居住在基礎設施

inhabiting the infrastructure

an alternative urban model for ShanShui cities

/ Ottavia Valz Gris /

supervisor_Mauro Berta
cosupervisor_Edoardo Bruno

Politecnico di Torino

POLITECNICO DI TORINO
Master of Architecture Construction City
A. Y. 2020/2021

居住在基礎設施
inhabiting the infrastructure
an alternative urban model for ShanShui cities

supervisor_
Mauro Berta
co-supervisor_
Edoardo Bruno

candidate_
Ottavia Valz Gris

I dedicate this work to my family who have never stopped believing in me.
To Andrea for standing by me in the most difficult moments.
To my flatmates for being my second family in these five years.
And to Edoardo for always encouraging me to do my best.

This research is based on the desire to continue the work begun on the urban design of Lishui, China, going into the project proposed in the competition phase or investigating possible alternative hypotheses. The subject was then explored in depth by working alongside lecturers Mauro Berta and Edoardo Bruno during the Architecture and Urban Design Co-Run course, born of the collaboration between the South China University of Technology and the Politecnico Of Turin.

During the competition, some Professors, PhD students, and students from Politecnico di Torino and the South China University of Technology had divided the area into three main systems: agricultural valley, dwelling on the mountains, and ecological reserve.

So the initial intention was to investigate the approach that promoted urbanization close to the mountain landscape, and which in particular would impose itself on existing infrastructure.

In the course of the research, we moved away from the initial proposal and tried to imagine different scenarios that could be universally applied in similar contexts, so as not to radicalize the project to the case study, but rather to make the devices devised generalizable.

This is a taxonomic investigation that proposes customizable archetypes to resolve morphological combinations. Central to this is the presence of an infrastructure dividing the mountain landscape from the agricultural landscape, which currently acts as a barrier and whose potential is not exploited. The solutions will not be single and, like the morphologies investigated, will not even all be present in the Lishui case study.

Therefore, the question turns out to be the identification of systems that propose spatial solutions, not only in terms of new construction but also in new public space. The latter aims to reactivate the non-places formed by the encounter between the different morphological patterns and the infrastructure.

The research includes an initial awareness and study of the Chinese historical context and the meaning of ShanShui, considered the primary research objective. The ShanShui landscape to which reference is made will then be the discriminating factor in identifying cases, which can be considered similar to that of Lishui, to which the newly designed devices can be applied.

居住在基礎設施
inhabiting the infrastructure
an alternative urban model for ShanShui cities

index_

1. research **00**

introduction 3

research question and methodology 7
the design of devices

the Chinese New Towns 10
literature review

the role of the infrastructure in China 18
Lishui as a case study

2. matrices **38**

geomorphological conditions 40

matrix A 58
geomorphological conditions combination

architectural spaces 62
the space "through the body"

matrix B 72
architectural spaces combination

devices 76
rules

matrix C 94
devices as solutions

3. application **98**

nine devices in Lishui 100

masterplan 106

axonometric view 108

architectural studies 128

4. coclusion **132**

the fllexibility of the matrix

5. sources **136**

bibliography

sitography

研究
research

Xu Yang, 1759, *Burgeoning Life in a Resplendent Age, or Prosperous Suzhou*

introduction_

The city of Lishui is located in the south-west of Zhejiang Province with a population of about 2.5 million. Literally, it means 'Beautiful Waters', a name that represents its landscape characteristics: it is crossed by the Ou River (Ouijiang) and lies in a valley surrounded by mountains. It is therefore characterised by a strong link with nature and at the same time shows much of its history: tradition is brought to light by the traditional villages, some of which are now recognised as tourist destinations (Zhu, Lan, Ness, Xing, Schneider, Lee and Ge, 2015).

Because of its natural qualities, it is promoted as a "home to health-preserving and longevity with its picturesque sceneries" (丽水市政府 Lishui city Government, 2016). Lishui originated more than 4,000 years ago during the Liangzhu culture, when tribes lived in the area; however, the first evidence of a real settlement dates back to 589, when the prefecture was founded under the name of Chuzhou by the Suy dynasty.

The name Lishui came into being in 779 under the Tang Dynasty, changing throughout history to its current name of Lishui City (Zhu et al., 2015).

The potential of this land also lies in its willingness to invest more in local products, in fact in recent decades it has shown great development in the sectors of industry (bamboo, textiles, pharmaceuticals and electronic machinery) and agriculture (edible mushrooms, fresh and dried fruit, tea, sericulture, medicinal herbs and vegetables).

The city of Lishui is therefore a fertile territory for reaffirming and practising this long-standing relationship between nature and the artificial adaptation of the land to human needs: as in the famous painting "Prosperous Suzhou", urban life, orderly countryside and misty mountains are three faces of a unique landscape, whose protagonist is the human being, both as creator and observer of this landscape. In 2013, Lishui's planning strategy (Greenway Network Planning 2013-2030) was to protect the mountain backdrop and build a first-class river. Creating a cultural calling card to highlight Lishui's charm through the vitality of the Oujiang River, linking with village revitalisation, and finally realising the 'multi-natural emerald green ca-tena of Oujiang'.

But in 2020 the government launched the international competition 'Future ShanShui City: International Urban Design Competition - Dwellings in Lishui Mountains', in which the Politecnico di Torino participated with South China University of Technology, winning the third place. The objectives of the competition can be summarised under three headings (Competition booklet, 2020):

Establish a set of spatial models of the future ShanShui city

To establish a universal, reproducible and promotable spatial model of the future city of ShanShui, and to establish

a general spatial framework on both banks of the Ou River in Lishui.

Set up a model of the future ShanShui city

Interpreting the brand connotation “Dwellings in the Lishui Mountains”, building an external image communication system, and establishing a highly stimulating model of a future ShanShui city.

Creating a lifestyle in the future ShanShui city

Pay attention to the perception of ShanShui in modern life, create a “landscape-friendly” lifestyle, and cultivate a “livable” ShanShui city in the new era.

The project proposed in the competition, entitled “Prosperous Lishui. One valley, three landscapes”, investigates the aporia between conservation and innovation, proposing a new development model that is more attentive to the quality of life, the heritage of the past and environmental values (Competition booklet, 2020).

Prosperous Lishui, master plan
Source: Competition Booklet, 2020

research question and methodology_

aim and research question_

The research will investigate only part of the subject matter of the call for tender, since the latter required the design of a master plan for the future development of an entire valley, not only in strategic terms, but also with a focus on the urban scale. The will of this study, instead, is to start from urban planning and design only on a very precise aspect of the valley envisaging modelling strategies.

The valley is interpreted as a metropolitan type system, where the role of the two main infrastructures at the foot of the mountains is to activate communication between the urban areas (the main city, villages, towns, industrial areas), agricultural land and nature reserves.

The pre-existence of the infrastructure on the eastern side of the valley, however, currently creates a clear gap between the mountain and the valley floor, thus not allowing permeation between the two systems and creating waste spaces destined for degradation. In addition, what we want to avoid is an excessive expansion towards the suburbs, which would lead to the demolition of many villas with their attached agricultural fabric. The research objective will therefore be to find devices that propose solutions where the infrastructure creates a clear gap between two equal or different morphologies. For this reason, it will be useful to test the devices in the case study of the Lishui valley, which allows an accurate and varied investigation in terms of morphological combinations.

Also part of this scenario is the desire to obtain spaces that promote the initial re-examination of the relationship between nature and artificial adaptation: designing a liveable Shan-Shui city in the new era.

methodology_

After having studied and analysed Lishui and the Chinese historical-economic context, a study area was identified and its morphological characteristics, strengths or weaknesses and objectives were graphically highlighted. The study area will be used in a first phase to demonstrate the generic role of the infrastructure, or rather of the highway, which currently, not only in Lishui Valley, has only one role. The research, therefore, includes a historical overview of the role of the infrastructure to understand its problems and any solutions already proposed.

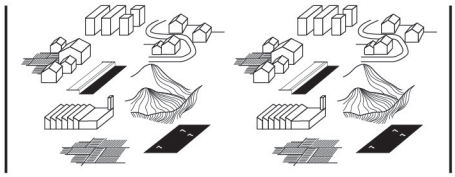
The intention was therefore to abstract this element from the context, together with geomorphic-logical conditions, to construct abstract case studies on which to design solutions of an archetypal nature.

The first design phase involves the construction of three matrices: the first relates the geomorphological conditions that relate to each other through the infrastructure; the second matrix consists of the combination of architectural spaces, thus resulting in architectural and urban devices; the third and last matrix is the design matrix that proposes devices to solve certain geomorphological conditions.

The results of the matrices will then form the basis for the case study of Lishui Valley, in which nine transects will be studied, as many as the conditions found there.

The transects are therefore design proposals based on the design matrix and are presented in graphic form to aid understanding. In the last phase, a specific transect was chosen on which to develop an architectonic outline as a demonstration of the fact that the generic device can adapt to the tastes and personality of the designer.

1. geomorphological conditions_matrix

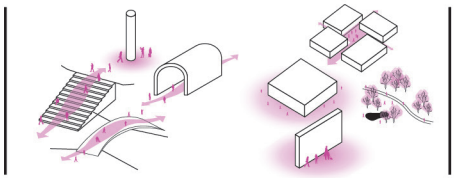


$= X$

2. case study attendance

$X_{\text{in Lishui}}$

3. architectural spaces_matrix



$= Y$

4. devices & geomorphological conditions _matrix

$$\begin{vmatrix} Y & X_{\text{in Lishui}} \end{vmatrix} = Z$$

the Chinese New Towns_

Chinese urban planning in history_

The late 1970s: China has less than 200 cities. Today there are almost 700 reclassified cities and counties.

In 1978, 18% of China's population lived in urban areas. Every year since then, city dwellers have increased by about 1% per year to 60% of the total population.

The construction of new infrastructures has distorted the image of the Chinese landscape, transforming both property rights and administrative boundaries, erasing rural areas and villages.

In just a few years we can see how the Chinese territory has undergone a great transformation.

To understand how the current urban condition was reached, it is necessary to face the historical process that distinguishes China from other countries.

Before 1949, the Socialist period, China based its planning traditions on a feudal system that referred to a symbolic imperial power and the construction of cities was based on the study of cosmology and geomancy. It is from the socialist period that the state organised a collective consumption of land, moving from cities of individual families to an organic society. Before socialism, there were few cases of modernism, two examples being Shanghai and Nanjing, but these were sporadic episodes not part of a definite plan, but driven by purely commercial reasons.

The reasons why the modern meaning of city planning took so long to arrive in China are manifold: the Capital Plan and the Greater Shanghai Plan had been frozen during the Republican era of China due to political conflicts and numerous wars. Economic and urban planning is in fact very much linked in Chinese history, as the latter was only a means, a tool to support the state-led industrialisation process.

From the advent of socialist China, urban planning became both a tool to promote 'socialist monumentalism' and a tendency to look to the West for inspiration, especially the zoning of America and the industrial satellite cities of Russia. The role of urban planning was therefore marginal since it served, as already mentioned, only as a tool, not as a normative plan to control urban development. Influencing the urban planning of the socialist period was the discipline of civil design, for example, the application of symmetrical layout, radial streets, large boulevards and avenues, and magnificent streetscapes. However, unlike its application in the Republic of China period, industrial development was much more pronounced (Wu, 2015). Indeed, the initial aim was to transform cities from centres of consumption to centres of production (Xie and Costa, 1991), thus arriving at a phenomenon of 'industrialisation without

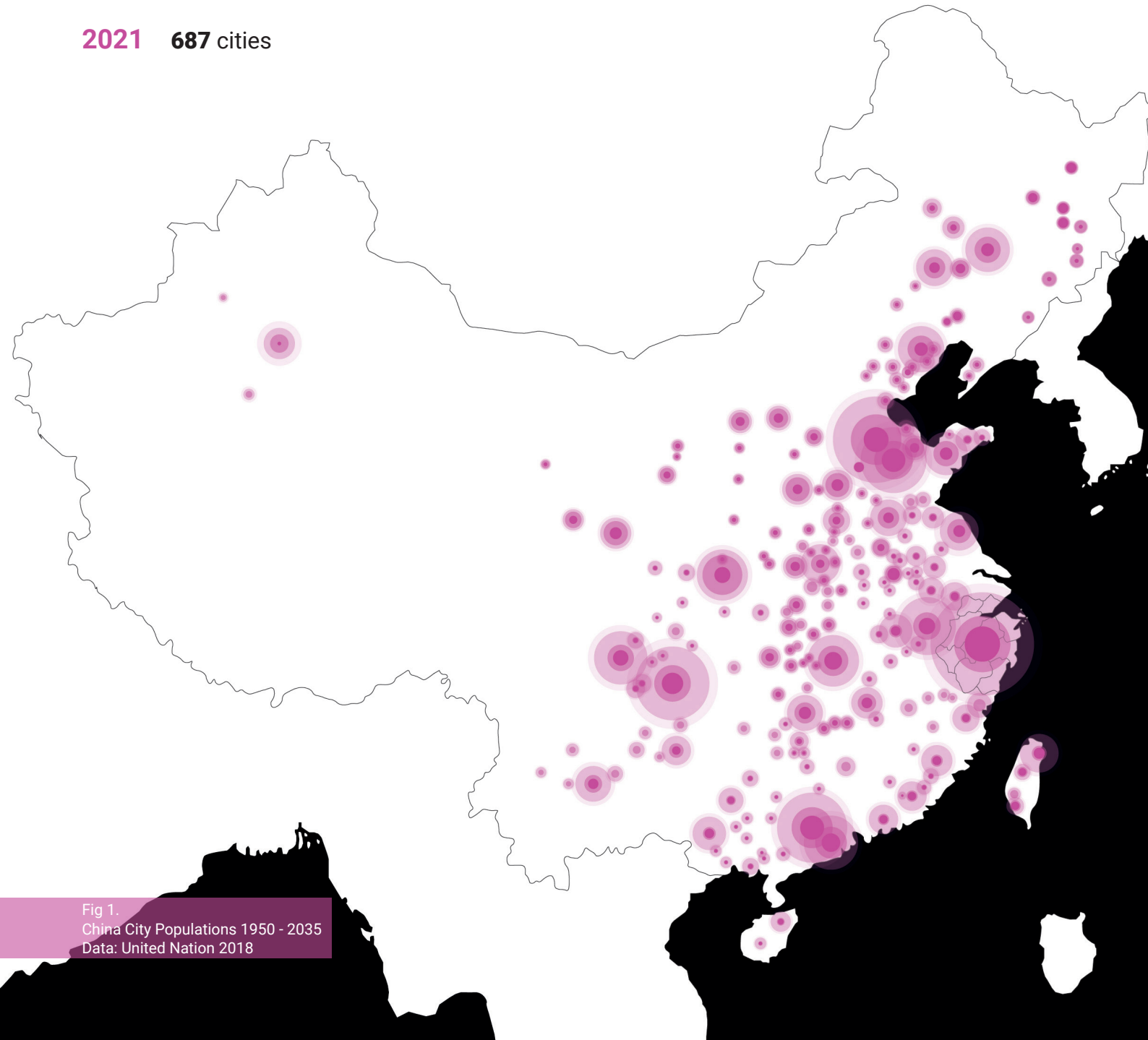


Fig 1.
China City Populations 1950 - 2035
Data: United Nation 2018

	State socialism 1949 - 1978	Early market reformist regime 1979 - 2001	Post-WTO market society 2001 - present
Form of state spatial selectivity	The national scale of statehood as overarching governance	Rising localities and dominance of central cities	Up-scaling towards the city-region
Form of urban-regional regulation	Managerialism achieved through hierarchical dualismeconomic planning	Urban entrepreneurialism and devolution of planning control	Strategic plans, centrally initiated regional coordination plan, soft institutions, and 'national new districts'
Major contradictions	Urban-rural dualism	Fierce inter-city competition and uncoordinated development	Inter-region competition for national entitlements

Fig 2.
The conceptual framework of region-building in different historical periods in China.
Source: Wu, 2015

urbanisation' (Wu, 2015).

The criticism in retrospect, after China broke off its relations with the Soviet Union, was that the Soviet imposed parameters on land use and housing standards were inadequate for the Chinese context at the time: the prescribed density was not high enough, plus the imposed uses were not mixed. This Soviet approach led to inefficient land use and even urban sprawl (ibid.).

To further understand how Chinese urban planning works, it is necessary to start by listing the three parallel types of planning: the series of urban plans under the Ministry of Housing and Urban-Rural Development (MOHURD), the land use plan under the Ministry of Land and Resources (MLR), and the five-year economic and social development plan under the National Development and Reform Commission (NDRC).

From the legislative point of view, there are three milestones.
In 1989, the City Planning Act was passed, which strengthened the role of localities, thus initiating cooperation between urban planning and economic planning.
In 2003, the CCP leadership then focused on the 'five types of coordination': coordination between urban and rural areas, coordination between regions, coordination between social and economic developments, coordination between the human and natural environment, and coordination between domestic markets and exports under the 'open door' policy. In doing so, it increased state governance, particularly on land regulation, and gave more and more important to local entrepreneurship. However, it is important to note that MOHURD could never claim control over rural-to-urban land conversions until 2008, with the enactment of The City and Countryside Planning Act, when planning practices including rural areas were formalised. The "rural building and planning permit" was added to form the system that consists of "one report and three permits": local policies are thus introduced that intend to respond to specific local conditions and apply the decentralised decision-making mechanism (Chen, 2016).

Subsequently, in 2010, MOHURD announced new regulations on the preparation of urban and rural plans, but, despite this, the planning techniques adopted have not changed, rather they have been extended to rural areas where there may, however, be no need for an essentially urban spatial plan (Wu, 2015).

today's urban planning system_

Today, the urban planning system consists of two levels: the urban master plan and the detailed plan. In turn, these two levels are supported by more specific plans.

However, the urban planning system derives from the fact that the Chinese city is built on the mechanism of the land market and the decentralised system of tax sharing. The central and local governments have separate tax sources. The financial system has therefore pushed local governments to implement an entrepreneurial approach, precisely because local leaders are in effect virtual CEOs of 'urban development companies' (Chien, 2008).

What actually drives the local realities to have an entrepreneurial approach is, therefore, the gain and prestige that is received in return: the Land Administration Act gives compulsory purchasing power to the local government, which can buy the land from the farmers at a low price and then sell it at a higher market price. The flow that is generated is that of industrialisation of a new area, which leads to the occupation of neighbouring land by workers and eventually to the creation of commercial space. All of this goes to subsidise local governments, which then benefit from the 'spill-over effect'.

Local governments are sometimes pushed to rely on real estate developers for the provision of public infrastructure, this is because the demand for development in a particular area is often high, but mainly because of limited financial capacity. In exchange for infrastructure, local governments then hand over urban land to developers, leaving them with power over the development of an area (Chen, 2016).

As thus illustrated, the motive and objective behind planning in China is therefore growth, i.e. the idea of creating new development.

This logic of growth has been central to the planning of New Towns (xincheng) since the socialist period, where they were proposed as satellite cities driven by state investment in industries and public housing (Wu, 2015). Indeed, the *growth machine* has become the necessary reference model for understanding Chinese urban governance (Wu, 2015).

However, it is from the 2000s onwards that the biggest changes in the planning of New Towns take place, implementing the desire to offer new public services so that they become more or less independent cities.

It is in fact at the beginning of the 21st century that the Chinese government announced the construction of twenty new cities every year for the next twenty years. The period up to 2020 is thus referred to as "the most intense period of construction of new cities (...) since the peak of colonial expansion" (Bonino et al., 2018).

