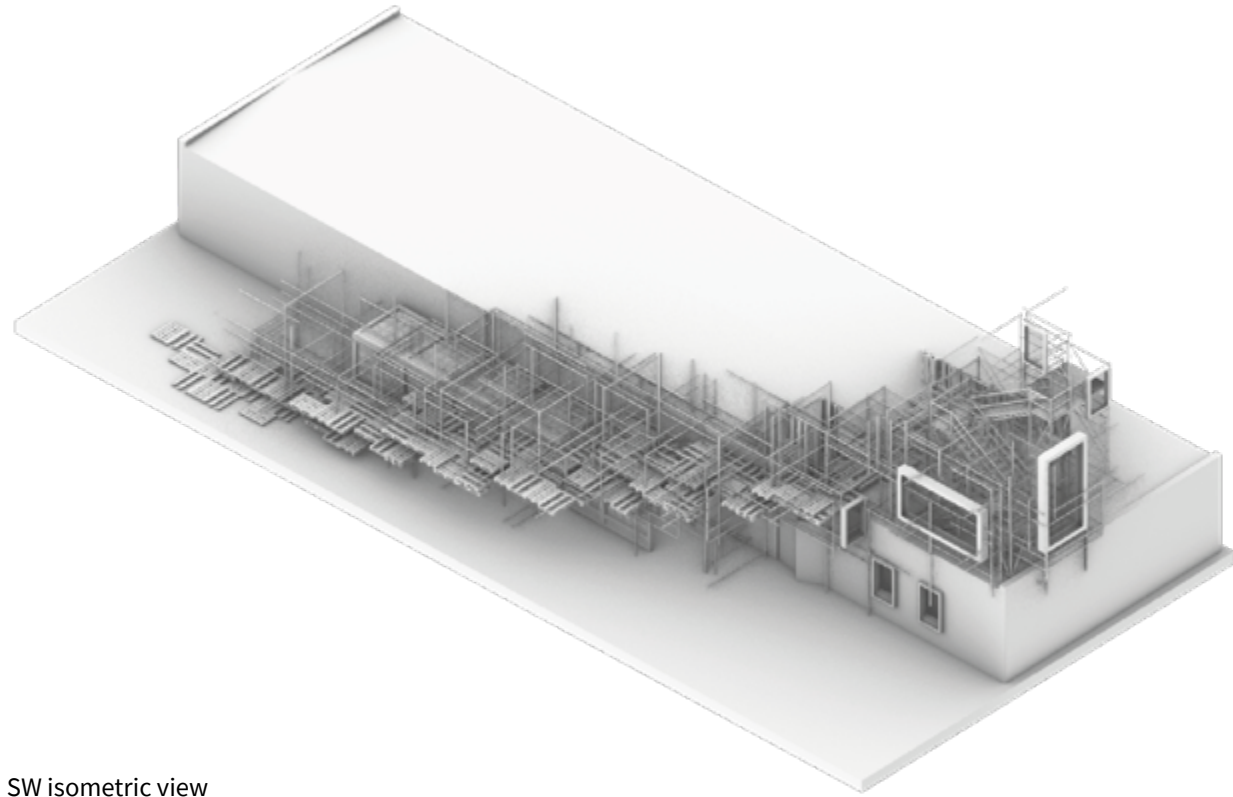
Top view  
Scale: 1:300



SW elevation  
Scale: 1:300

## Arcade scenario

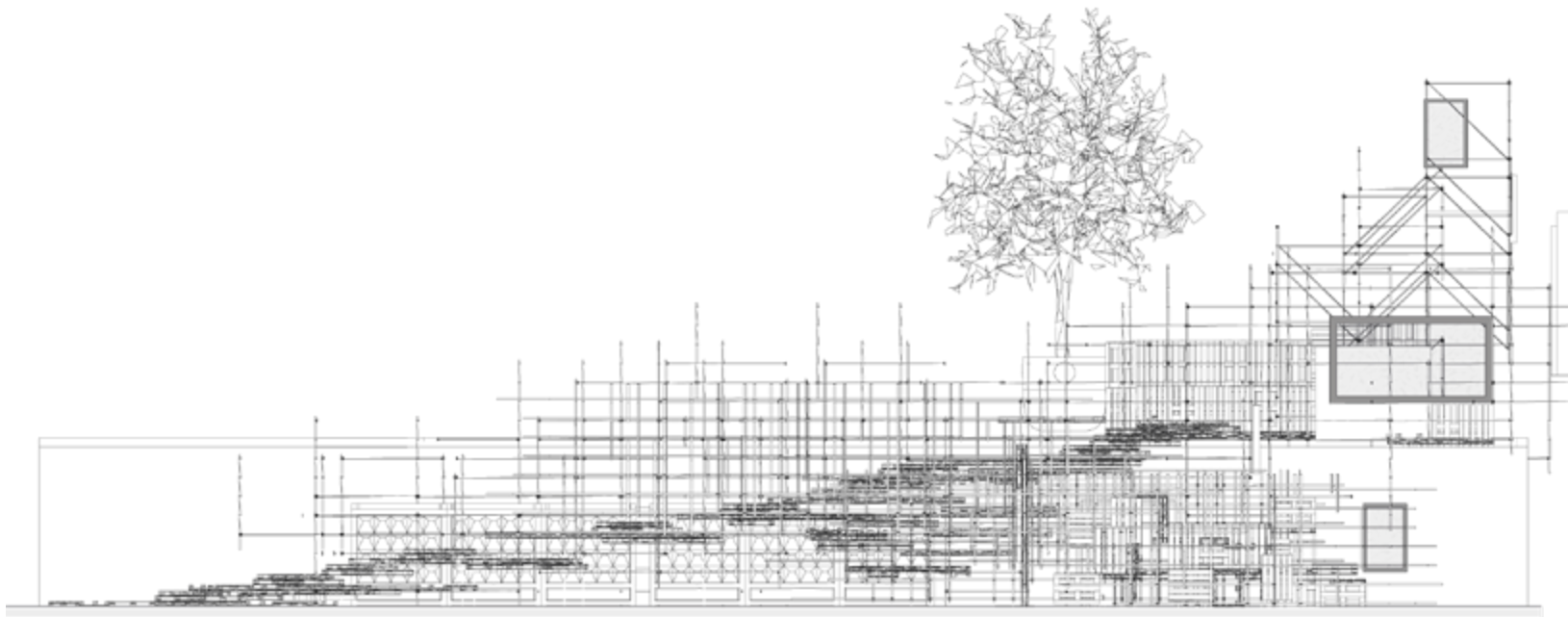
Another classical element translated to become a framework for commercial areas and various public amenities.