The New Towns are designed to build new expansions with the sole purpose of

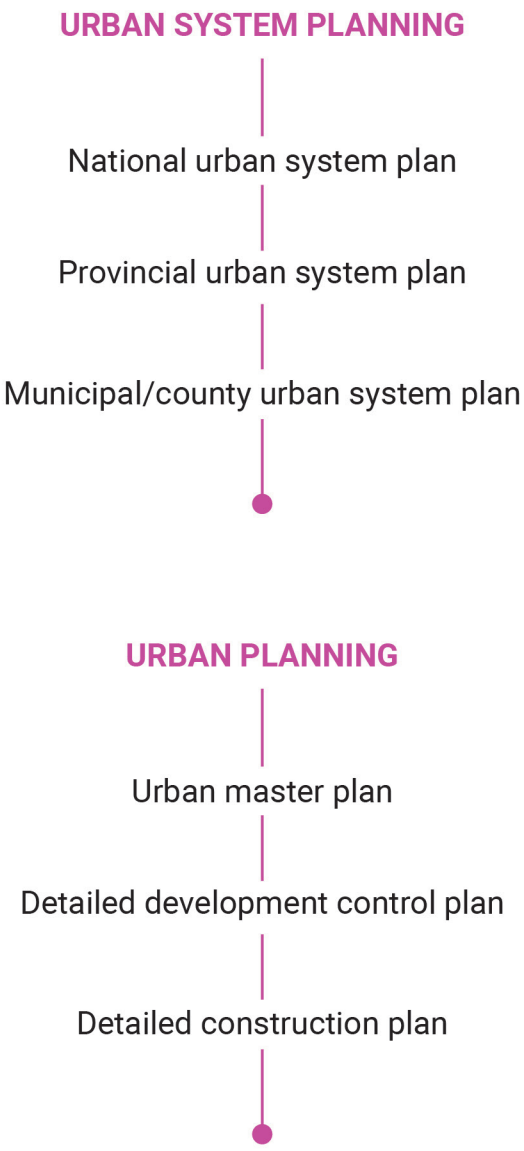


Fig 3.
Source: Wu, 2015

New town development	Initiation time	Target locality	Policy objective	Development mode	Relation with city/town centre
Satellite town	1950s	Designated towns or other localities in suburbs	Serving industrialisation	Relying on industrial development or based on existing	Away from existing city centre
New city	1990s		Holding new urban growth or decentralising existing city centre	Based on existing town development or combined with development zones	
New town	2000s	Designated towns in suburbs	New growth pole in rural areas	Scaled expansion of existing town centre	Neighbouring existing town centre

Fig 4.
Various new town developments within their planning policy frameworks.
Source: (Bonino, Governa, Repellino, Sampieri, 2018)

development and economic growth; for this reason, they are similar to the previous satellite cities, but unlike the latter, they are not located on the outskirts of the cities, kilometres from the old centres and based on industrial development; the New Towns instead define new poles in rural areas close to the city centre (Fig. 4).

The table (Fig. 4) shows how, from the 1950s to the 2000s, the new settlements were based on the urbanisation of existing industrial areas, thus giving great importance to the infrastructure serving them. The process started with the construction of new infrastructure, followed by the industrialisation of the area and only at the end by the construction of the satellite town. We can see, therefore, how infrastructures have assumed a central role in this context.

the role of the infrastructure in China_

the investments of the PRC_

With the rapid growth of the Chinese economy, the high demand for infrastructure has slowed the country's sustainable development. In this sense we see that the People's Republic of China (PRC) is one of the most densely populated countries in the world: the United Nations Economic Commission for Europe (2007) predicted that the urban population in the PRC will increase from 41% in 2005 to 57% in 2025.

The substantial increase in urban population has and will continue to put great pressure on transport systems in large cities. Air pollution problems will worsen and both traffic congestion and collisions will occur more frequently if the government does not manage urban transport challenges efficiently and effectively (Loo, 2017).

To alleviate the negative impact of the growth of unorganised urbanisation, the PRC government is pushing for the development of public transport by promoting sustainable policies in favour of reducing pollution and improving quality of life (Chan, Lam, Chan, M.ASCE, Cheung and Ke 2010). In general, the focus of densely populated megacities, such as Beijing and Shanghai, will be on improving the quality rather than increasing the quantity of urbanisation, as was previously the case (Loo, 2017).

The government's plans include encouraging the rural population to move to the cities, but especially stimulating urbanisation by forming urban agglomerations with international competitiveness in the eastern region, while clustering cities with mature economies in the central and western regions; this will stimulate rapid development of the transport system due to the demand for a more efficient intercity transport network.

Chinese investments in infrastructure are therefore not only outward-looking and thus linked to global trade ("Belt and Road Initiative"[1], Fig. 5), but also partly for the development of suburbs and the creation of new cities. The fact, however, is that infrastructure cannot be fully financed by the government, but relies instead on public-private partnerships (PPP), which could be considered a favourable option to help provide urgently needed public works and services (Liu, Schindler and Liu, 2020).

As we have previously explained, the infrastructure in socialist China was designed as a means to reach satellite

[1] BRI is a transcontinental long-term policy and investment program which aims at infrastructure development and acceleration of the economic integration of countries along the route of the historic Silk Road. The Initiative was unveiled in 2013 by China`s president Xi Jinping and until 2016, was known as OBOR – One Belt One Road. On March 28, 2015, the official outline for the Belt and Road Initiative was issued by the National Development and Reform Commission (NDRC), the Ministry of Foreign Affairs (MOFA) and the Ministry of Commerce (MOFCOM) of the People`s Republic of China (PRC), with authorization of the State Council.
Source: beltroad-initiative.com

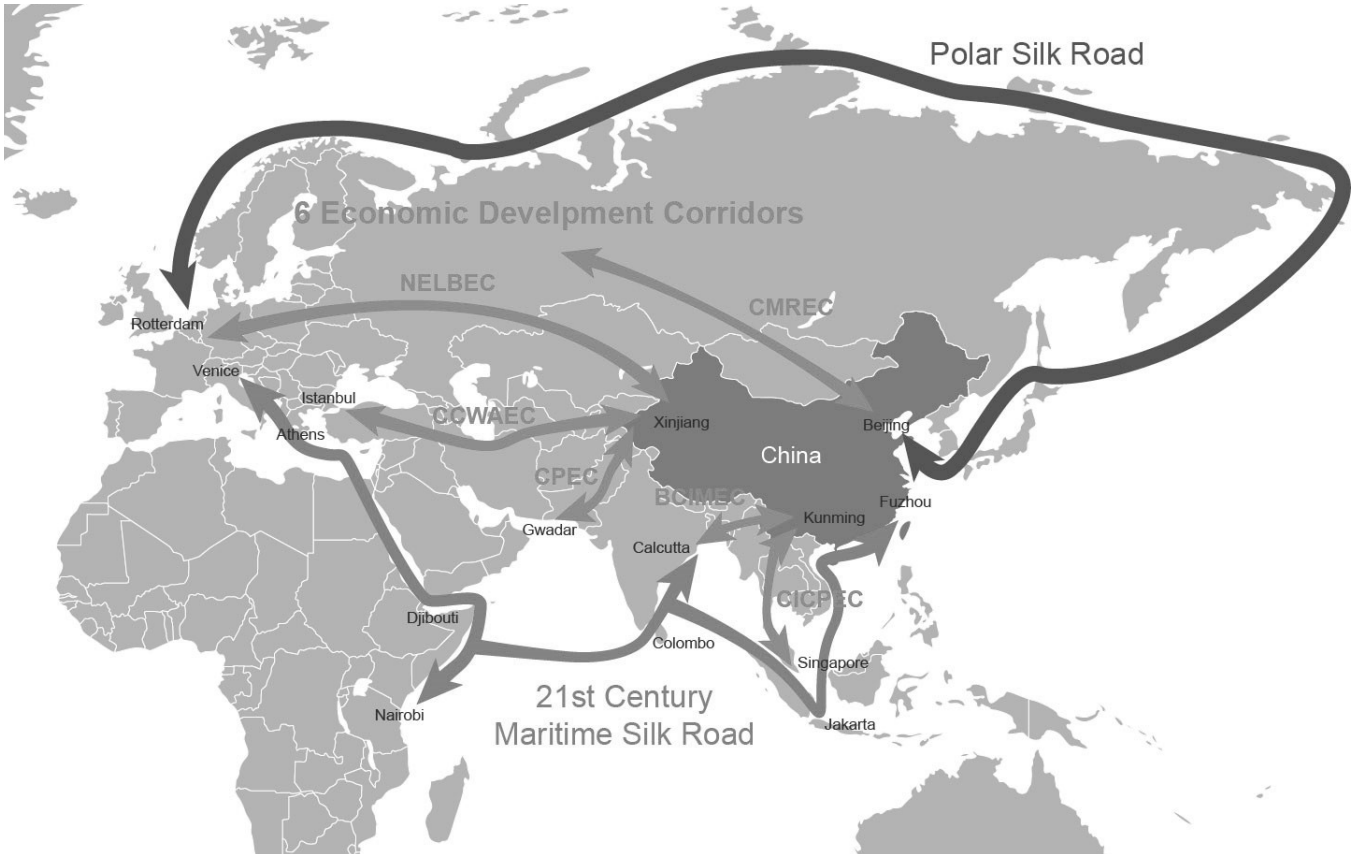


Fig. 5
The Belt and Road Initiative: the (land based) Silk Road Economic Belt, comprising six development corridors, and the 21st Century Maritime Silk Road; additionally the map shows the Polar Silk Road, referring to the Northern Sea Route (NSR), as officially mentioned in China`s Arctic policy.
Source: beltroad-initiative.com

cities based on industry and commerce. This led to the extremely rapid construction of numerous highways without public services. It is only since the 2000s that, in correspondence with the Chinese government's decision to build many new cities, a more sustainable attitude has begun to be supported in both environmental and social terms.

The enormous environmental impact of the rapid development of Chinese cities led the Chinese government to worry about the

role that infrastructure could play, but this was not the only reason. This was not the only reason, however. 2008 saw the People's Republic of China presidential election and the Republic of China presidential election: from this moment on, at the end of the Hu Jintao era, China's attitude towards foreign policies changed, and it began to engage in multilateral platforms for regional cooperation. Foreign policies since then must show innovation and advance China's national interests abroad in a rapidly developing international environment (Yu, 2017).

China with Xi Jinping in government has adopted as a strategy the willingness to help Asian countries modernise their infrastructure and improve cross-border transport; this is intending to become a bilateral economic power with Asian neighbours.

"Connectivity is the shortcut to economic prosperity" (Yu, 2017). Thus, infrastructure assumes a central role in China's development to overcome the current backward conditions in some areas and to ensure its industrial and economic prosperity.

The maps (Fig. 7) thus show how this process of economic development and opening up to a more outward-looking China led to an increase in infrastructure within it in a very short period: in twelve years, high-speed railway lines developed mainly in the south of China and then expanded northwards.

The current situation is thus the result of industrialisation and globalisation, but this process is often conceived as simplified and above all has led to the traces of previous forms of urbanisation disappearing.

What currently emerges is the need to deepen the morphological study of local territories and thus the integration of an "intermediate scale of analysis": this would make it possible to create guidelines to be followed by local realities but above all not to continue applying the "five connections one leveling" approach currently used by local municipalities (Bruno, 2017). This approach, which has been used up to now, has led to the cancellation of local realities by not taking into account their uses and practices as well as morphologies, giving priority to a tabula rasa.

The aim of this research is therefore to study the effects of urbanisation, taking the case of Lishui as a starting point, and to propose an approach that is conservative towards historical traces but ensures innovative development possibilities.

Fig. 6
The three regions in China

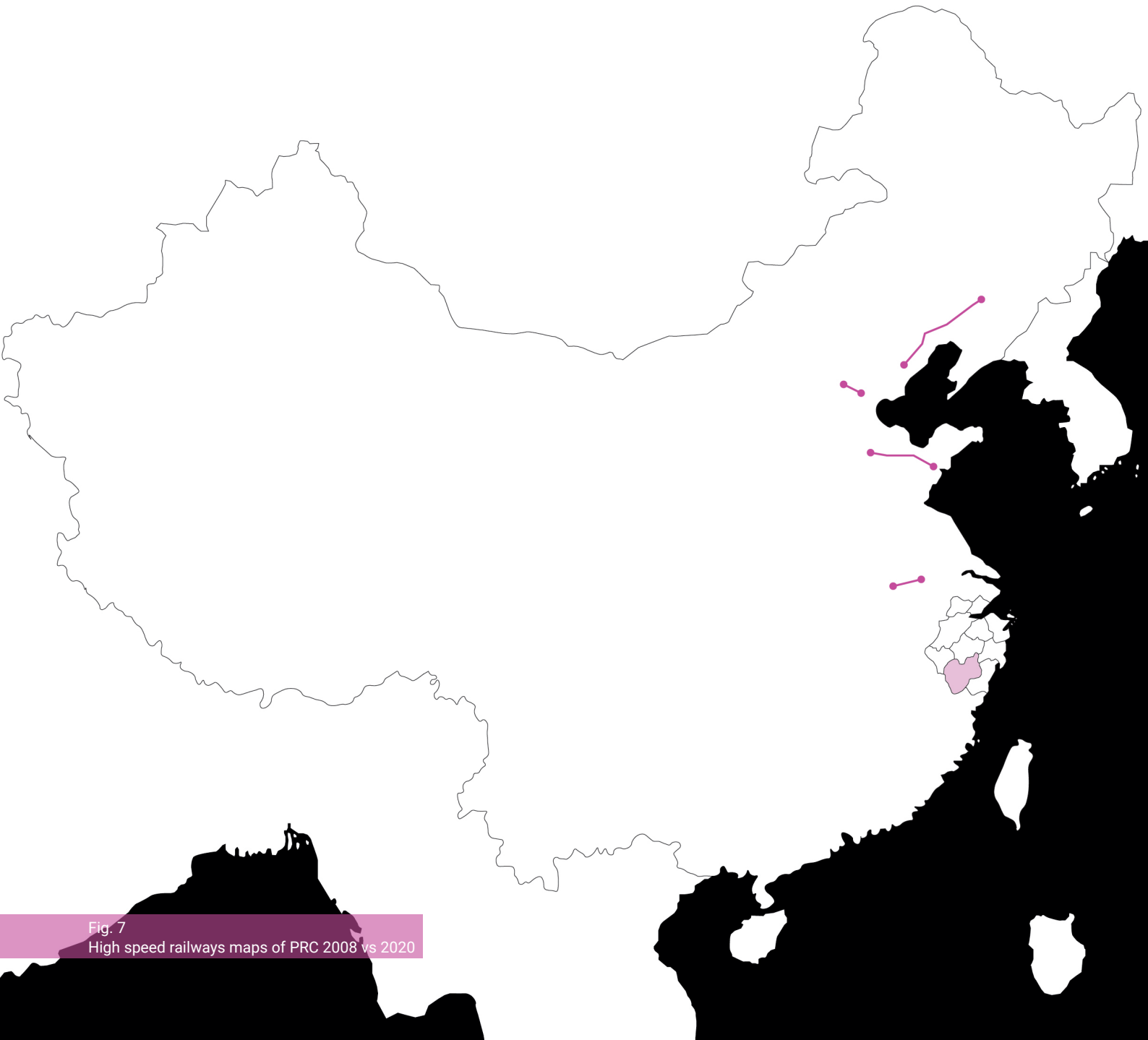
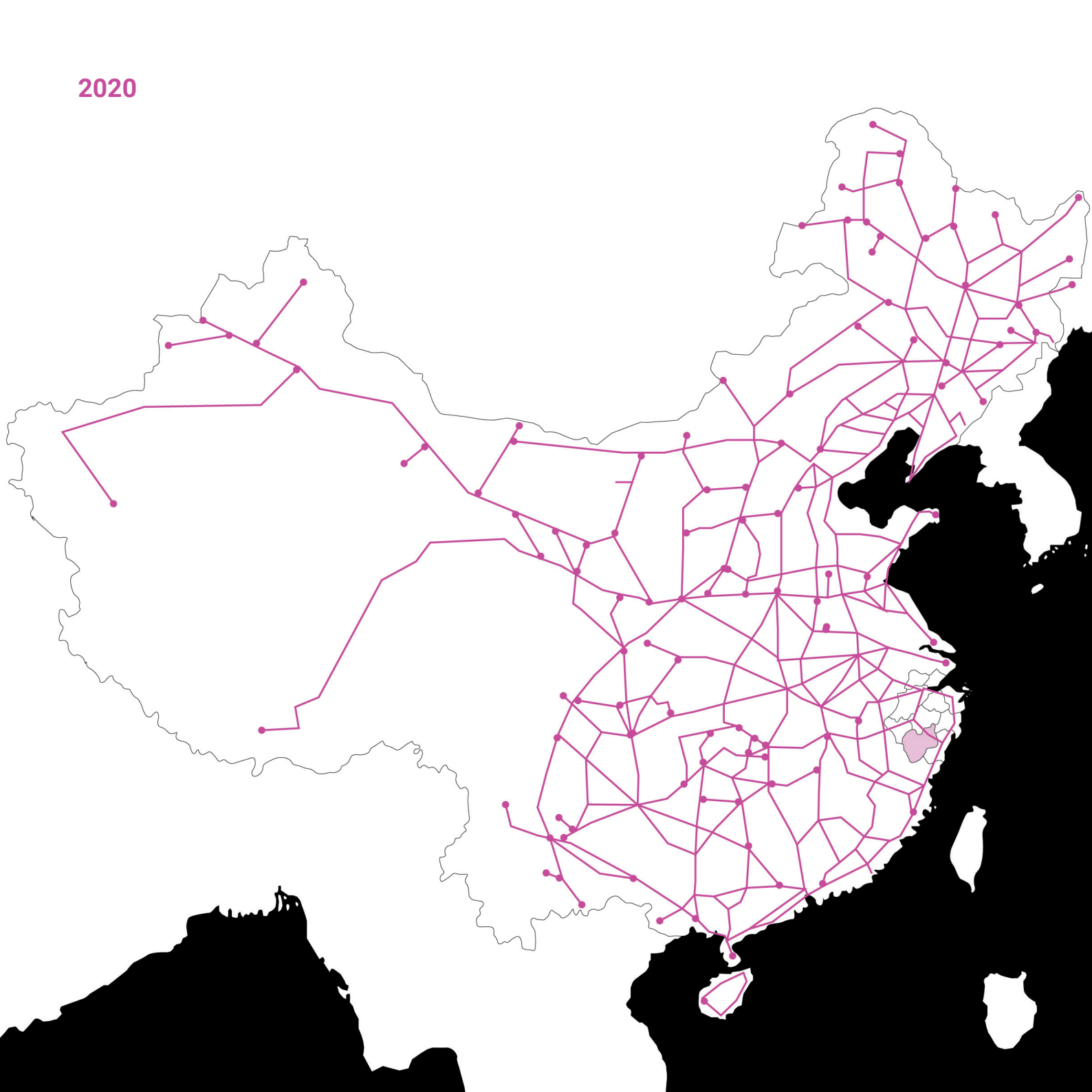


Fig. 7
High speed railways maps of PRC 2008 vs 2020


2020

Lishui as a case study_

Lishui Prefecture, located in the southwest of Zhejiang Province, covers 17.300km^2 with almost 90% of the region dominated by mountainous landscapes. It has 2.1 million inhabitants, most of whom live in rural areas or mountain villages. The strength of this area is certainly not its general economic development or its average per capita income, but rather its physical and natural characteristics: Lishui has a forest cover of about 70% and thus rich forest resources and products (timber, bam-bu, tea, nuts, etc.), as well as ecological and cultural diversity. Eighty per cent of Lishui's forests are managed by the rural families to whom they have been allocated and, consequently, the economic profile of the region is defined by small cooperatives and family farms (Zhu, Lan, Ness, Xing, Schneider, Lee and Ge, 2015).

The natural environment of Lishui thus presents unique conditions and a high potential for the development of ecotourism and agricultural industries.

Despite these premises, however, Lishui is in danger of being overwhelmed by the phenomenon of urbanisation that has characterised Chinese cities in recent decades. The development of the region's rural communities is limited by an ineffective financial system: they are supported by rural and agricultural subsidies, mortgages or micro-loans, but it is not easy to obtain these instruments. There are logistical and economic difficulties in going to the nearest branches to collect subsidies; or, it could be added that each family in the rural area of Lishui is entrusted with a percentage of forest and is therefore entitled to market and mortgage its forest rights, but all this is hardly applicable due to the lack of communication between the bodies involved (ibid.). This shows how the lack of services and the presence of road infrastructure alone are limiting factors in the management of rural areas and their development.

The Lishui map (Fig. 9) shows that the landscape is already undergoing significant transformation and that the road system is rapidly encroaching on rural and forested areas. What is lacking in the current rapid urbanisation, however, is the lack of new public transport and, above all, the fact that roads are mono-functional and invasive in their construction. Urban development is in fact following grids that do not reflect the morphology of the land and denaturalise an area which, as already mentioned, has great potential in terms of ecotourism and the development of agricultural industries. Lishui, with its purely naturalistic character, could become a pole of attraction for its landscape qualities by enhancing the agricultural and woodland areas and exploiting the built elements already present on them.

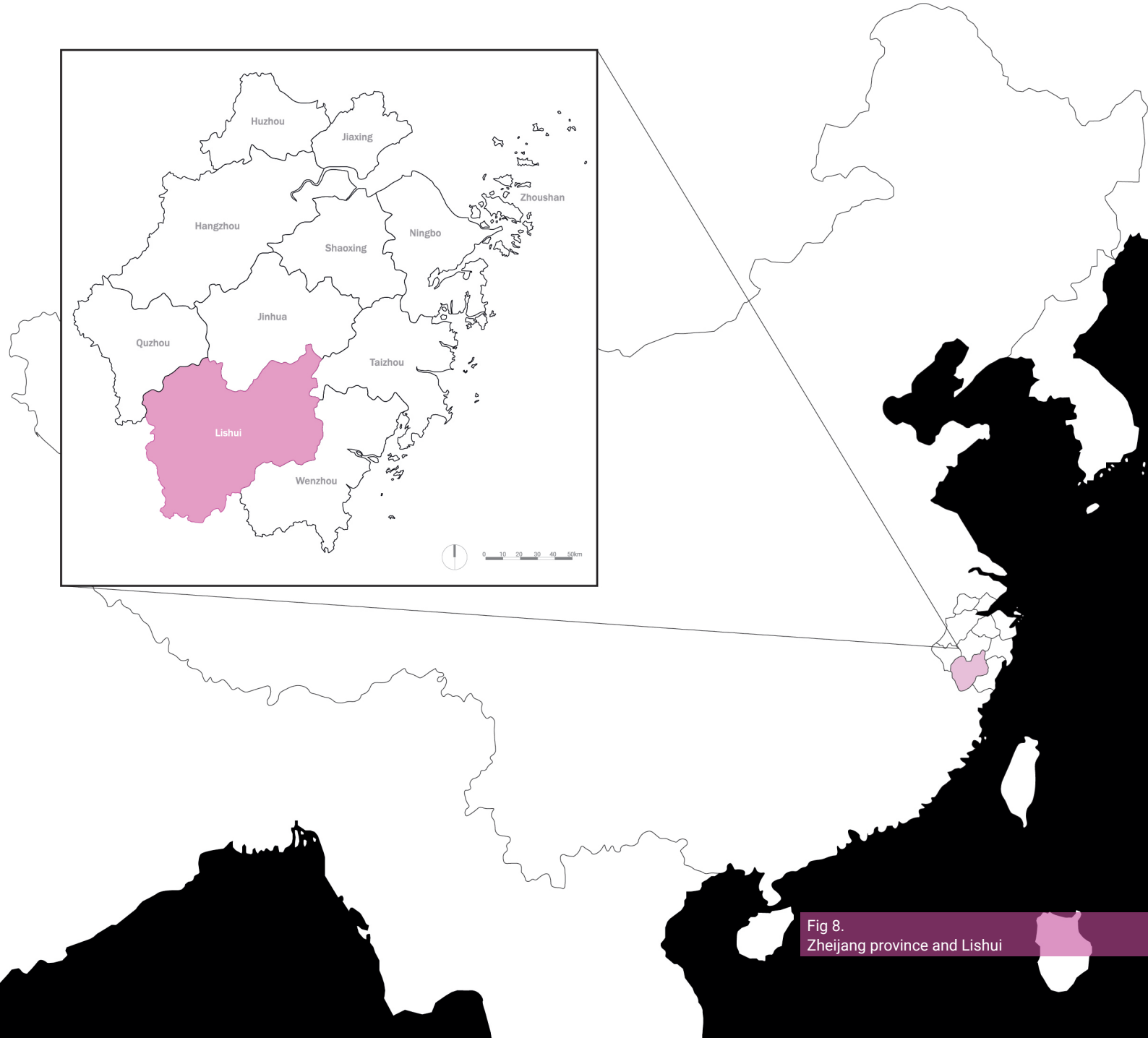


Fig 8.
Zheijang province and Lishui

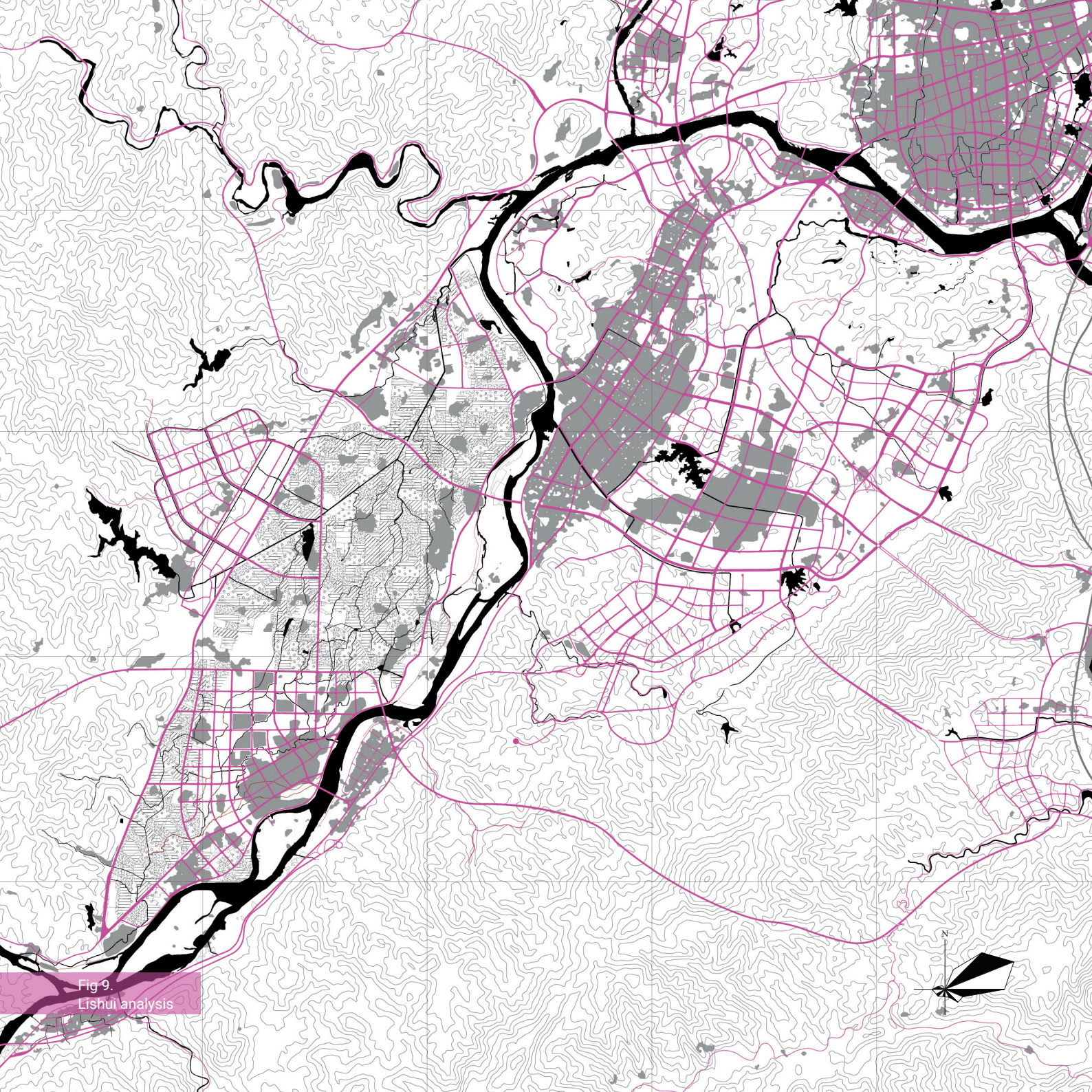


Fig 9.
Lishui analysis

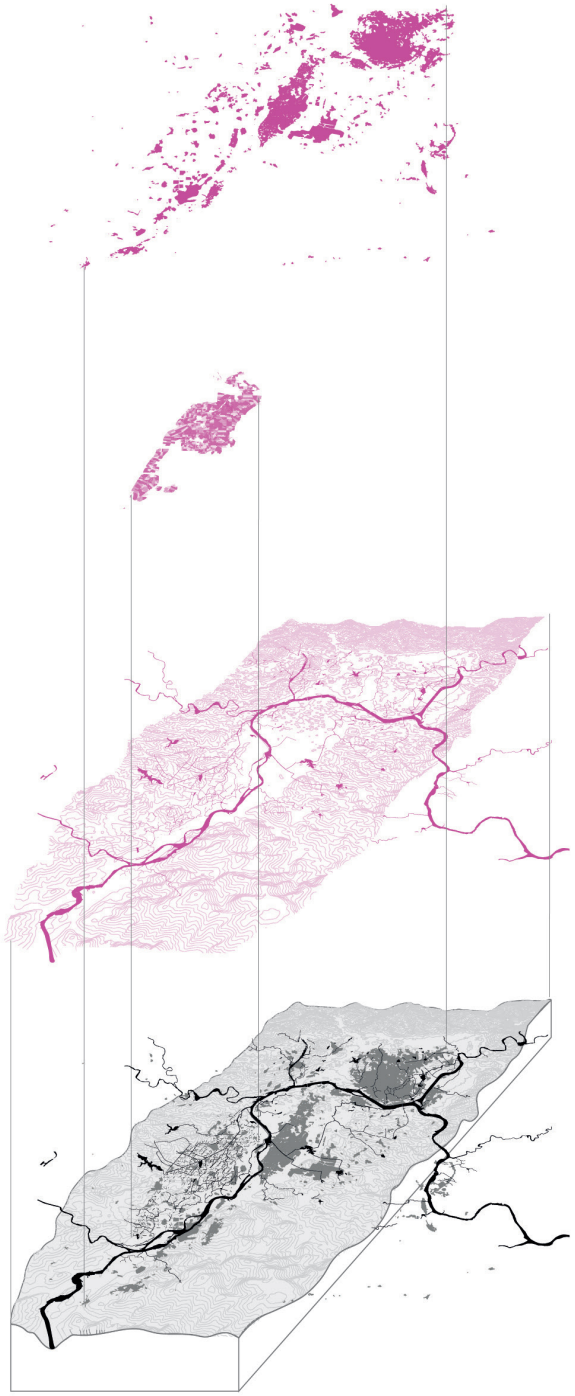


Fig 10.
Lishui's systems

The presence of large road infrastructures could become an opportunity for new linear urban developments: these roads, which today divide the landscape and lack eco-sustainable infrastructure, could take on the appearance of integrated systems allowing the development of the city in both qualitative and quantitative terms.

This would mean moving from an urban design based on quantitative growth (growth machine) to a qualitative approach that focuses on an appropriate lifestyle in rural and forest areas.

project area_

The identified project area, with a total extension of 3 x 3 km, defines a portion of Lishui that brings to light a high traffic road infrastructure and at the same time different geomorphologic situations with which it relates. It can be seen from the drawings (Fig. 12 and Fig. 13) that the road runs along the mountainside as well as the forested area of the prefecture and that there is thus a clear division between the purely agricultural or residential landscape and the mountains. The area is therefore devoid of connections between the two road fronts, thus preventing easy use of the entire area.

Also of great importance is the strong presence of water given by the river Ou and the canals that cross the whole area.

The approach used for the study of this area, however, is not so much that of investigating the pre-existences as that of identifying generalisable situations that can be found in similar contexts or in other areas of Lishui. The object of study is the infrastructure that crosses the area and, in doing so, encounters certain geomorphological conditions that we will later analyse.

It is therefore important to understand how the characteristics of the territory of Lishui are important for the identification of a typology of territory to which this approach is applicable.

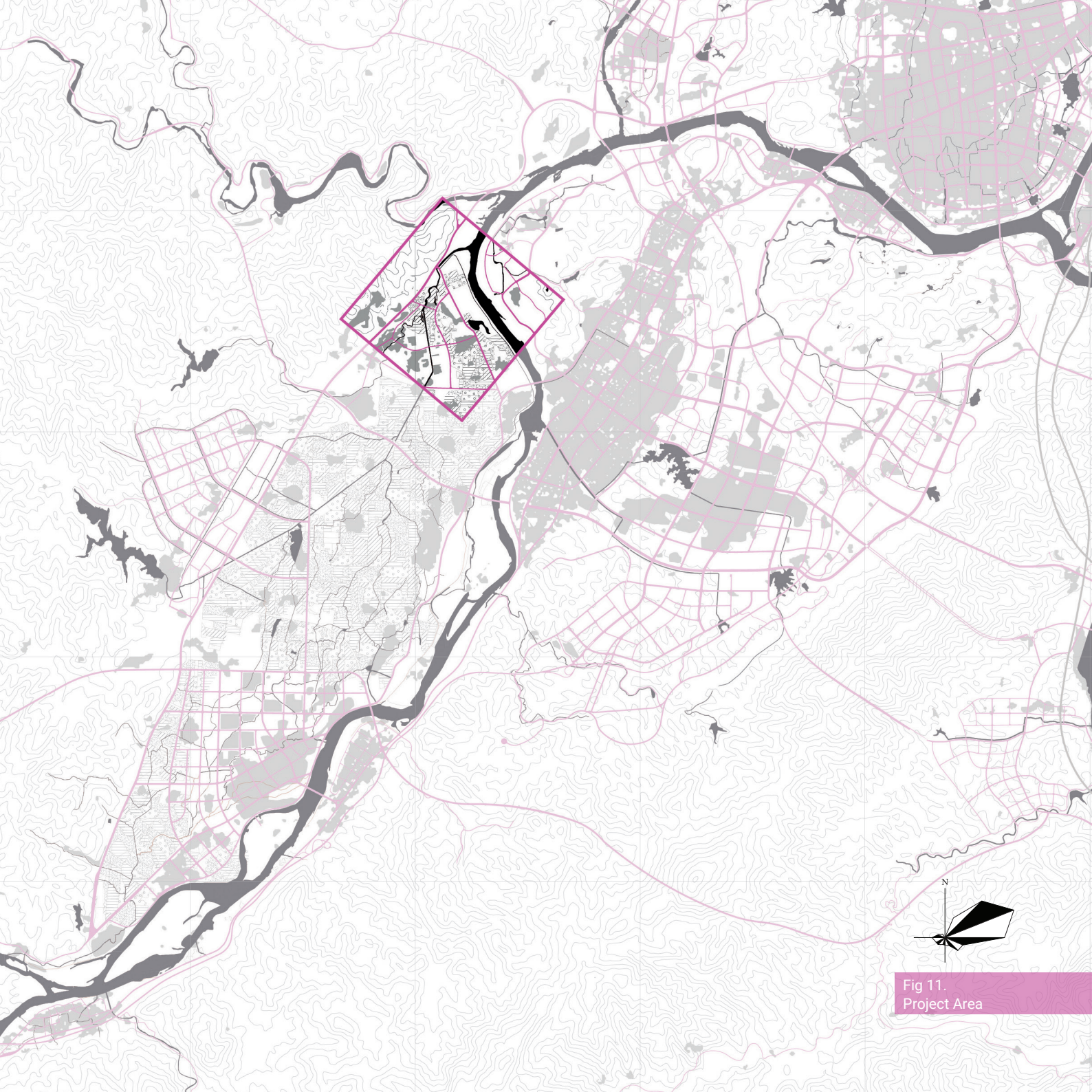


Fig 11.
Project Area

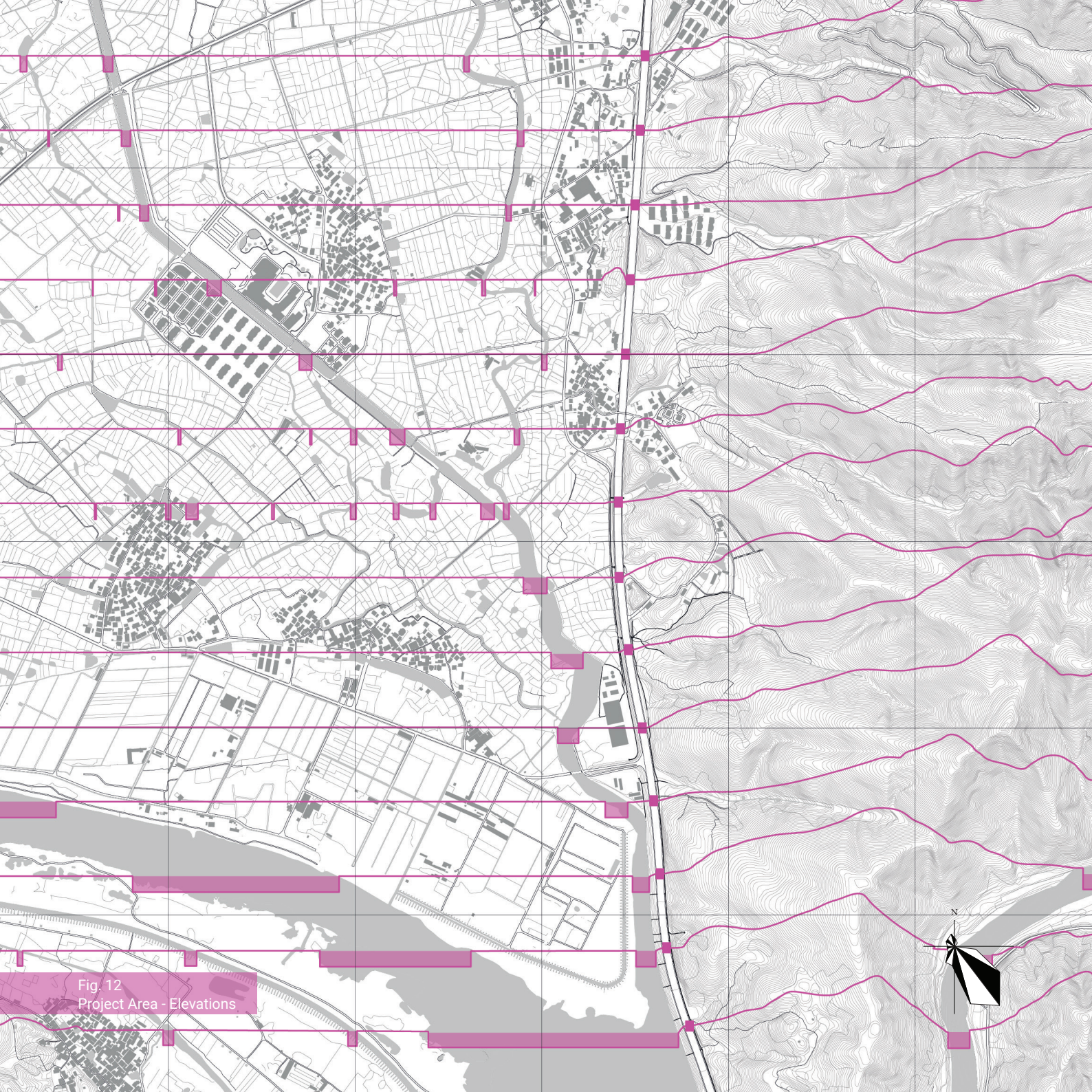


Fig. 12
Project Area - Elevations

Fig. 13
Project Area - Axonometric view

Natural system

- Water system
- Fields
- Green fields
- Forest

Built environment

- Villages
- Industries
- Residential compound

Mobility system

- Main roads
- Roads
- Dirt roads

Aerial view of Lishui, 2021
Source: Chaojin Ruan, Chenfei Liu, Ming Zhao

Aerial view of Lishui, 2021.
Source: Chaojin Ruan, Chenfei Liu, Ming Zhao

Aerial view of Lishui, 2021
Source: Chaojin Ruan, Chenfei Liu, Ming Zhao

矩阵
matrices

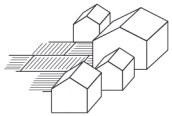
geomorphological conditions_

Through the study of the territory, several geomorphological conditions facing the road fronts were identified.