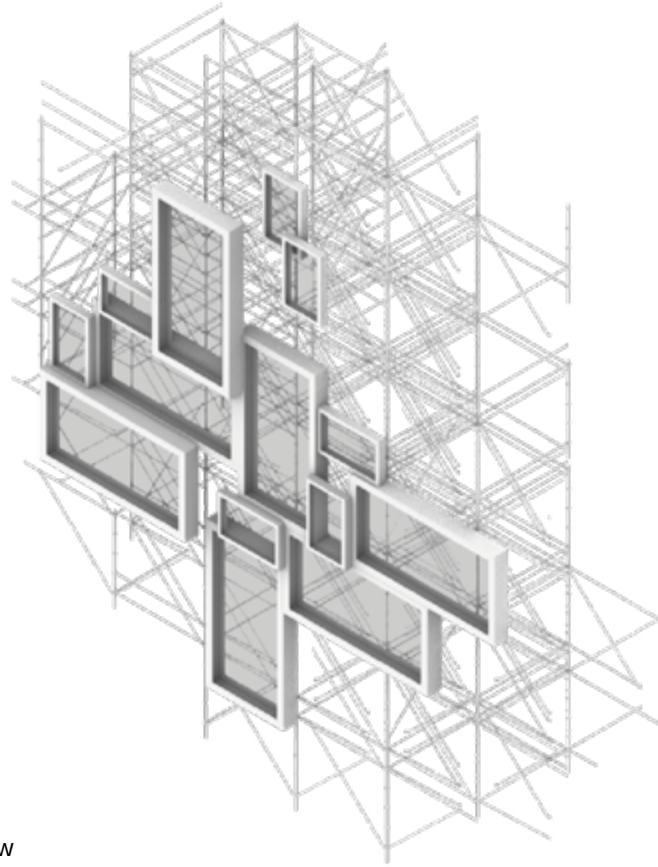
SW isometric view

## Warehouse parasite

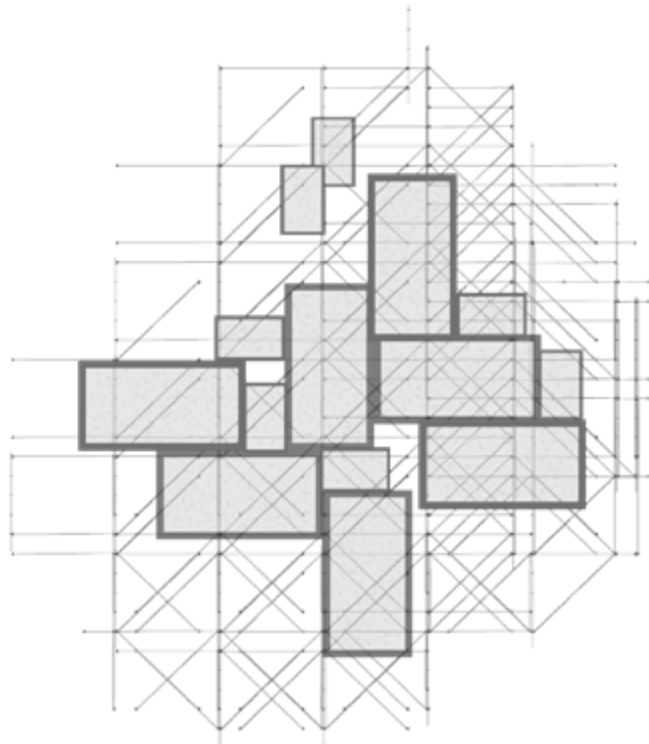
This scenario illustrates the possibility for the generative construction to occupy spaces around and within volumes of existing abandoned buildings, utilizing the remaining structures and completing some of its missing elements (e.g. used billboard becoming a new window frame).