These conditions were schematised and then analysed and described to fully understand their weaknesses and potential. The approach is therefore analytical for each condition to make the project immediately generalizable: the geomorphological conditions identified are present in many other areas of Lishui and certainly in as many foothill contexts under development.

Eight geomorphological conditions were found: agricultural village, new buildings, foothill village, industry, mountains, fields, riverfront, water.

The aim is therefore to obtain an abacus of geomorphological conditions that will subsequently relate to each other.

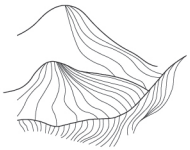


Agricultural village

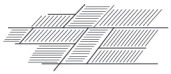
New buildings

Foothill village

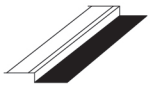
Industry



Mountains

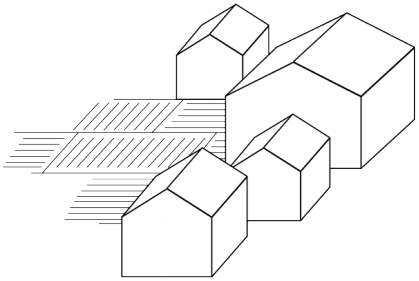


Fields



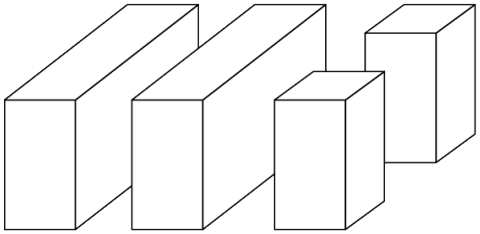
Riverfront

Water



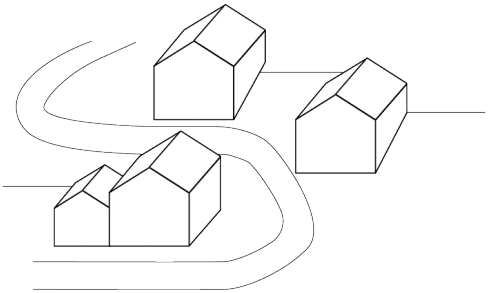
Rural and traditional villages that are supported by the surrounding agricultural landscape. The land is not privately owned, but its characteristics must be preserved.

Lishuilynn, A small countryside village with old houses, Lishui, 2017



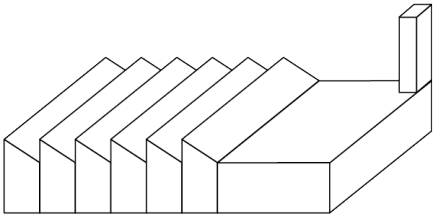
New residential settlements. These are buildings with a standardised appearance that do not currently blend in with their surroundings, creating a strong gap between nature and the built environment.

New residentiale area, Lishui, 2021



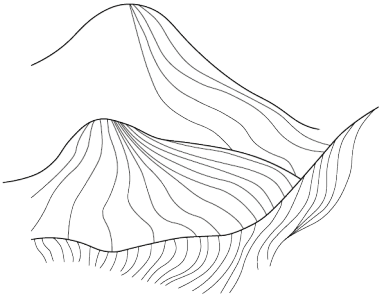
Traditional foothill villages that develop as branch settlements. They too make their living from agriculture, exploiting the surrounding land.

Aerial photo, Lishui, 2021



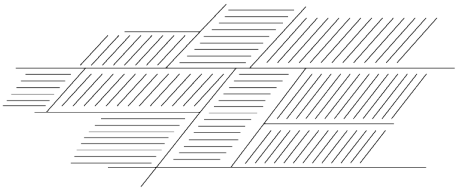
Industrial context developing in correspondence with water availability. These are large factories that contrast with the natural environment.

Industries of the area, Lishui, 2021



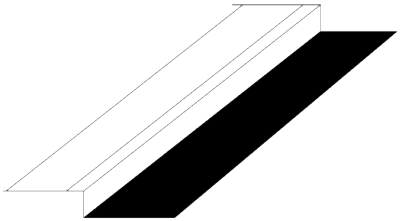
Wuyi Mountains. A mountainous context that stands out from the agricultural context and opens up sport-related tourism possibilities.

Wuyi Mountains, Lishui, 2021



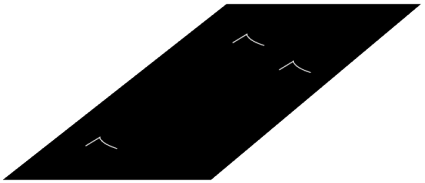
Expanses of fields growing tea and rice where there is plenty of water. The fields currently support the villages but could be better exploited.

Aerial photo of an agricolutural area, Lishui, 2021



The road under consideration relates to the Ou River coastline. In this case there is the possibility of using these places for tourism purposes with light architecture.

Aerial photo of a riverbank, Lishui, 2021



The Ou River flows through the city before emptying in the East China Sea. The river is navigable with the possibility of creating new moorings.

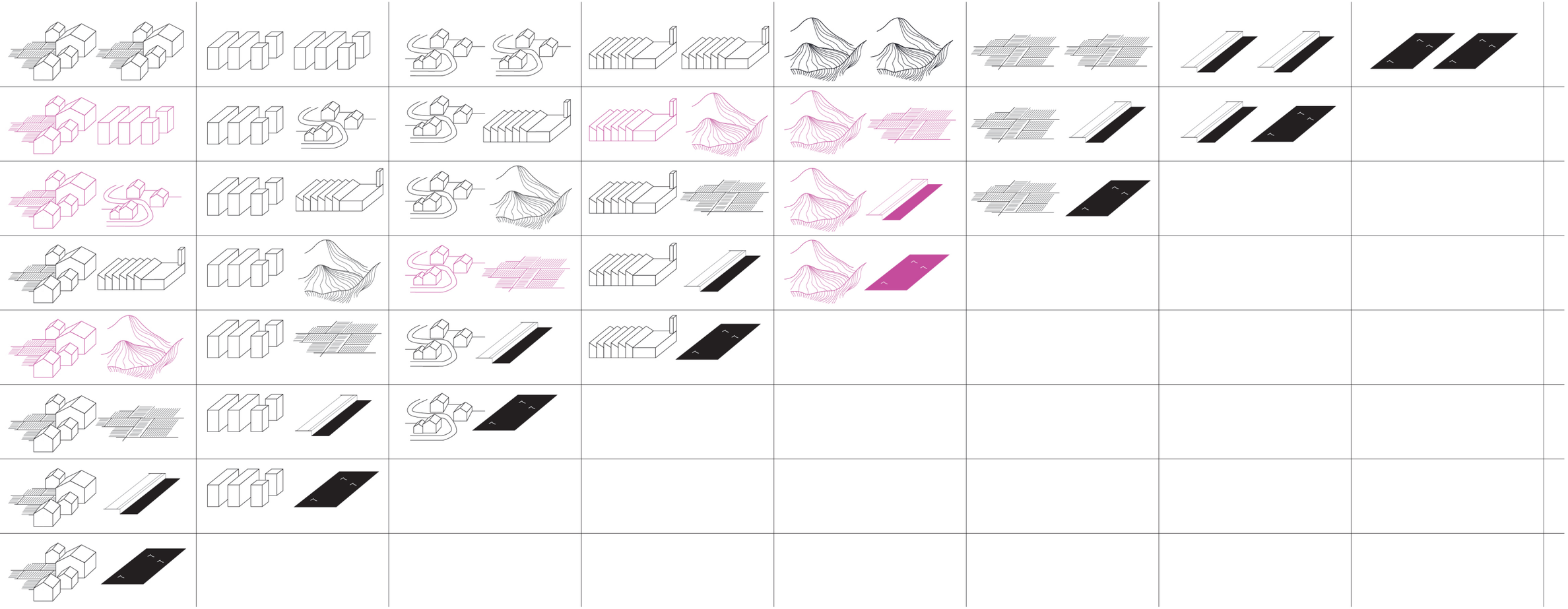
Aerial view of the Ou River, Lishui, 2021

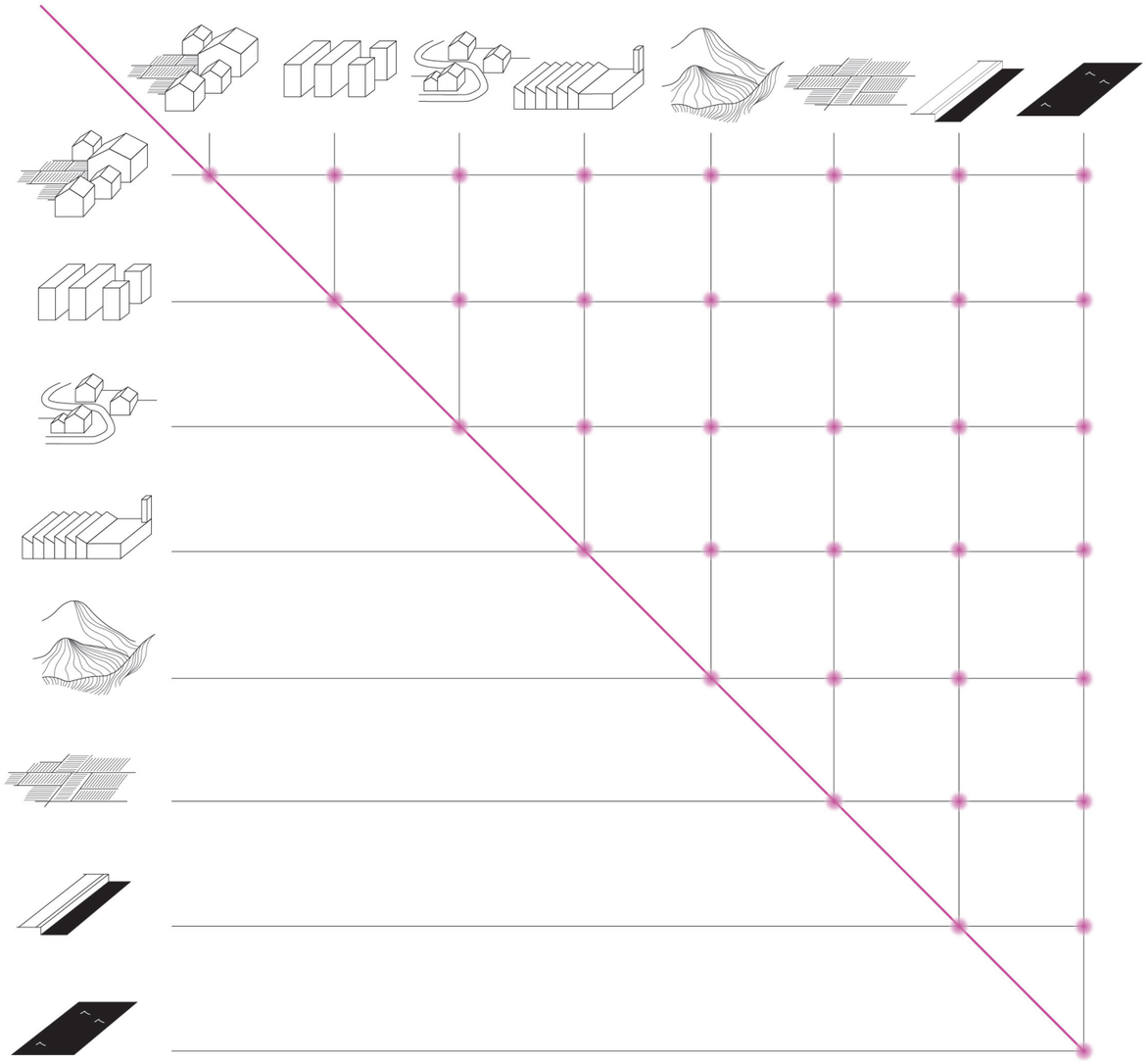
matrix A_

After having identified the geomorphological conditions on the territory, a square matrix is composed. The matrix relates the conditions studied one by one, forming pairs of conditions that indicate the meeting between them and the banks of the infrastructure. Thirty-six pairs of combinations are thus obtained.

Subsequently, however, it is necessary to highlight and then consider only the binomials present in the case study of Lishui. We therefore find:

1. Agricultural village/New buildings
2. Agricultural village/Foothill village
3. Agricultural village/Mountain
4. Foothill village/Fields
5. Industry/Mountain
6. Mountain/Fields
7. Mountain/Riverfront
8. Mountain/Water





architectural spaces_

Having identified the binomials of geomorphological conditions that are disconnected from the strong presence of infrastructure, the question arises as to how this obstacle can be overcome.

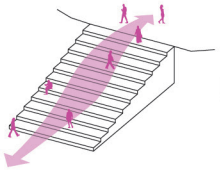
Previous analyses of urban design in China, and in particular the case of Lishui, reveal the lack of relationship between urban space and the man who inhabits it, but above all the difficulty man has in experiencing cities.

As early as 1994, Richard Sennet pointed out the ineffectiveness of this way of designing cities (referring at the time to western cities), and today this debate is extremely topical in China: some recent studies propose designing space “through” the body (Bonino and Mancini, 2021), introducing the world of architecture to a new subject, urban ergonomics. This subject involves an approach to design according to five different scales representing the different ways in which humans relate to the space around them. In short, the first scale is the macro-urban scale, or the man-city interface, which reduces a human to a dot moving in space; the second scale is the man-road interface, where man takes the form of a vector moving in space; the third relates to the relationship with the architectural space, also known as the man-costume interface, where man begins to take on human form; the fourth is the man-camera interface, where the morphology of the body about space is studied; and the last scale is the micro-scale, which deals with the psychological and intrinsic aspects of man (Li, 2021).

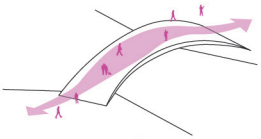
Taking into account the study of urban ergonomics and its five scales, we imagine designing connecting elements in the eight binomials of geo-morphological conditions: we must therefore take into account first of all the permeability of the spaces and then the relationship between the latter and the man who will inhabit them.

The first step was to identify eight architectural spaces studied for their characteristics and in relation to the human body: in particular, reference will be made to the man-road interface and the man-costume interface; the themes of connection and co-division become important.

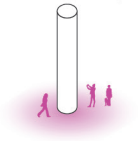
These architectural spaces will then be the basis for the construction of the architectonic devices as solutions. As can be deduced from the schematisation of these architectural spaces, the fundamental component is therefore the relationship between the man who lives in the space and the space itself, thus taking as a fundamental point the inhabitation of places that can bend and change according to it.



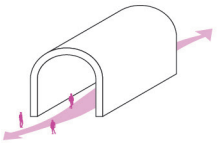
Ramp



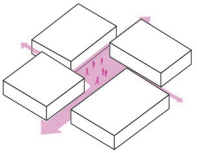
Bridge



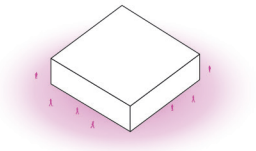
Column



Gallery

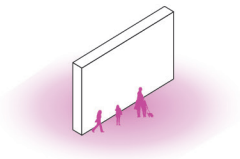


Empty space

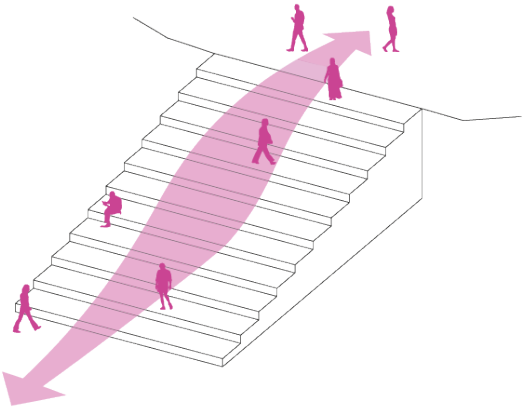


Volume

Garden



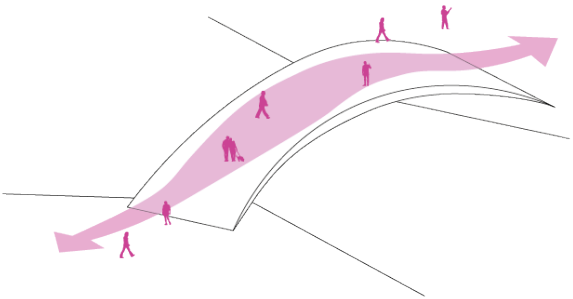
Wall



A staircase is commonly understood to be any vertical connection. What we want to explore, however, is the inhabitation of this architectural space: the body climbs the stairs, stops, observes and sits within this space.

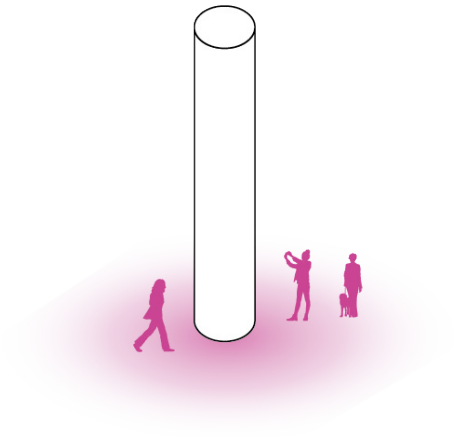
It is a connecting element that is meant to be crossed to go from A to B in different ways according to its architectural development. It can connect two territories with different textures or simply be a connecting tool within a building or infrastructure.

bridge_

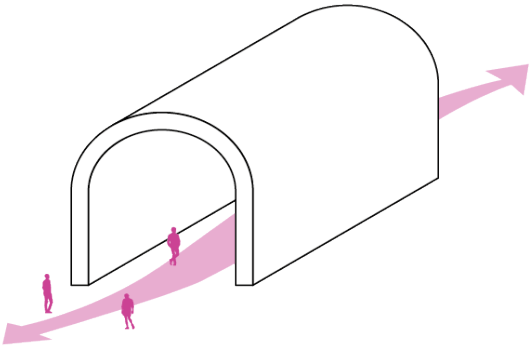


The bridge is an architectural element that can take on various connotations depending on the speed with which one wishes to cross it. The body may decide to cross it on foot, making it necessary to design parking spaces; or it may decide to cross it by bicycle, following the spaces provided; or it may decide to cross it with a motor vehicle, making its use much faster. Inhabiting this space, therefore, changes according to the speed, but the desire to connect two points by crossing an obstacle remains.