SW elevation  
Scale: 1:300



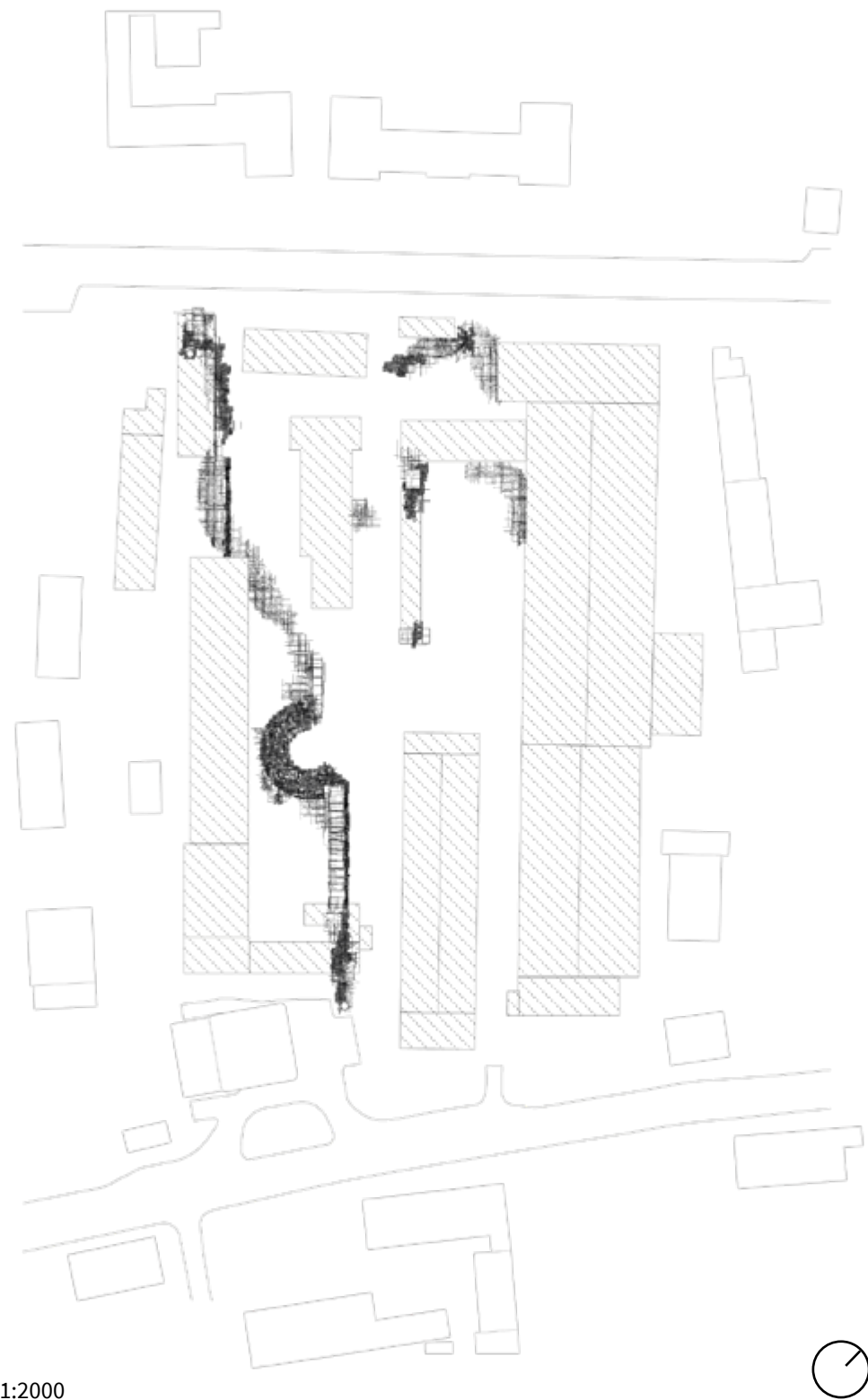
SW isometric view



SW elevation  
Scale: 1:300

## Billboard exhibition

A pile of used billboards of various sizes accumulated in the middle of the underused courtyard of the former industrial site. Reclaiming the trashed advertisement panels presents an opportunity to create an exhibition layout operated by local artists.