*column_*

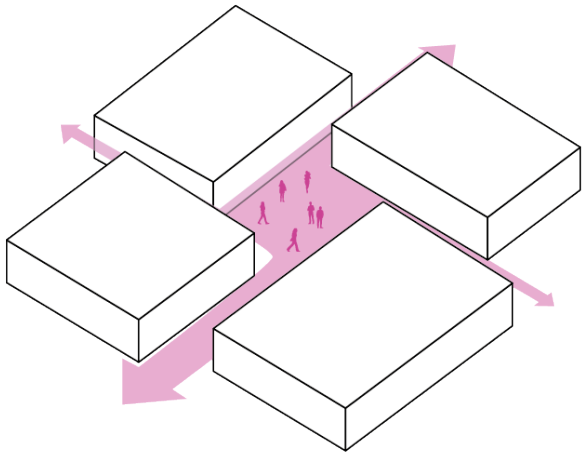


The column might at first glance be seen only as an architectural element, but in reality, it has the possibility of modifying the space and creating new ones. Several columns can create a portico, an architectural space that acts on the territory, creating a close relationship between the public space and the private building; the column can also be a punctual element that creates a meeting space around it (like an obelisk in the centre of a square), or it can be inhabited inside and thus become an element of vertical connection.



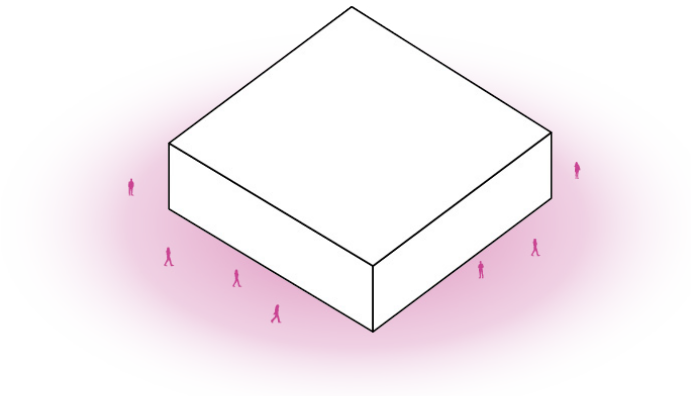
The tunnel is properly a connecting space that, like the bridge, can be crossed more or less quickly. It has the power to generate spaces underneath the urban tissue, thus creating new connections, relationships and living spaces. With the use of the tunnel, one has the possibility to work on stratified fabrics by bringing living on several levels.

*empty space_*

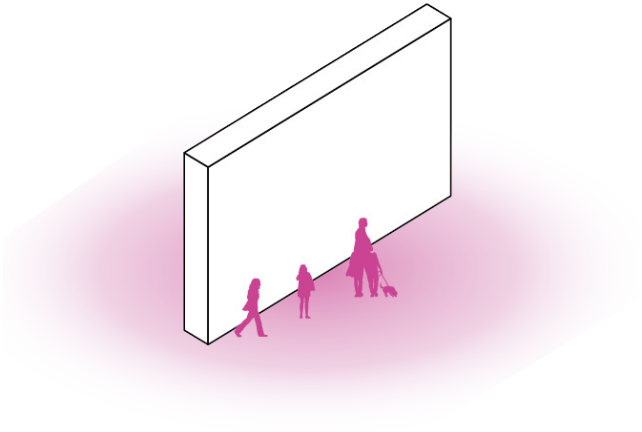


The empty space within an urban fabric can take on different roles, ranging from more active to more passive living. It is chosen for its flexibility and because it gives the possibility of creating spatial connections avoiding the construction of architectural volumes. It can be transformed into a square or even become a place for outdoor sports activities. It is something malleable that can be modified according to the way people live.

volume_

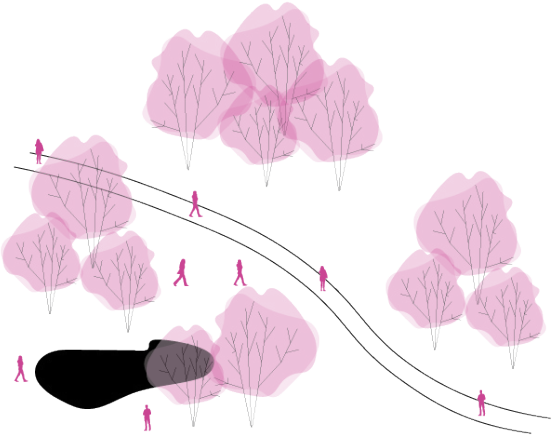


The volume is a closed architectural space that relates to a more or less intimate question of living. It can generate public spaces, becoming an element of connection between two different urban tissues, or it can simply become a place for intimate living. It transforms and adapts itself according to needs, and in this research, the connections created both with the outside and the inside of the volume is important.



The wall, as Francesco Cacciatore wrote when analysing the works of Louis Kahn (Cacciatore, 2016), can become a “container of places”. It can be a dividing element and thus create two independent urban tissues, but it can also become an element of connection and a living place.

*garden_*



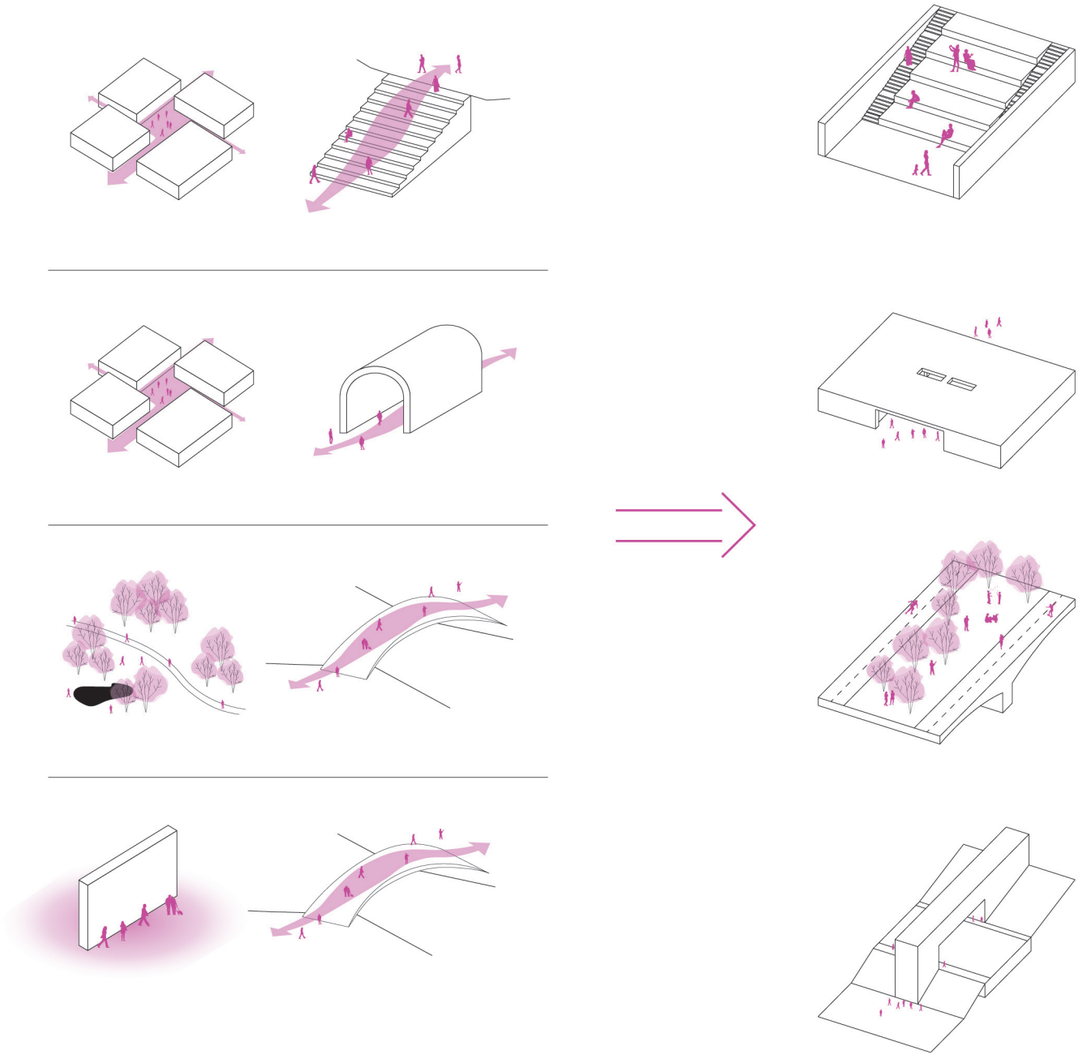
A garden is an open space with a strong presence of greenery that is a place for recreation and walking. This space can be used freely, and green corridors or parks can be created to link different urban areas and compensate for a lack common to both. The garden can be walked through quickly or become a place of recreation, and in either case, it will improve the quality of living.

matrix B_

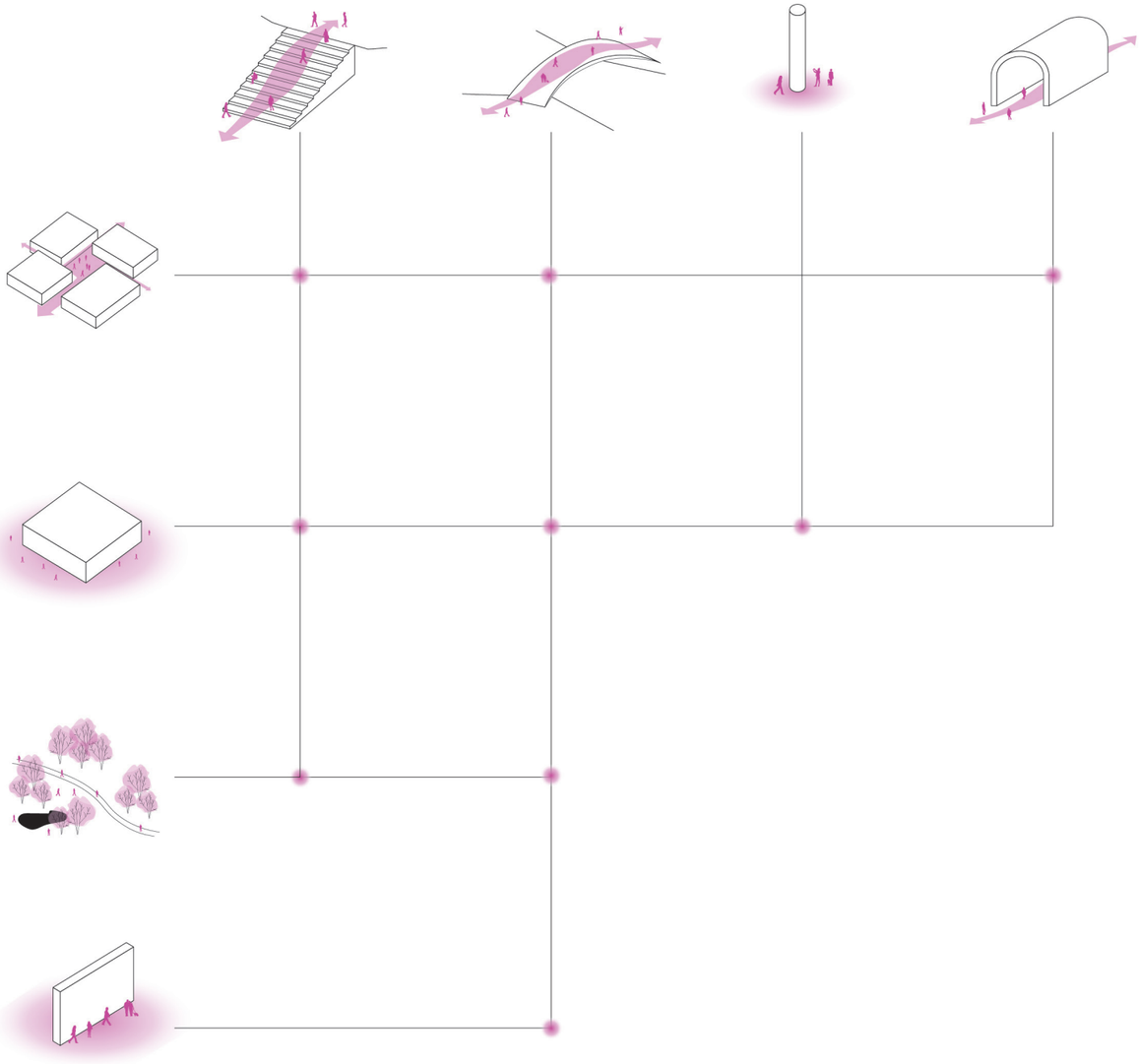
After identifying the eight architectural spaces, a second matrix was constructed.

This matrix is made up of eight architectural spaces divided equally between rows and columns: the purpose of relating the spaces is to create new architectural devices that can respond to design needs.

Only eight of the sixteen possible combinations were extrapolated from the matrix to obtain eight useful devices.



devices_

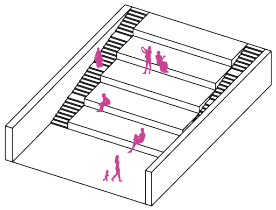


The devices identified are conceived as connecting elements, as generators of new spaces that are not designed based on function, but rather with the desire to break down barriers.

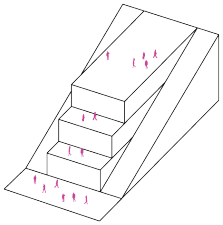
Each of them represents an open or closed public space that will be activated according to certain conditions: rules have been established to guide the application of these devices in contexts similar to the study area.

The devices will therefore generate processes of activation of collective living, making it possible to overcome the infrastructure through a process of integration and not negation.

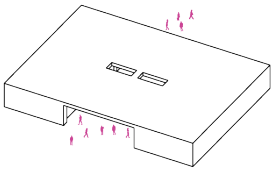
Terraced square



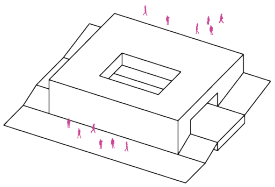
Terraced building



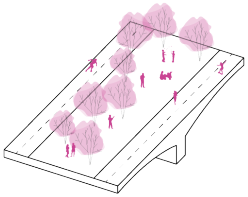
Underground plaza



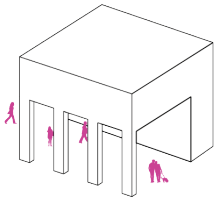
Courtyard building



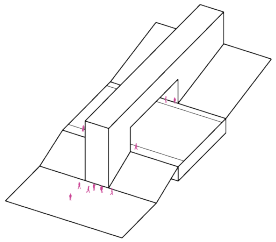
Green way



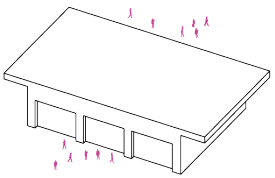
Porch



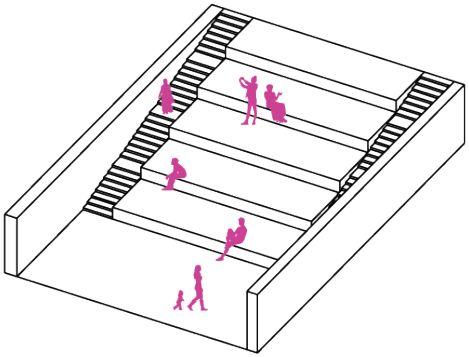
Bridge building



Hypogeum building



device 1_



Terraced square

The terraced square is a device that refers to open public space and combines the idea of connecting two urban tissues with the concept of living. It creates zones of rest even though it mainly generates movement.

Reference:
Apple Piazza Liberty, Foster + Partners, Milan, 2018

rules

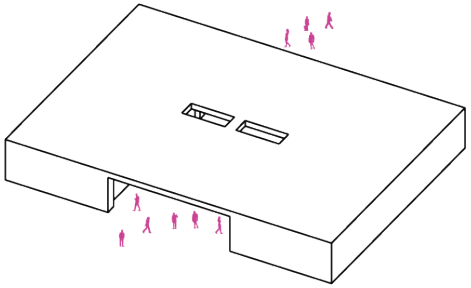
Street under the square.

Use when there is a difference in level.

Use when the available space between buildings is at least 100m.


NESPRESSO
OPENING SOON

device 2_



Underground plaza

The underground square is a device that provides for the integration of open public spaces and closed public spaces, acting at the same time as a connecting element. The idea is to create commercial galleries that make living in these places more efficient.

Reference:
Expansions of Path, Matthew Lawson, Toronto, 1960s

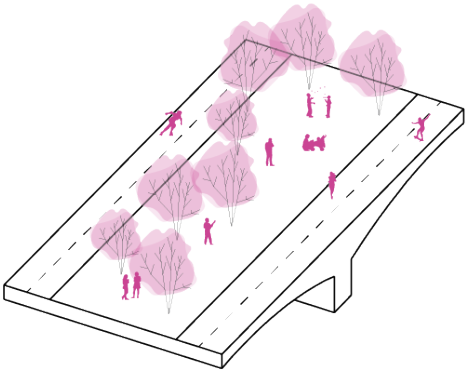
rules_

Street under the square.

Include commercial space.

Use when there is a difference in level.

*device 3_*



Green way

This device can be developed either perpendicular to the infrastructure, thus taking the form of a bridge, or in correspondence with it, creating a connecting green open space. The aim is to give greener and more restful spaces to both urban contexts with which it will relate.

Reference:
The High Line, Diller Scofidio + Renfro, New York, 2009

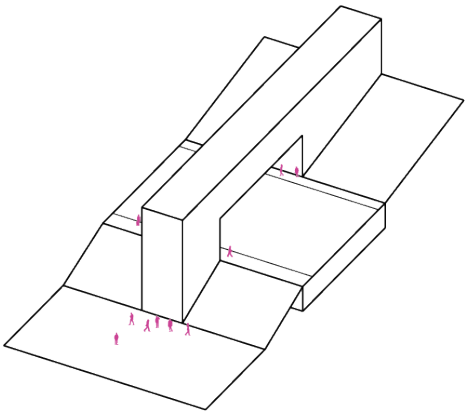
rules

Street under the device.

Include Metro stop.

Include cycle path.

*device 4_*



Bridge-building

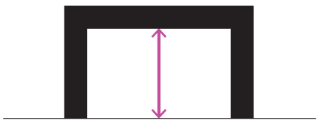
The bridge-building is intended to overcome the obstacle of the road by integrating the purpose of connecting two spaces with that of creating new living spaces. This will result in buildings for both public and private use with the possibility of reaching both urban contexts.

Reference:
Panorama – Airtime Bridge Building, Marc Mimram, Paris, France, 2018

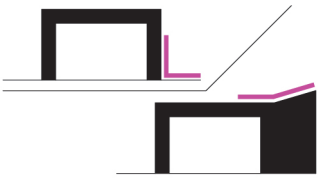
rules

Street in the current position.

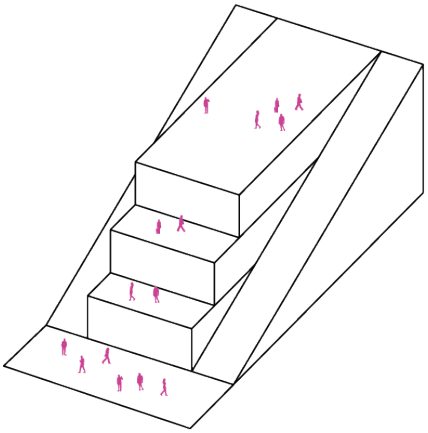
Minimum height 7meters.



Adapt the device to the terrain.