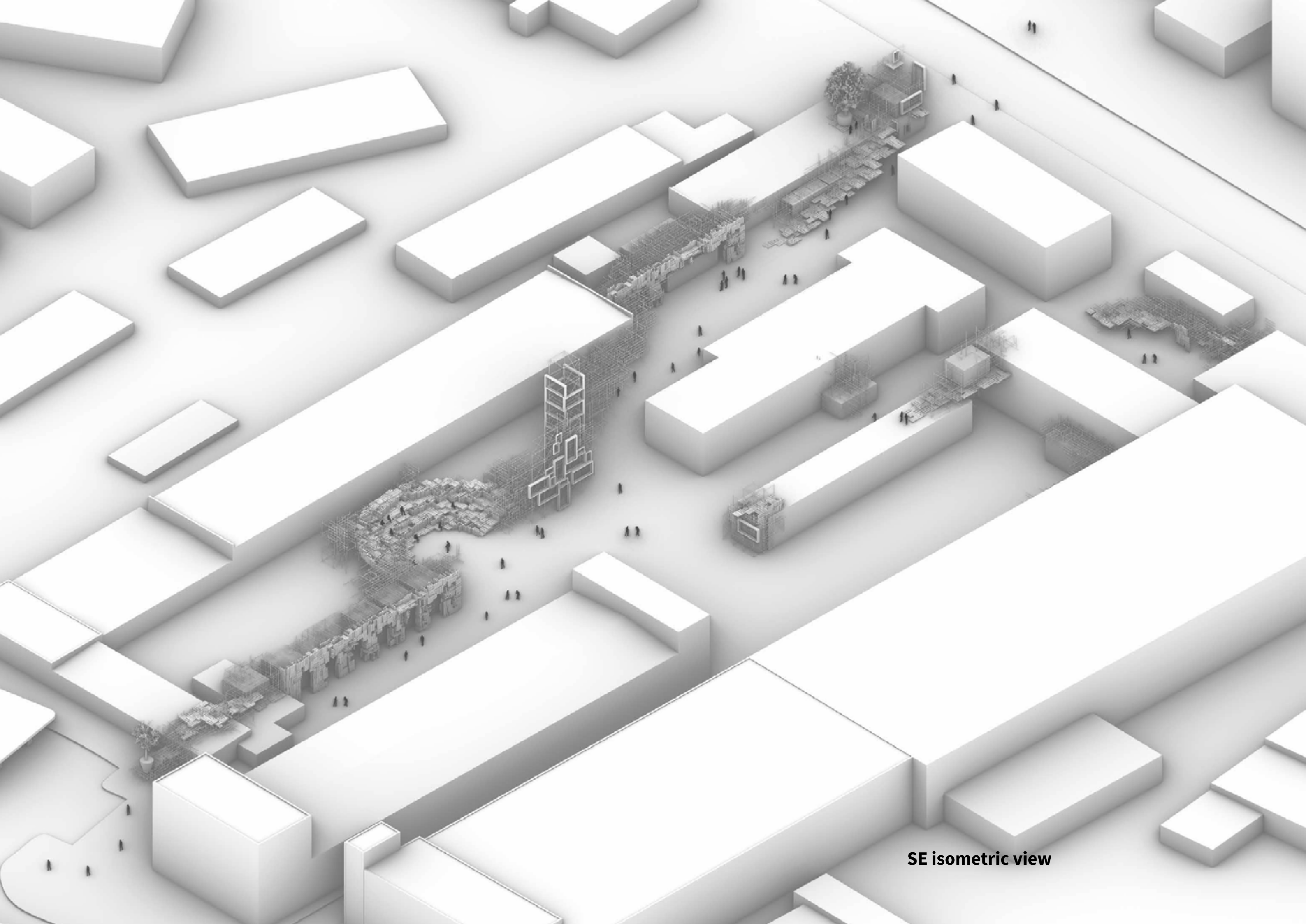


Scale: 1:2000

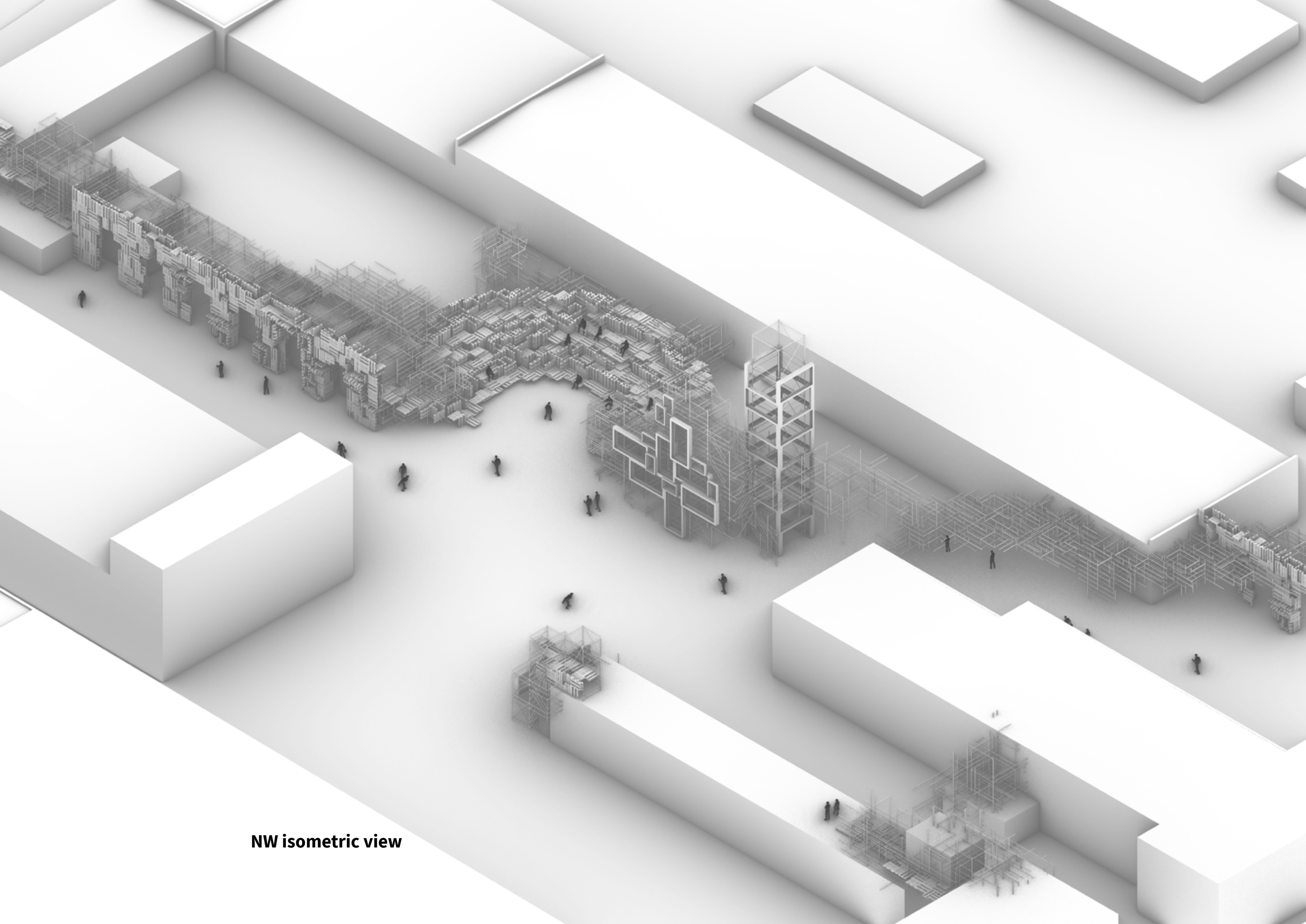
## Site plan

The top view of the parasitic architecture accommodating commercial and cultural activities. The drawing illustrates the continuous flow of temporal structures in the crack of the urban fabric of the former industrial site.





SE isometric view



**NW isometric view**





**Northern entrance view**

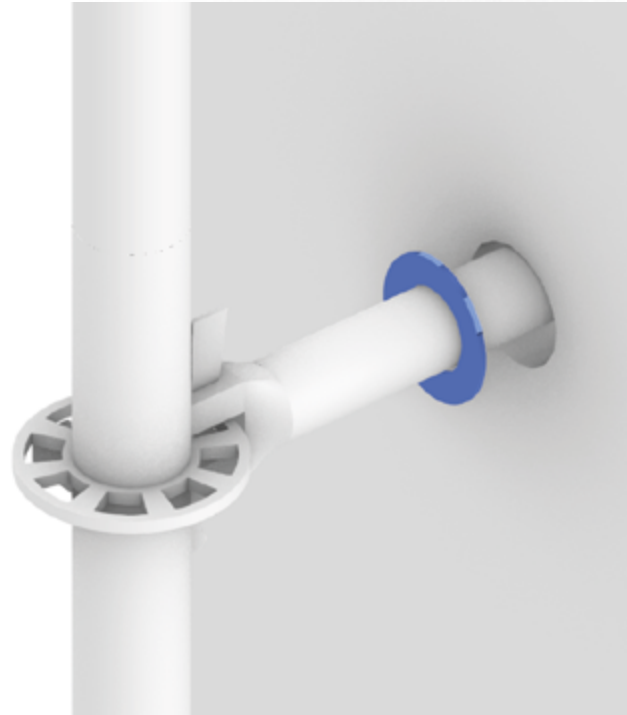
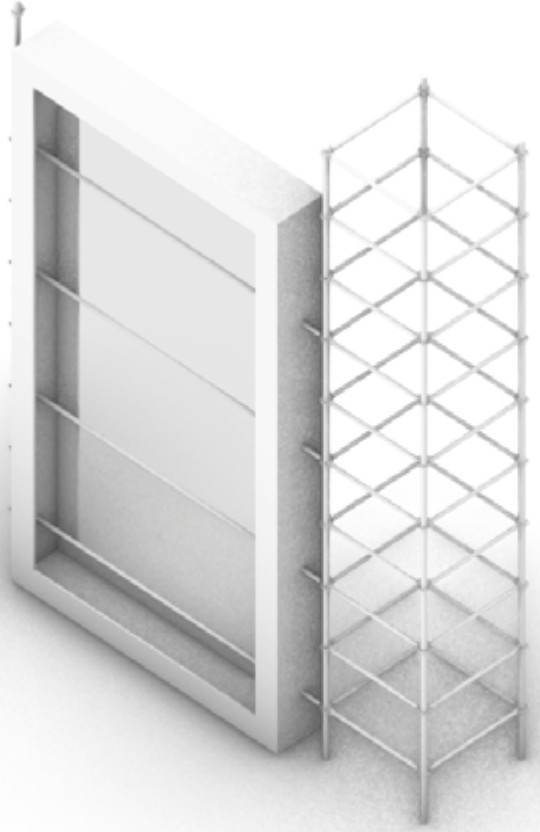