*device 5_*



Terraced building

This device envisages an intimate living space overlooking the collective one. It takes advantage of the slope of the land to provide open and closed spaces for each unit and to design a street-front that reflects the geomorphological conditions.

Reference:
ANNSO Hill Hotel, STUDIO QI, China, 2019

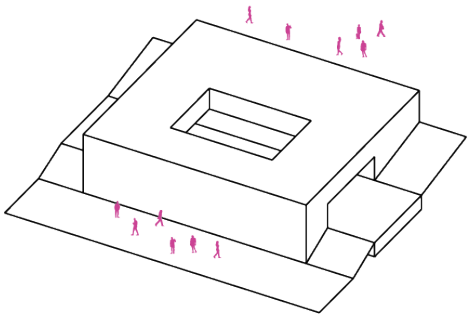
rules

Street under the device.

Building follow the slope of the site.

Include an open-air space for each unit.

device 6_



Courtyard building

The courtyard building tries to bring public living from the outside to the inside, demonstrating permeability and flexibility.

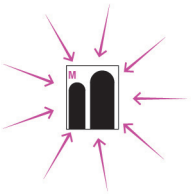
This device has a large public component and becomes a point of interchange between urban contexts.

Reference:
West Village - Basis Yard, Jiakun Architects, Chengdu (China), 2015

rules

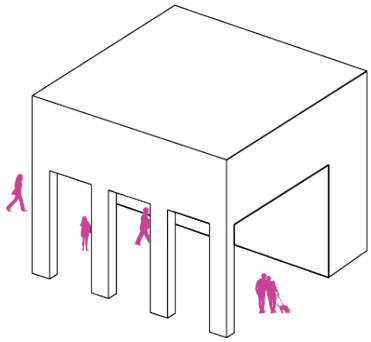
Street in the current position.

Point of interchange with a large metro stop.



Overlooking a street for public use.

device 7_



Porch

The portico can be understood either as a porticoed building integrating public and private space, or an infrastructural building as will be seen applied to the case study. It allows overcoming the infrastructure by integrating it.

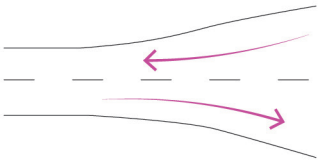
Reference:
KØGE North Station, Dissing & Weitling, COBE, COWI, Denmark, 2014

rules

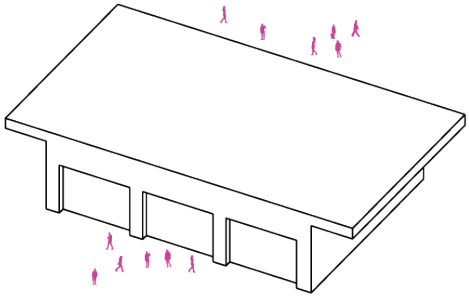
Street under the device.

Possibility to park.

Ensure motorway exit and entry



device 8_



Hypogeum building

The underground building would be developed below the road surface becoming a covered public space connecting the two parts.

Reference:
EWHA Womans University, Dominique Perrault, Seoul, 2008

rules

Street in the current position.

Building for public services.

Use when there is a difference in level.

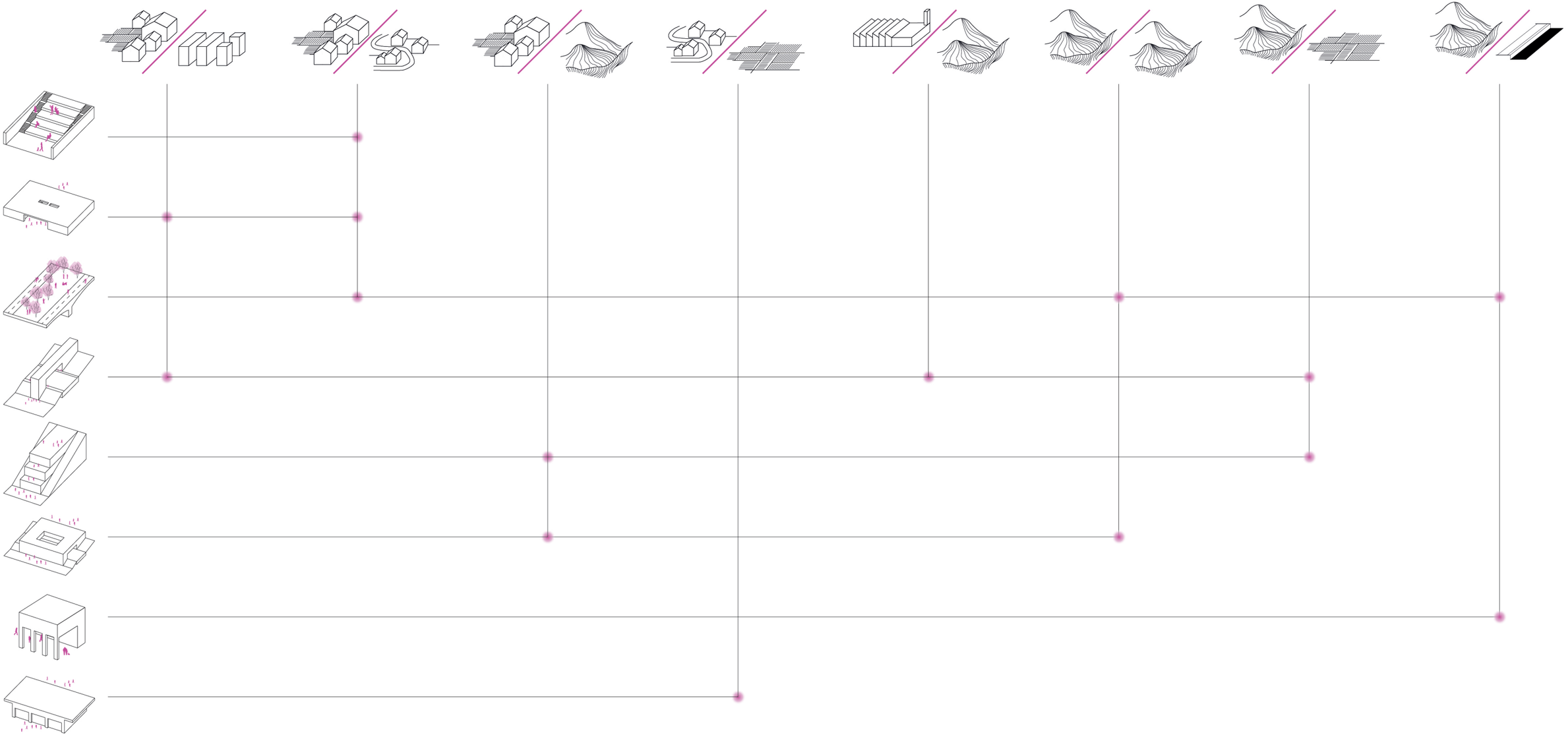
matrix C_

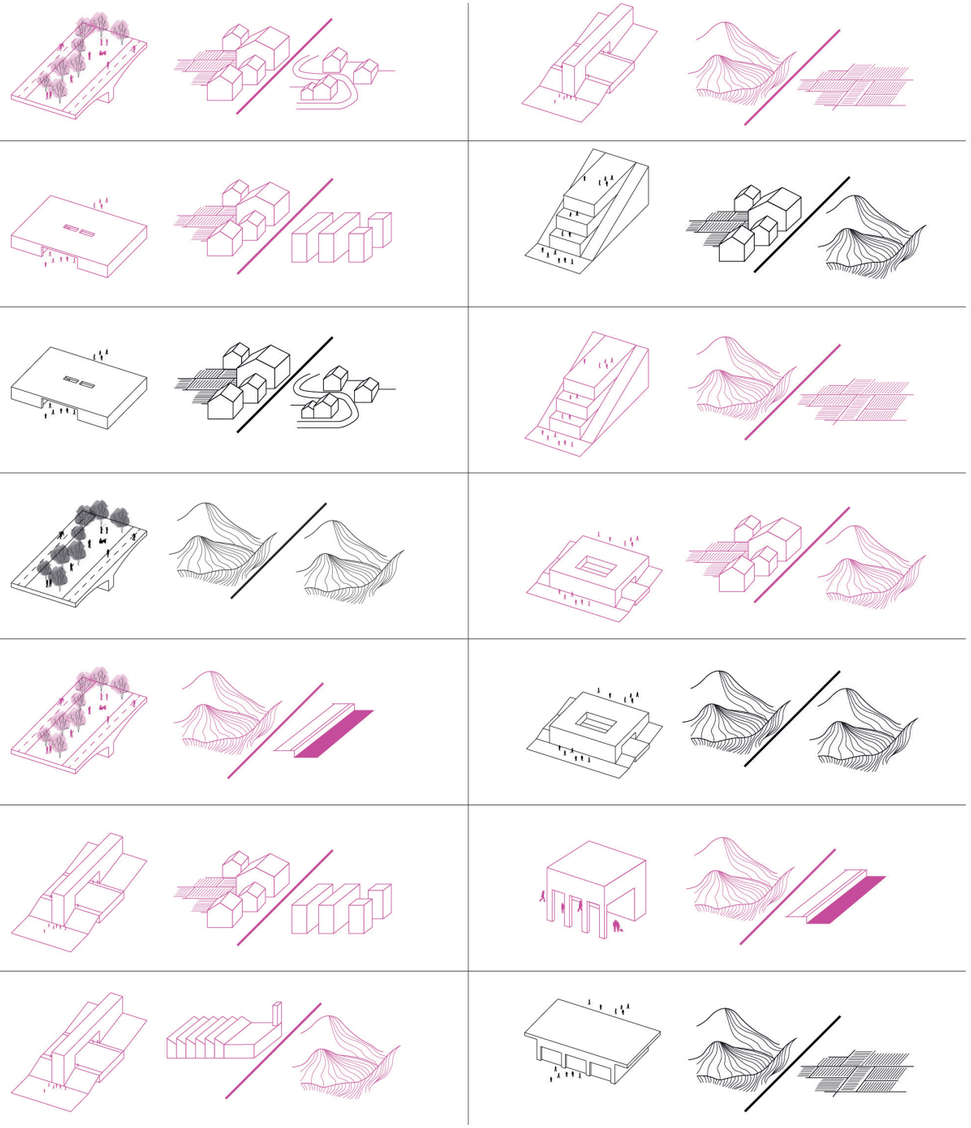
The last matrix relates the identified devices to the binomials of geomorphological conditions present in the project area.

The thirteen proposed solutions are intended to resolve the binomials by modifying the current structure of the infrastructure. It is foreseen that in each solution the device acts as a reactivator, bringing with it the insertion of a light infrastructure such as a metro or railway line.

The intention is therefore to guarantee an optimal quality of life even in the suburbs where infrastructures are often not opportunities for sustainable development and where basic services are currently lacking.

The aim is therefore to create common living areas that integrate with intimate living areas, guaranteeing the possibility of physical and cultural interchange with neighbouring urban contexts.





应用
application

nine devices in Lishui_

The case study examined was divided into nine parts that identify nine binomials of geomorphological conditions.

In particular, there are six types of binomials, in the diagram the first circle from the centre, which is then resolved using devices.

The diagram is representative of the interpretative method used for the case study: in sequence in the circles are represented the binomials of geomorphological conditions, the architectural spaces and the devices.