**Amphitheatre view**

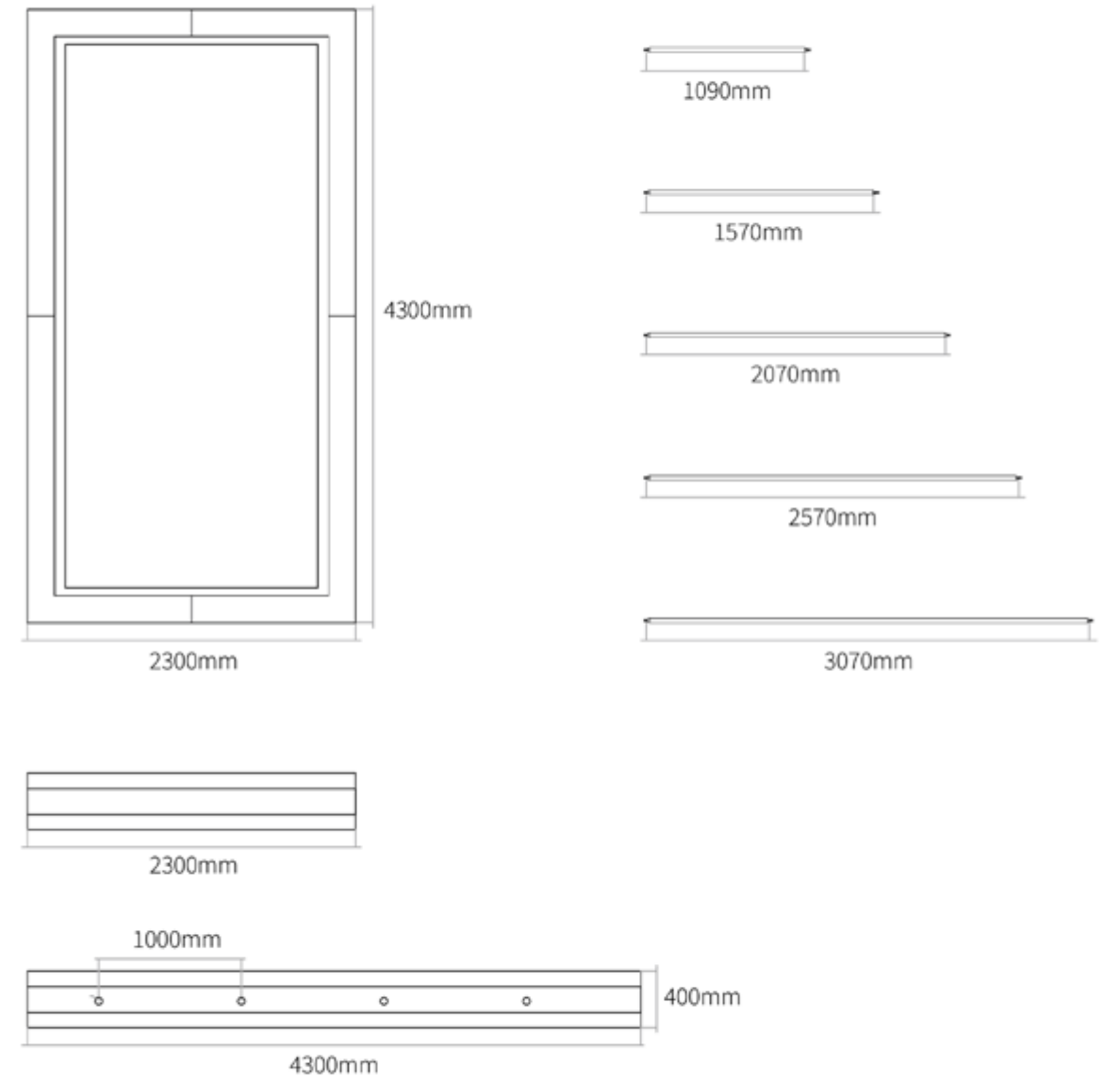




**Billboard tower view**



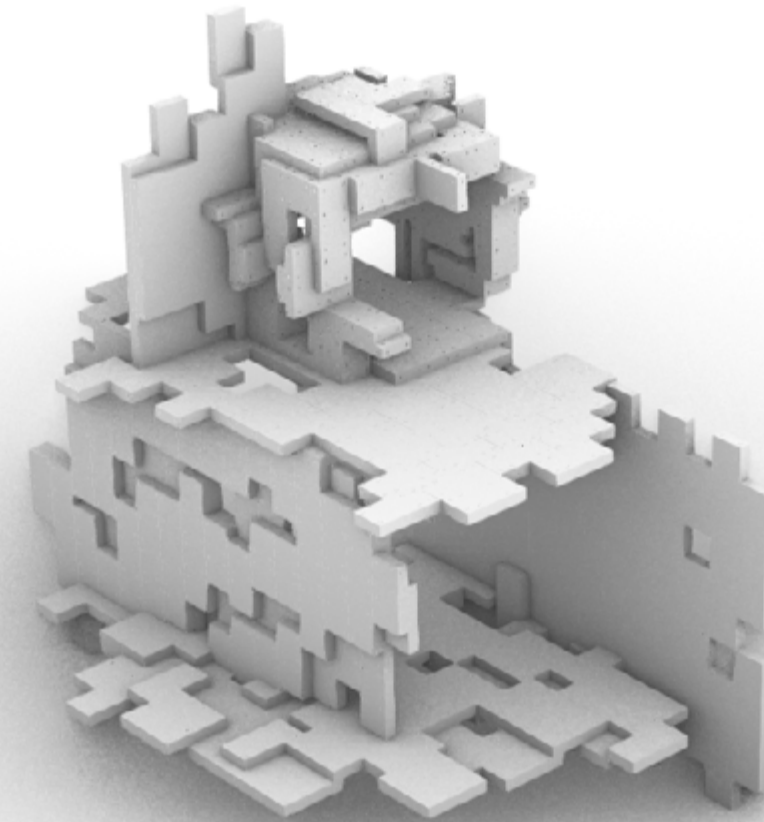
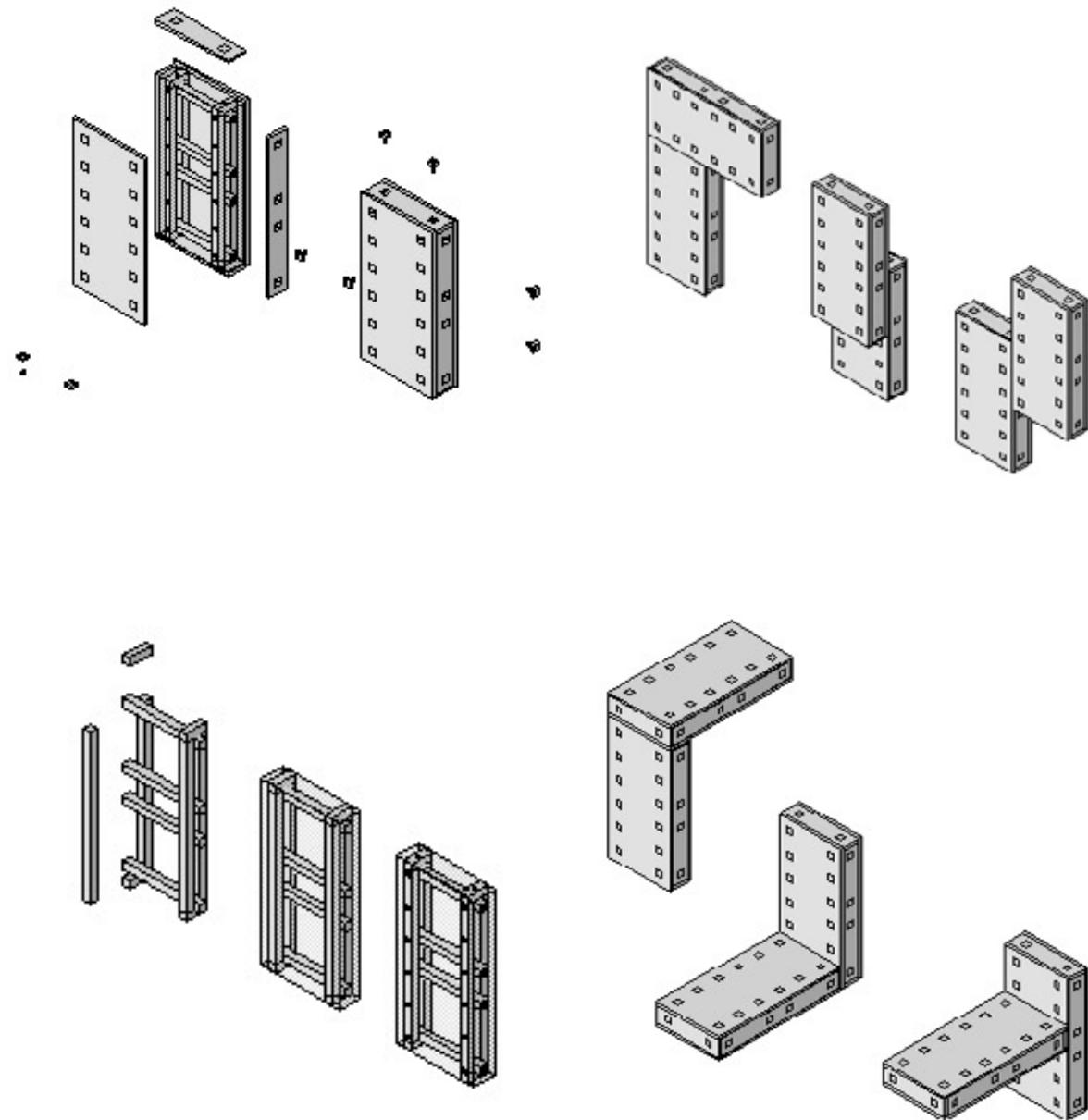
**Billboard connection**