Agricoltural village

Foothill village

New buildings

Industry

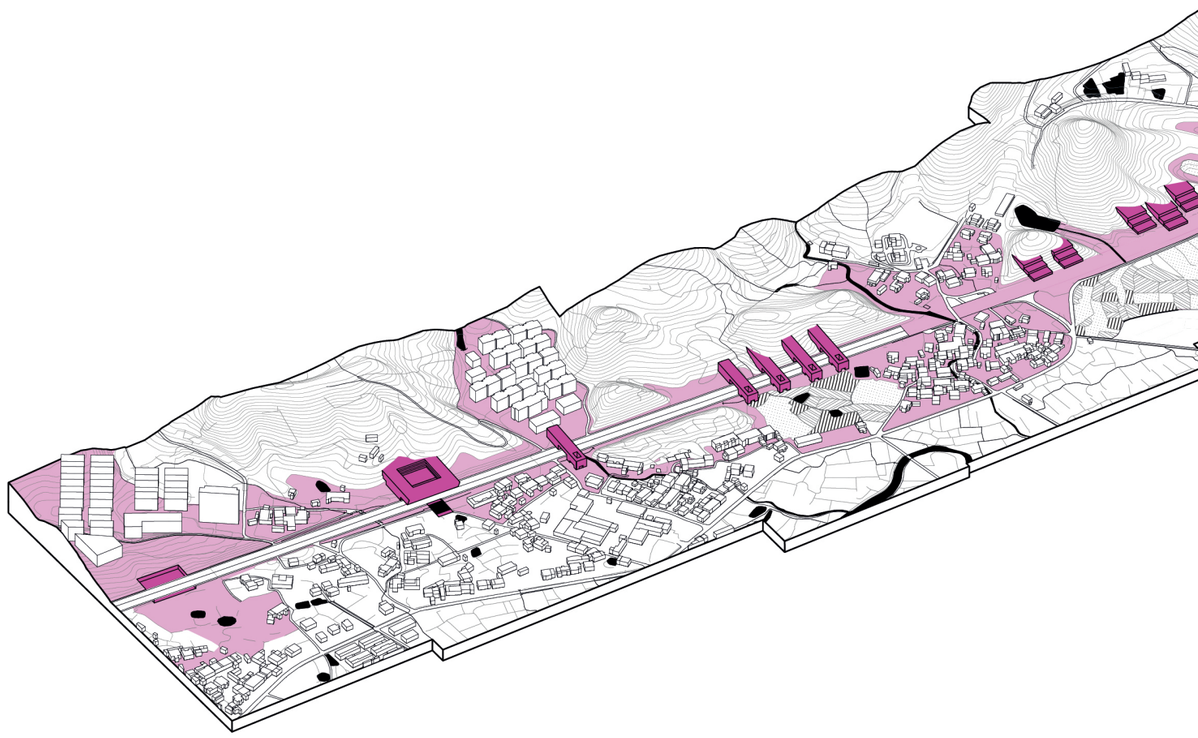
Fields

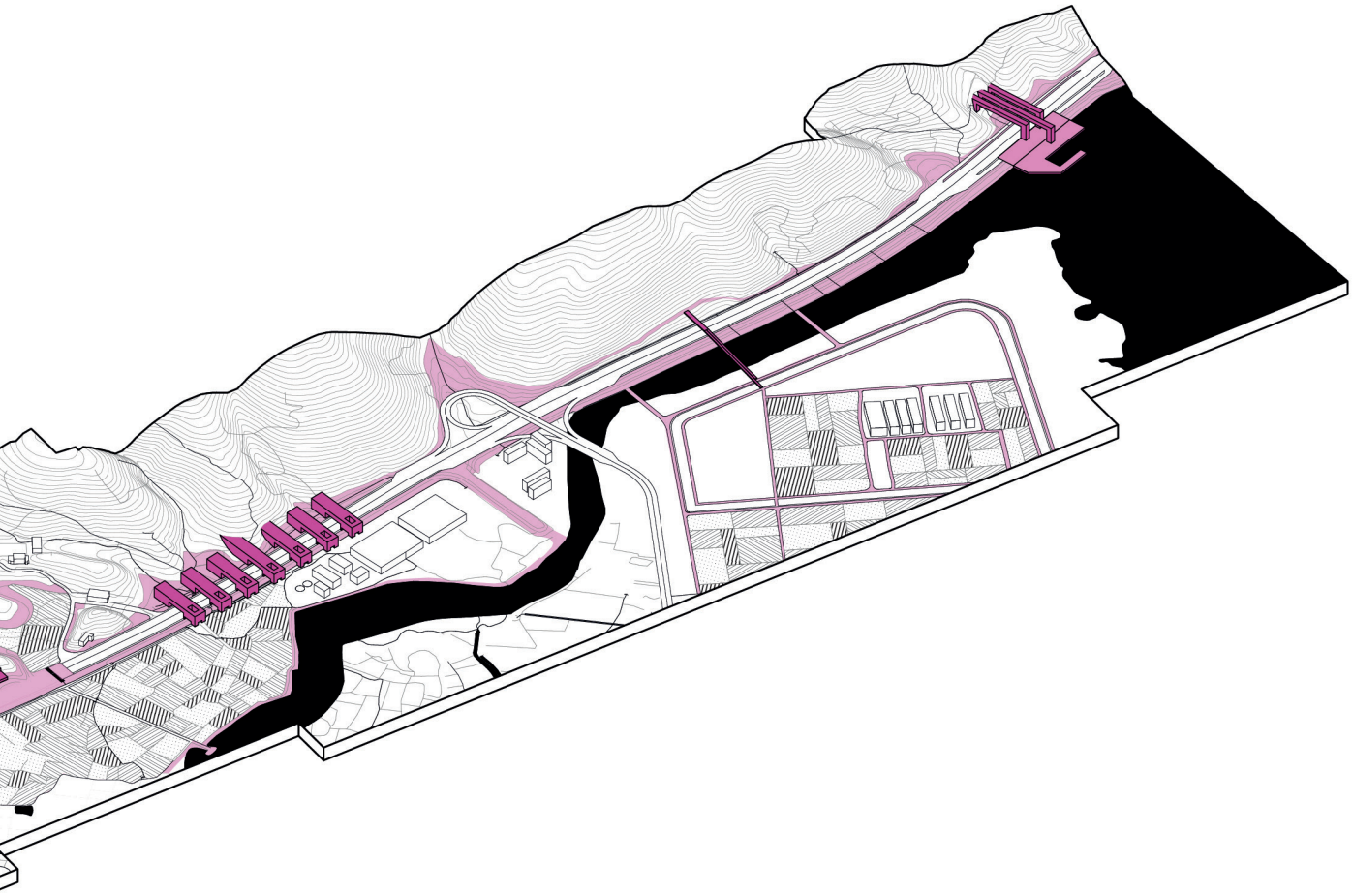
Mountains

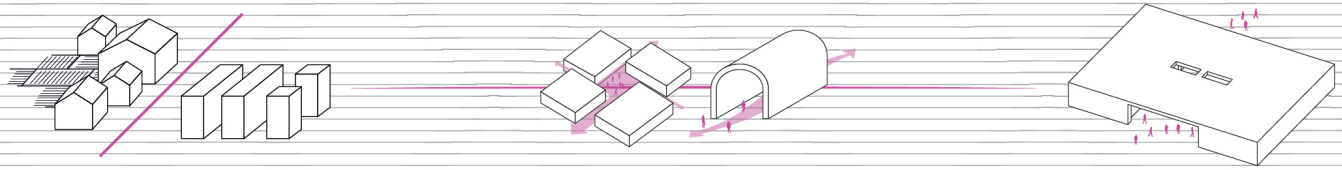
Water

0 50 100 150 200 250

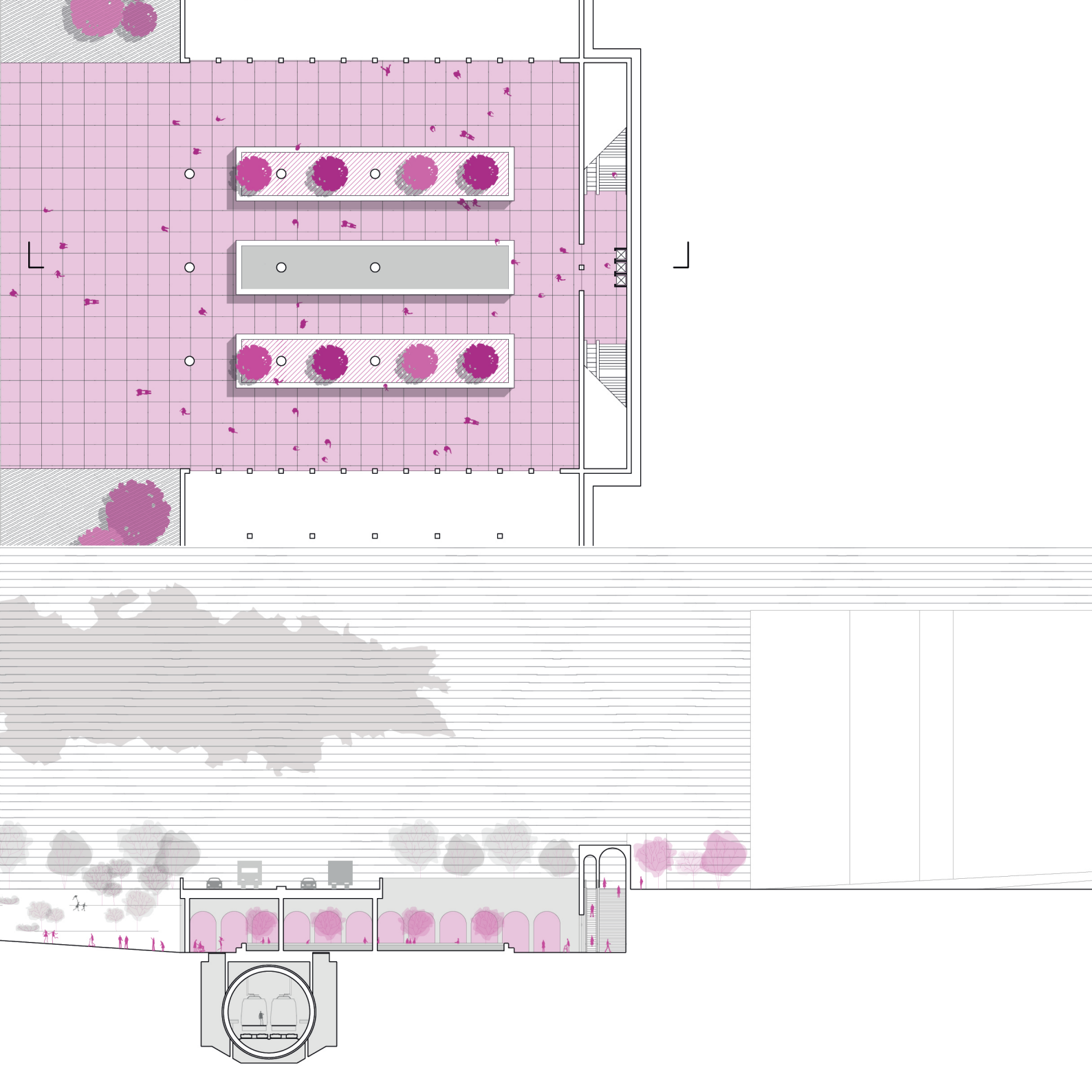
axonometric view_

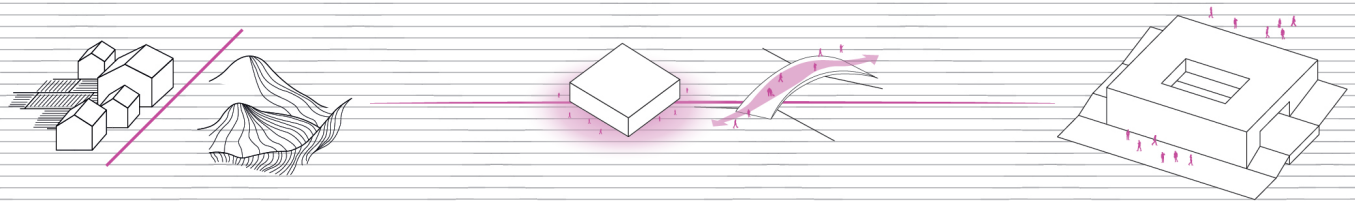




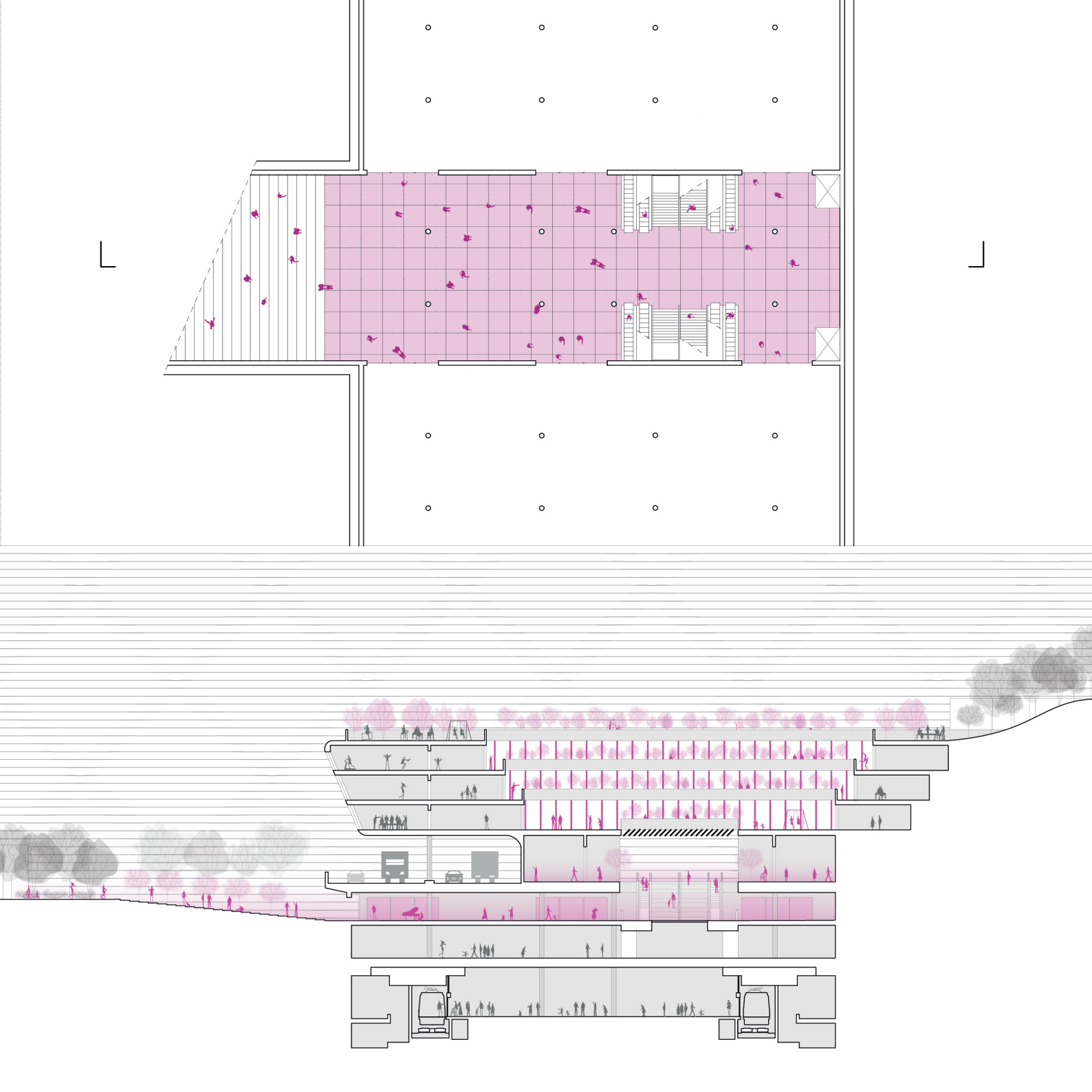


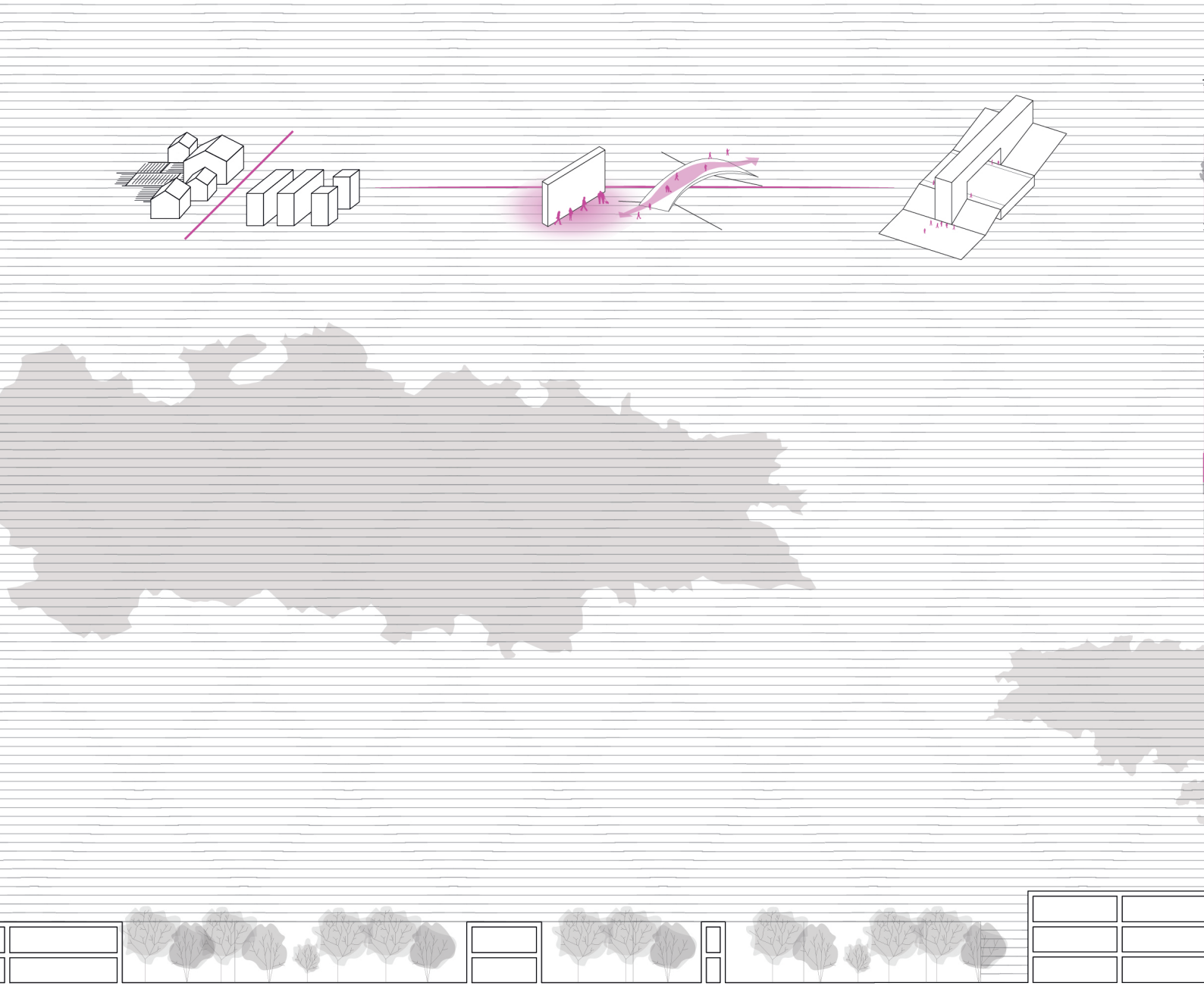
0 5 10 15 20 25



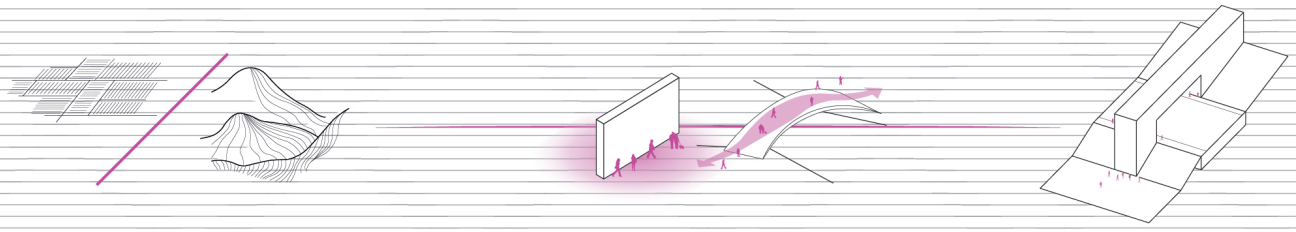