Scale 1:50



## Hempcrete panels

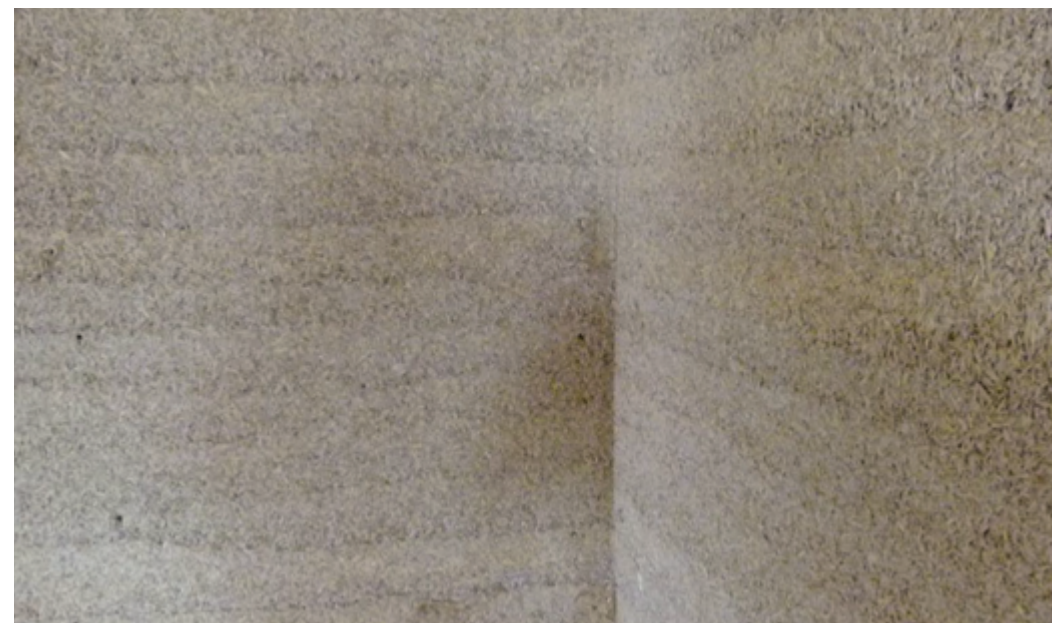


# Material report

Hemcrete – is a bio-composite material consisting of hemp hurd, binder, and water. The exact ratio between the three components vary depending on the binder chosen for the solution. Preparing the mixture does not necessarily require any specialized machinery and can be done in any waterproof container.

The “basic” hemcrete mix slightly varies in the proportion of binder to hemp hurd according to the binder manufacturer recommendations. Increasing the proportion of the binder in the mixture will produce a higher-density material (usual hemcrete density = 275kg/m<sup>3</sup>) performing higher structural strength, but reduced isolation value. On the other hand, the same volume of hemp hurds mixed with lower amount of binding component will make hemcrete lighter and less structurally sound, but improve its thermal characteristics.

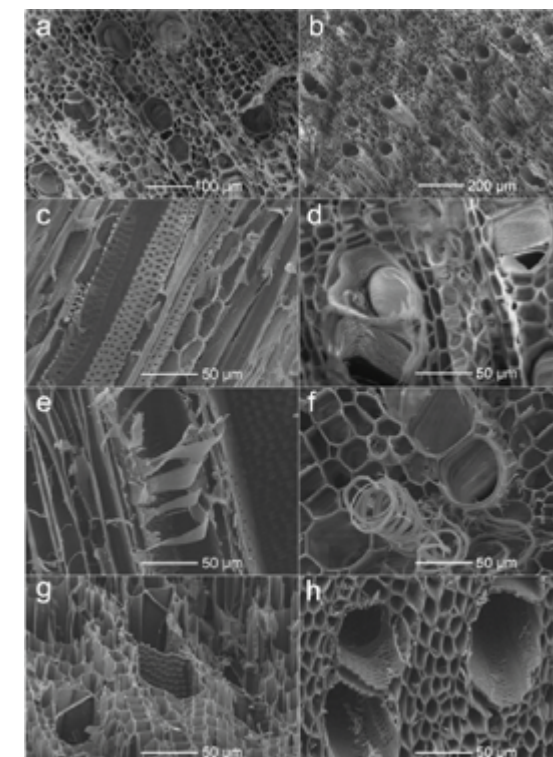
Various combinations of naturally occurring lime products are often mixed with pozzolans or other additives. The manufacturer also formulates the composition of the hemp hurd base with additions like paper pulp or other alternatives.



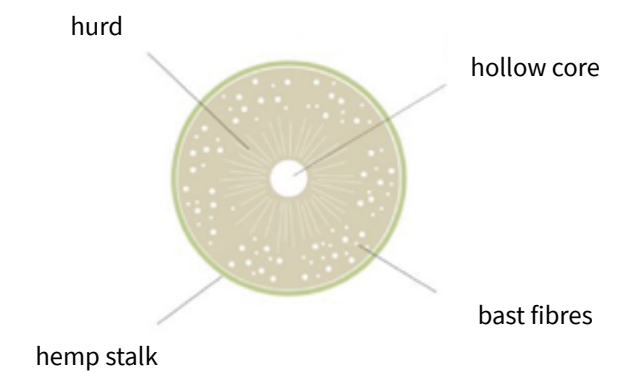
## Hemp hurd

Industrial hemp can be harvested up to four times a year depending on the climate, requires low amounts of water and absorbs CO<sub>2</sub> while growing 150 times faster than trees. The inner woody core of its stems is a source of a material called “shiv” or “hurd” (Figure 2a) has a unique property to bind with lime. Such mixture of plant-based fibres with aggregate and water produces a stiff light-weight bio-composite with exceptional insulating properties. Negative carbon footprint, low levels of embodied energy, biodegradability and recyclability make Hempcrete a highly sustainable material with wide range of potential applications in contemporary construction.

In order to extract the desired hurd, the chemical process of breaking down the structure of the plant has to be facilitated. So-called “retting” can be launched naturally – the stalks are left to rot for several weeks until the fibres separate, but not degrade and lose their qualities. Water retting can be applied as a more reliable, but recourse demanding alternative. [1]. Sorted, dried and packaged (Figure 4) hemp hurd is ready to become the base ingredient for the hempcrete composite. The material can be delivered and mixed on site or processed in the facility producing prefabricated construction elements.



hemp hurds fibres



dried hemp hurds



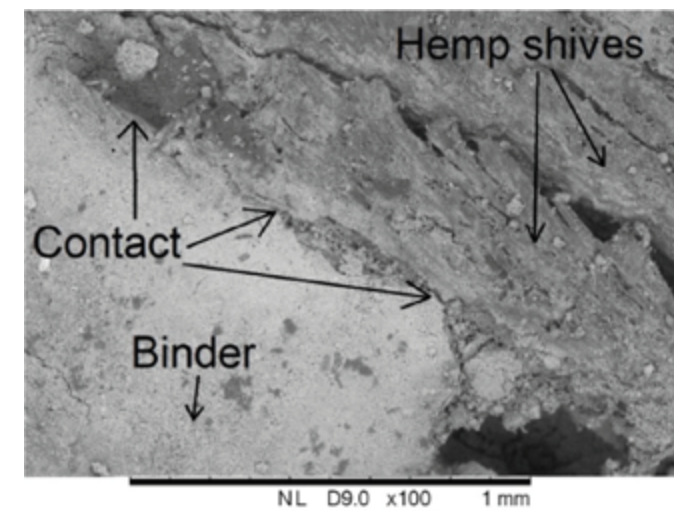
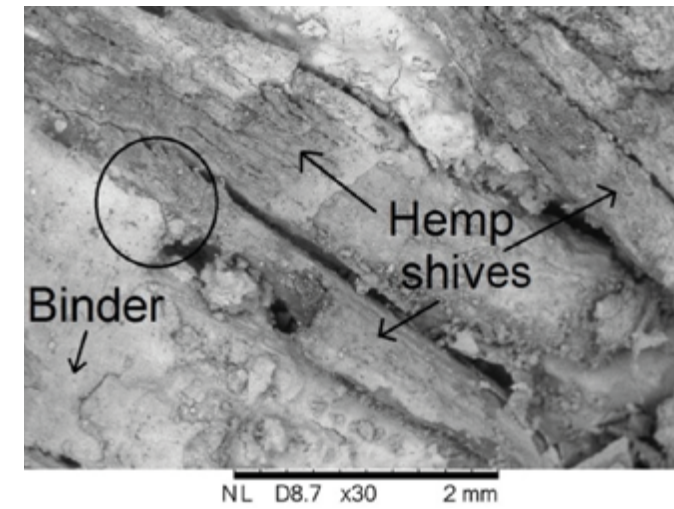
## Lime Binder

The choice of binding component for the composite largely depends on the condition of solution preparation. Hempcrete for the structures cast on-site is mixed and applied immediately requires different types of lime to the one used for pre-cast construction elements. Pure air lime and hydraulic lime may not be sufficiently strong to support the weight of the wall while it dries, but it is perfectly suitable for pre-cast applications, such as production of hempcrete blocks and panels. Natural cement is extensively used for cast-in-situ method, alongside with the binders developed specifically for hempcrete recipes. Such proprietary formulas usually include air or hydraulic lime and a proportion of Portland cement and result in order to enhance the setting process.



The essential hempcrete binder qualities are based on the structural strength of the cast element and its hydraulic performance. The main requirements are:

- **Strong hydraulic set.** To provide enough strength for the mixture during its initial set in order to support the weight of the cast hempcrete wall.
- **Vapour permeability.** To allow the water to continuously evaporate from after the initial set.
- **Structural strength.** To ensure the stability of the hempcrete structure through the full set process.



binder and hurd contact

## Material Properties

Extremely low embodied energy, high thermal mass (average **Thermal Capacity: 1000 –1560 J/kgK**) and exceptional insulation characteristics of hempcrete set it apart from other building materials. [4]

The proportion of binder and the hemp hurd and the degree of compaction of the hempcrete are playing a major role in thermal performance of the finished cast material, with a lower-density hempcrete performing significantly better. [2] Hempcrete cannot be compared to other lightweight insulation material by thickness, as it usually fills up the whole depth of the wall.

When tested on-site hempcrete repeatedly outperformed its lab achievements. In the dynamic context of real building, the combination of thermal mass and insulation play a role along hempcrete's hydrothermal behaviour – a property resulting from the interaction between humidity and temperature.

Therefore, hempcrete's vapour permeability and hygroscopicity are directly linked to its thermal performance. The hempcrete wall absorbs the water vapour from the surrounding air and the condensate in the pores of the hemp hurds, with average **Water Absorption Coefficient (capillary): 0.0736 – 0.15 kg/m<sup>2</sup>/s and Moisture Diffusion Coefficient: ~ 1.10<sup>-9</sup> m<sup>2</sup>/s**. [4]

As a plant-based organic material, hempcrete is vapor permeable in contrast to conventional synthetic building materials developed to form a barrier against humidity. Such technologically advanced and expansive materials often fail to perform on the long run, while hempcrete's cellulose-based aggregate and its porous structure allows it to repeatedly withstand absorption and desorption of moisture almost indefinitely. Its high **Water Vapour Diffusion Resistance Factor: ~ 4.85** makes it resistant to water ingress and even perform when directly exposed to the water source.

The plant-derived base of hempcrete is enclosed within the mass of lime binder, which makes the material highly fire resistant. Lime-based mortars display clear and definite carbonation boundary, but in case of hempcrete, a certain degree of irregularity is present due to variable intra-particle porosity of the hemp hurd aggregates. [5]

The way hempcrete is cast around the wooden framework also creates the barrier the inner structure and potential fire. The structural stability of the wall only decreases under the impact of fire in case the inner wooden frame is unable to withstand the load, while the integrity and insulation properties of the wall do not fail prior to structural collapse. [2]

The fire resistance tests indicate that the proportions of the initial mixture and the presence of finishes on the wall surface have a substantial impact on hempcrete's performance under the fire. The data provided by the experiments suggests that hempcrete is suitable for application in situations where 60 minute fire resistance is required, while alteration in the binder to hurd ratio and the specified properties of the finishes can increase it to 90 or even 120 minutes.



## **Concluding statement**

The architectural precedent responds to the specific conditions set in the brief, by proposing a light, flexible and disposable structure, temporarily utilizing the elements used in conventional construction processes (scaffolding, crane towers, fencing, etc.). The proposal is intended to accommodate a cultural and commercial program that can become an attractive investment for the current owner of the site, but at the same time contradict the character of the future residential development and gentrification processes.

The study is aimed to rethink construction processes in the city as a new medium for architecture of in-between the site and the finished structure. The lifespan of the building and the entire city is viewed as a trace of anthropogenic activity and the new perspective is taken on the development processes as constant metamorphosis. Therefore, the temporality of physical presence, utilitarian value and cultural impart of constructed volumes is set as the main subject.