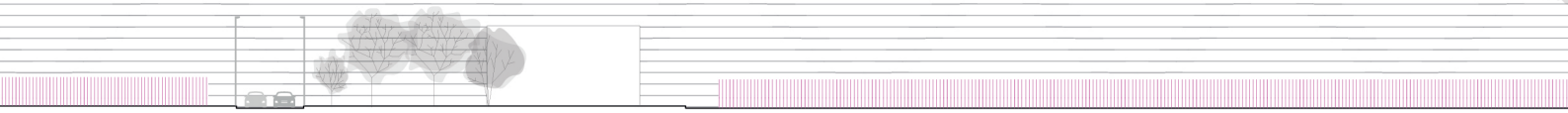
0 5 10 15 20 25



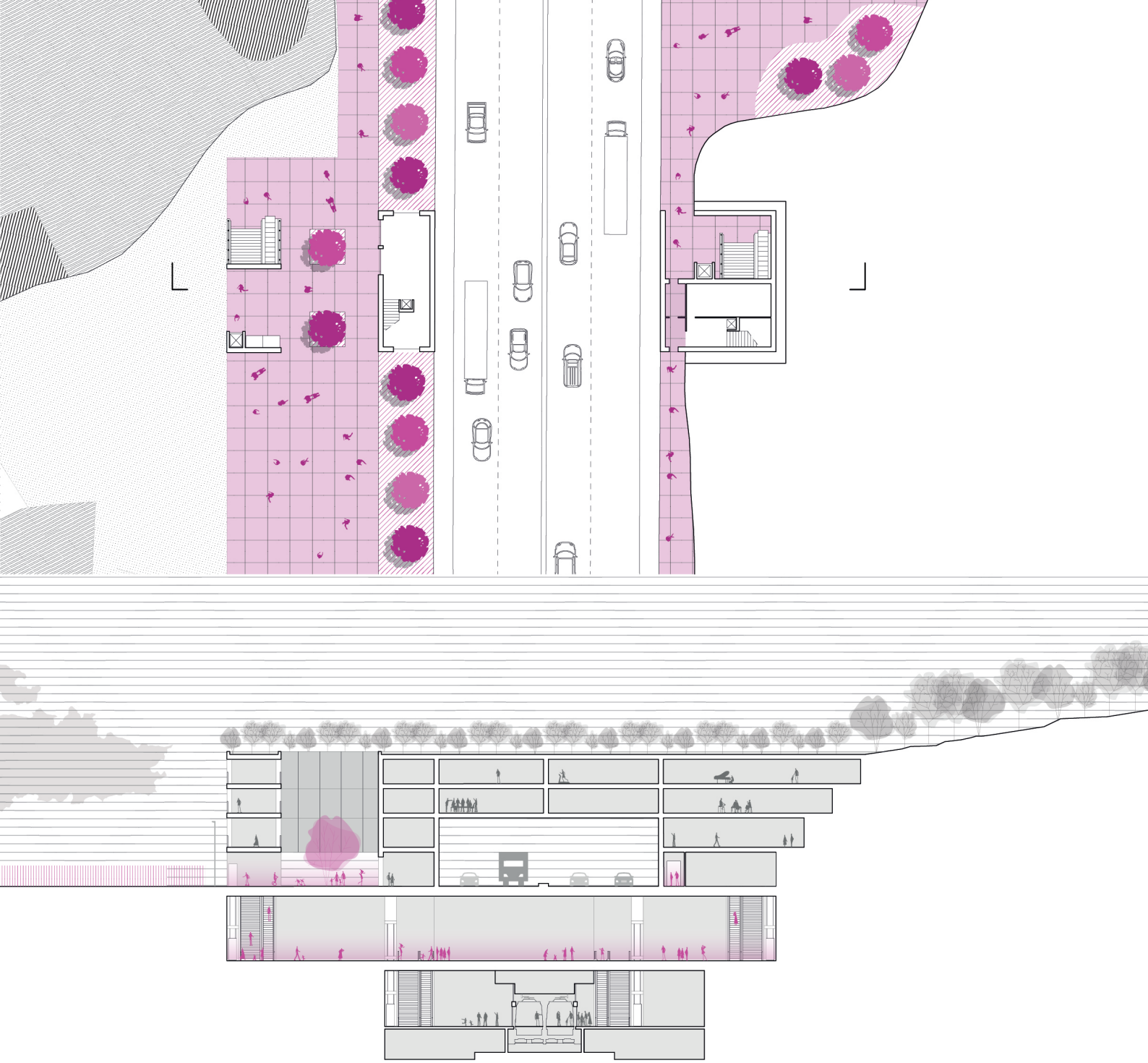


0 5 10 15 20 25

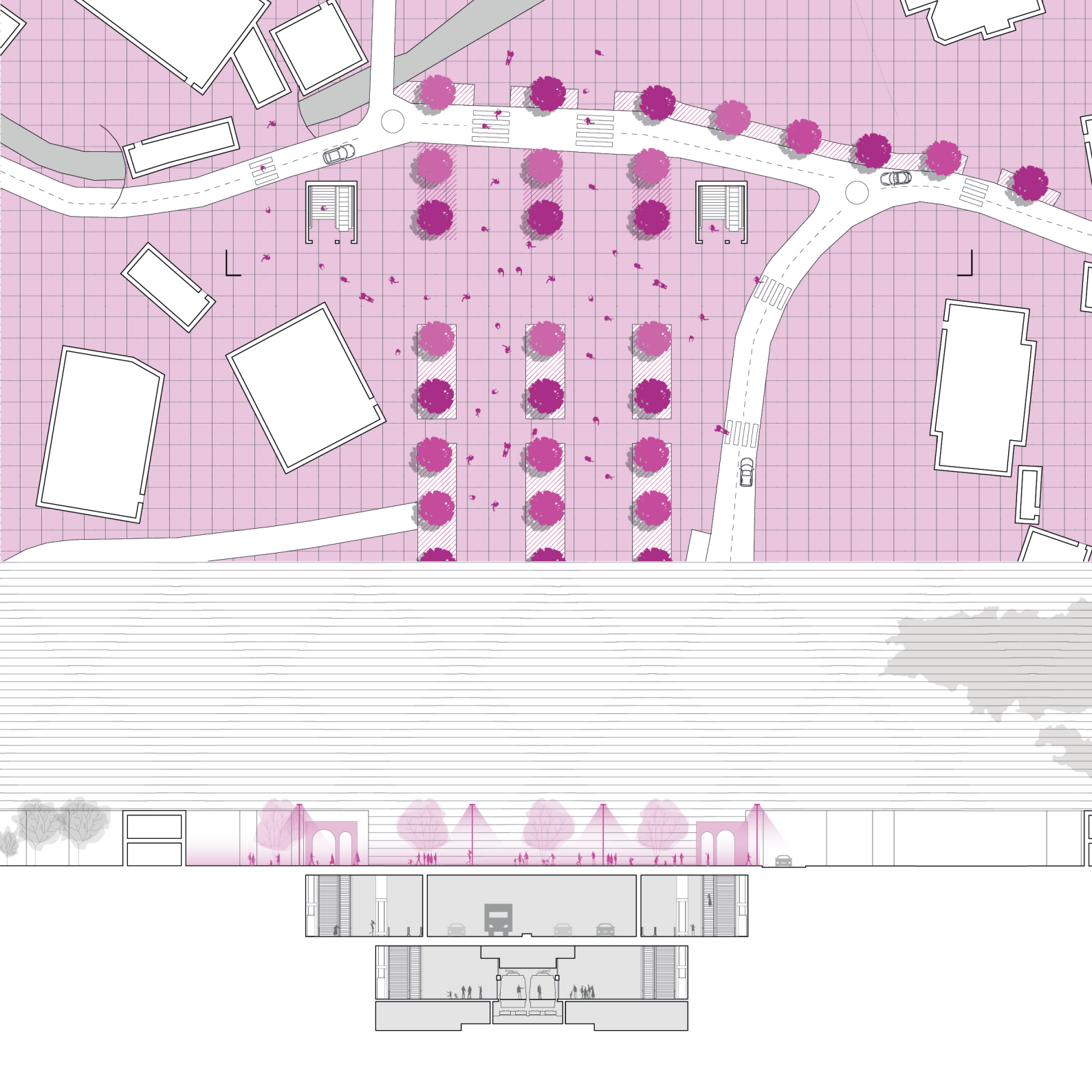




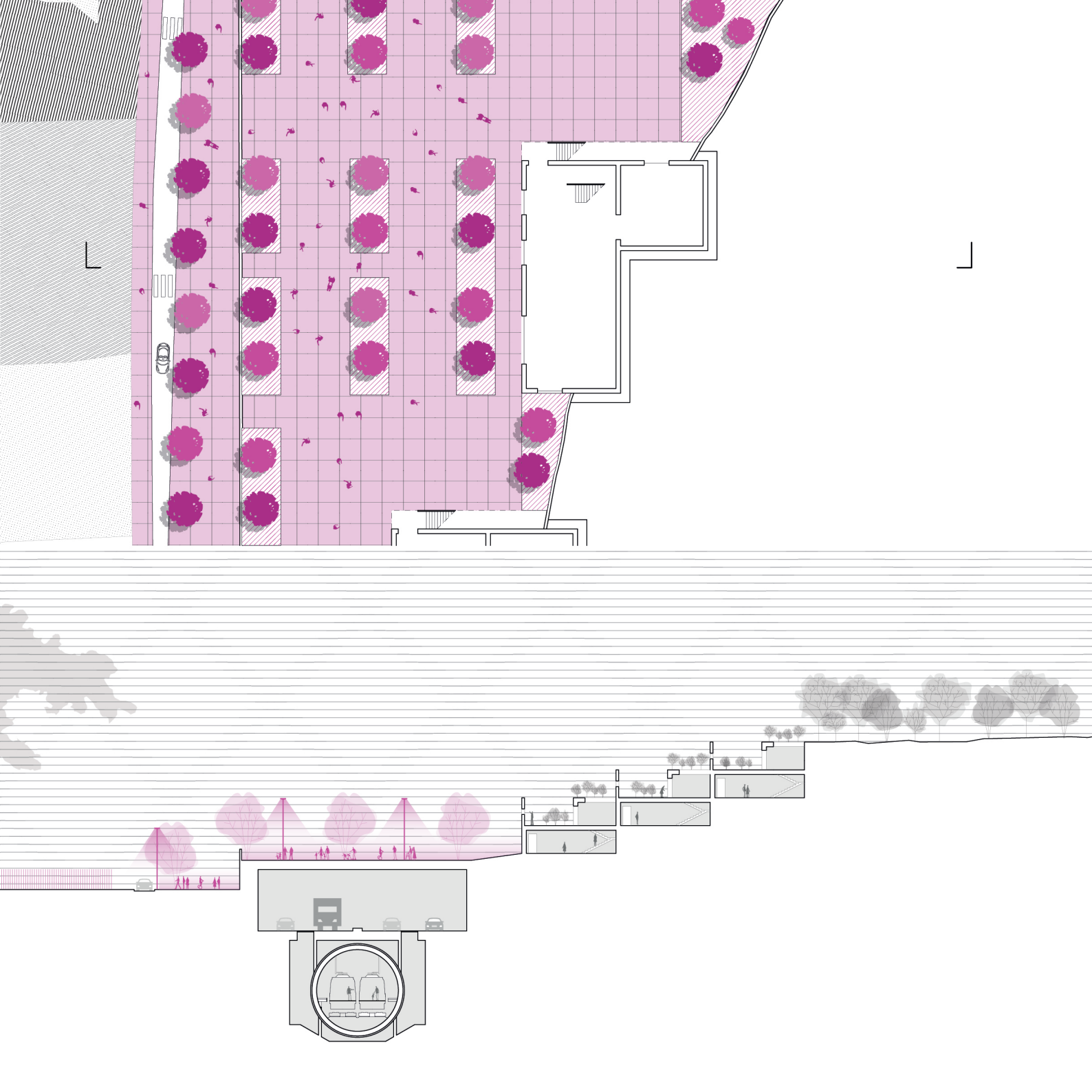
0 5 10 15 20 25

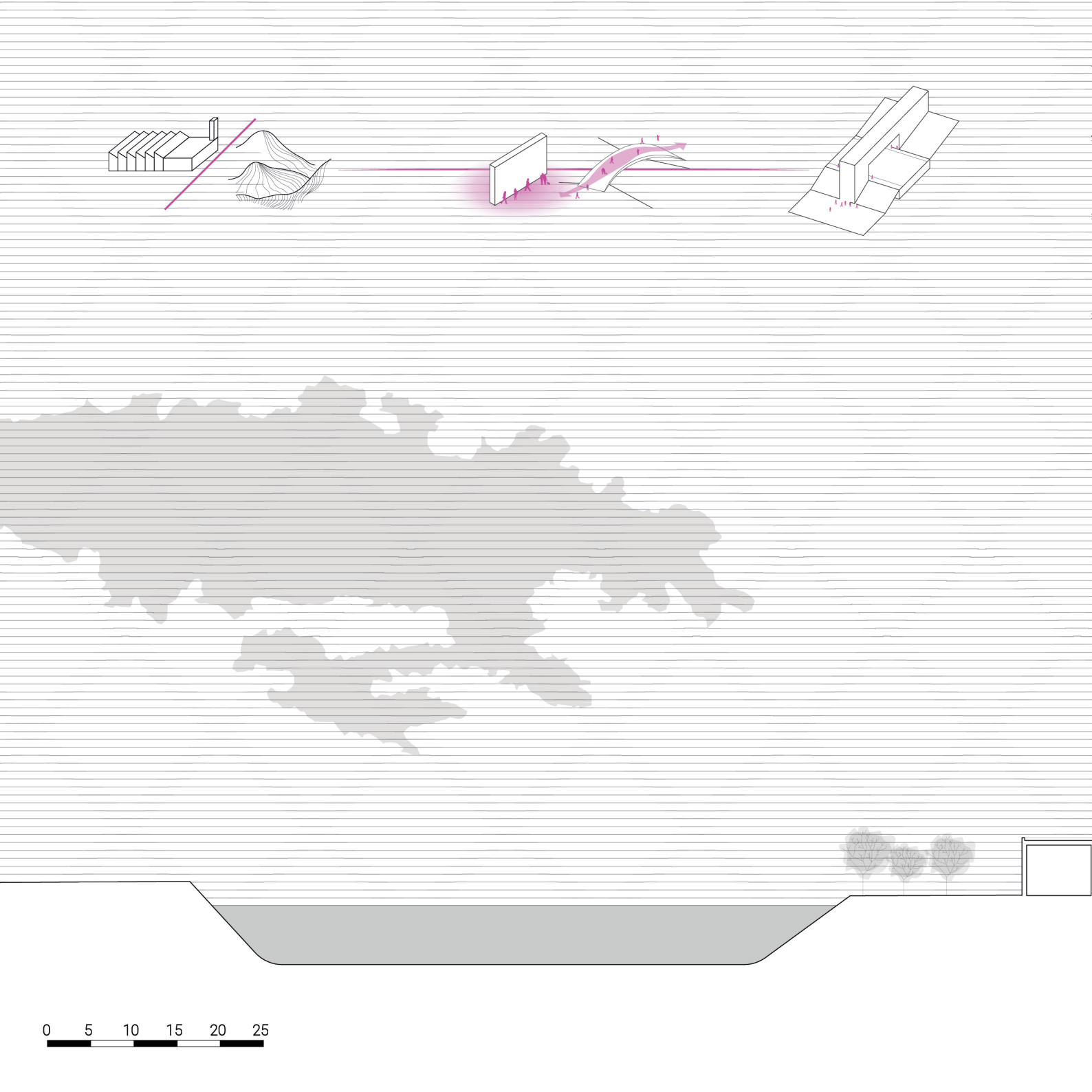


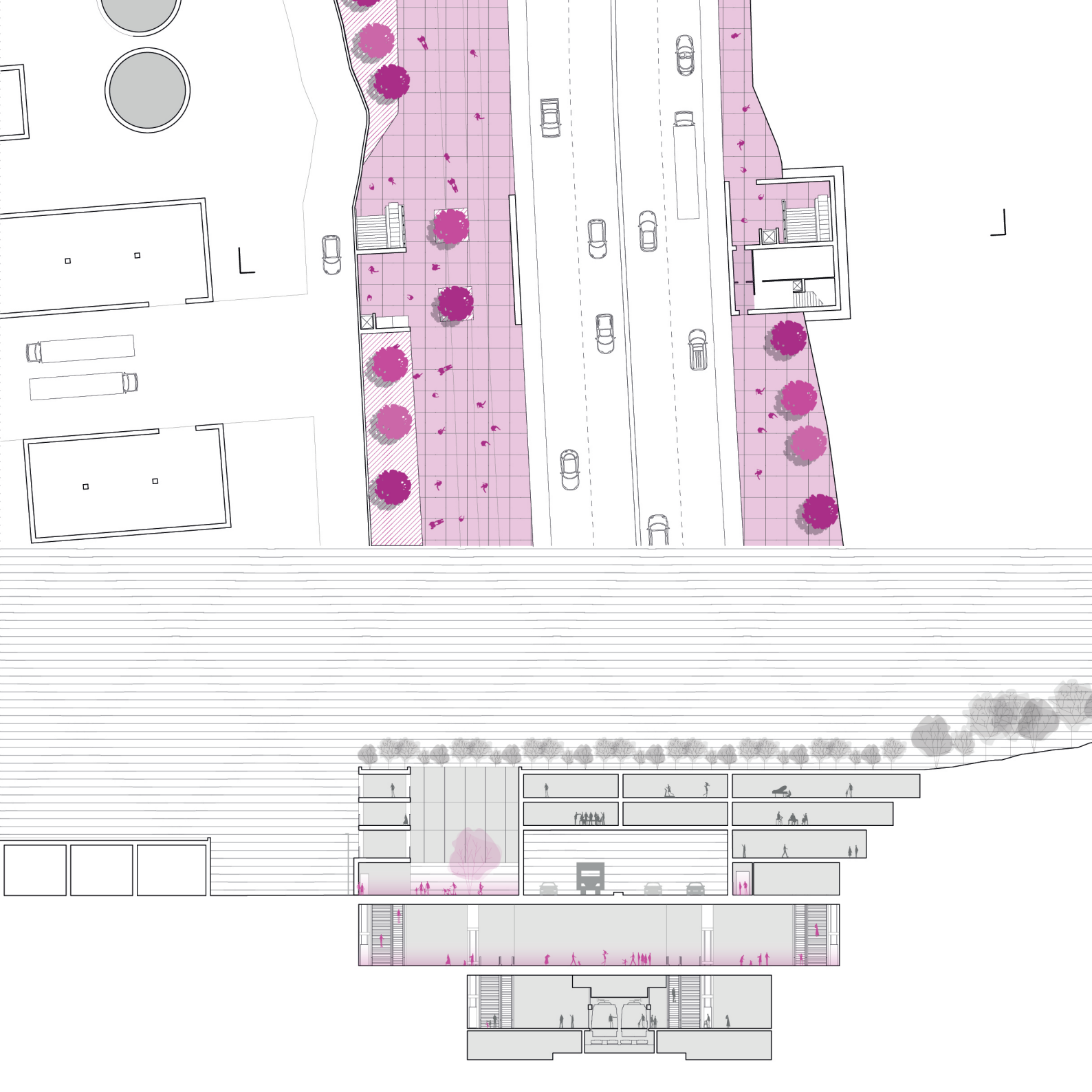
0 5 10 15 20 25



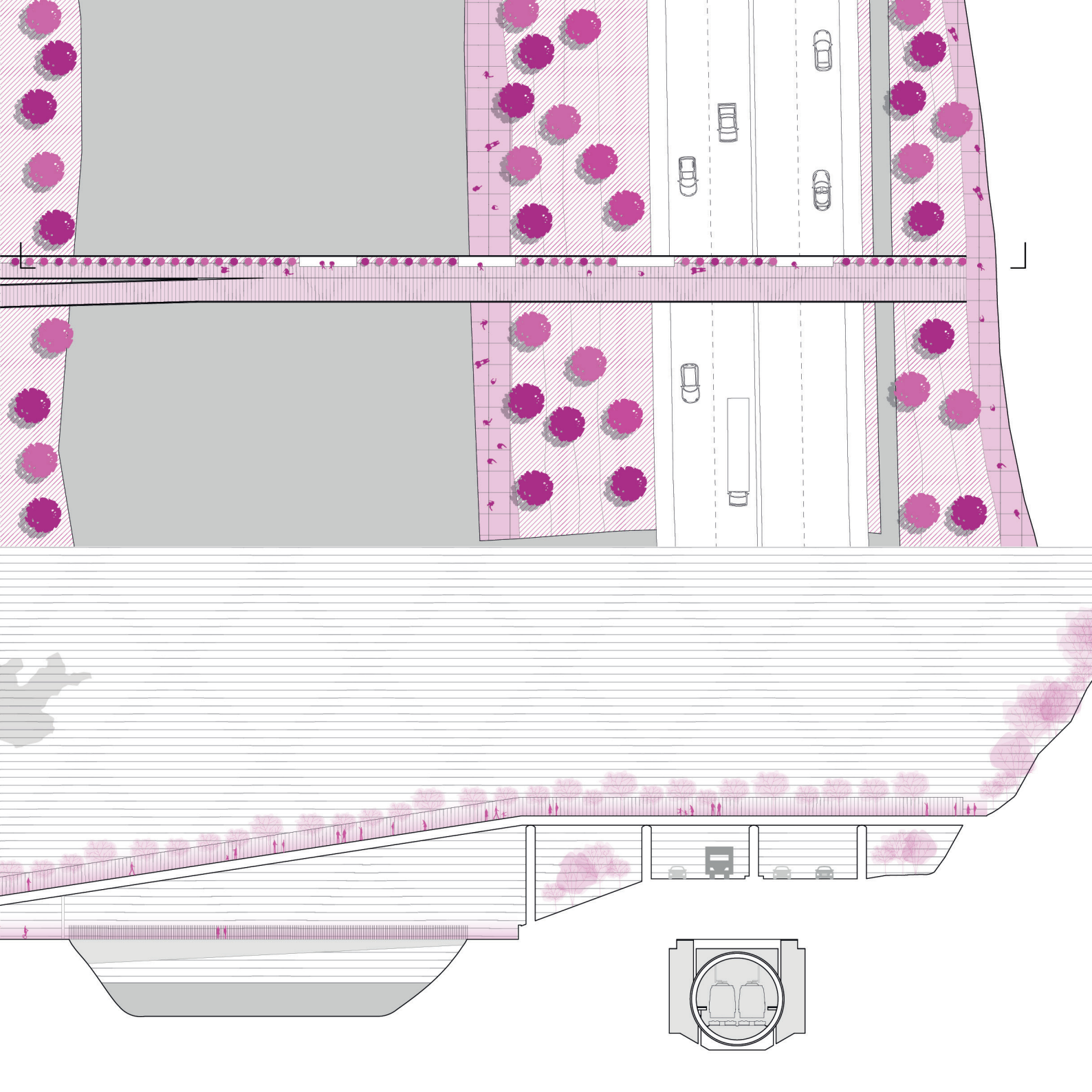
0 5 10 15 20 25



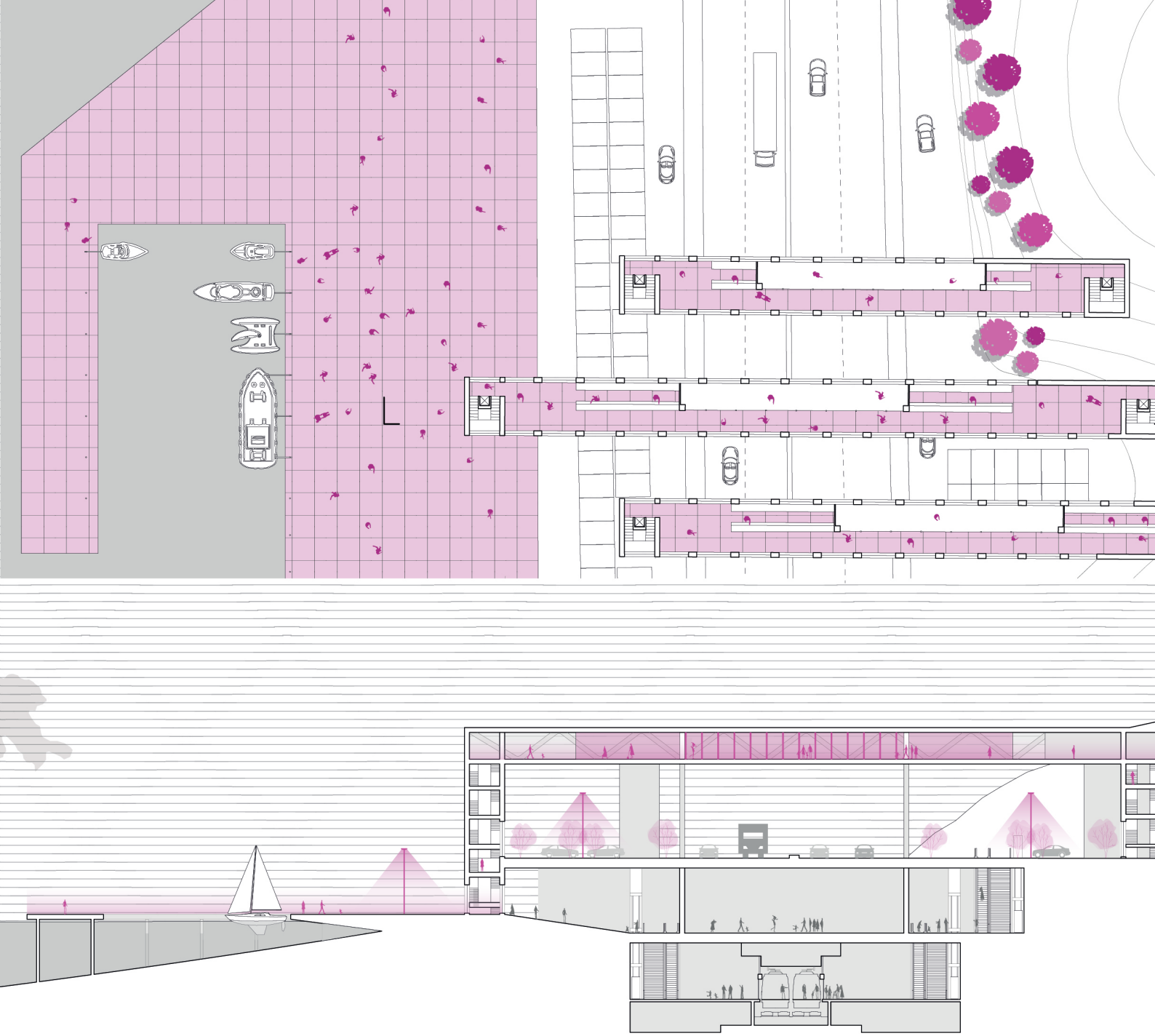

0
5
10
15
20
25



0 5 10 15 20 25

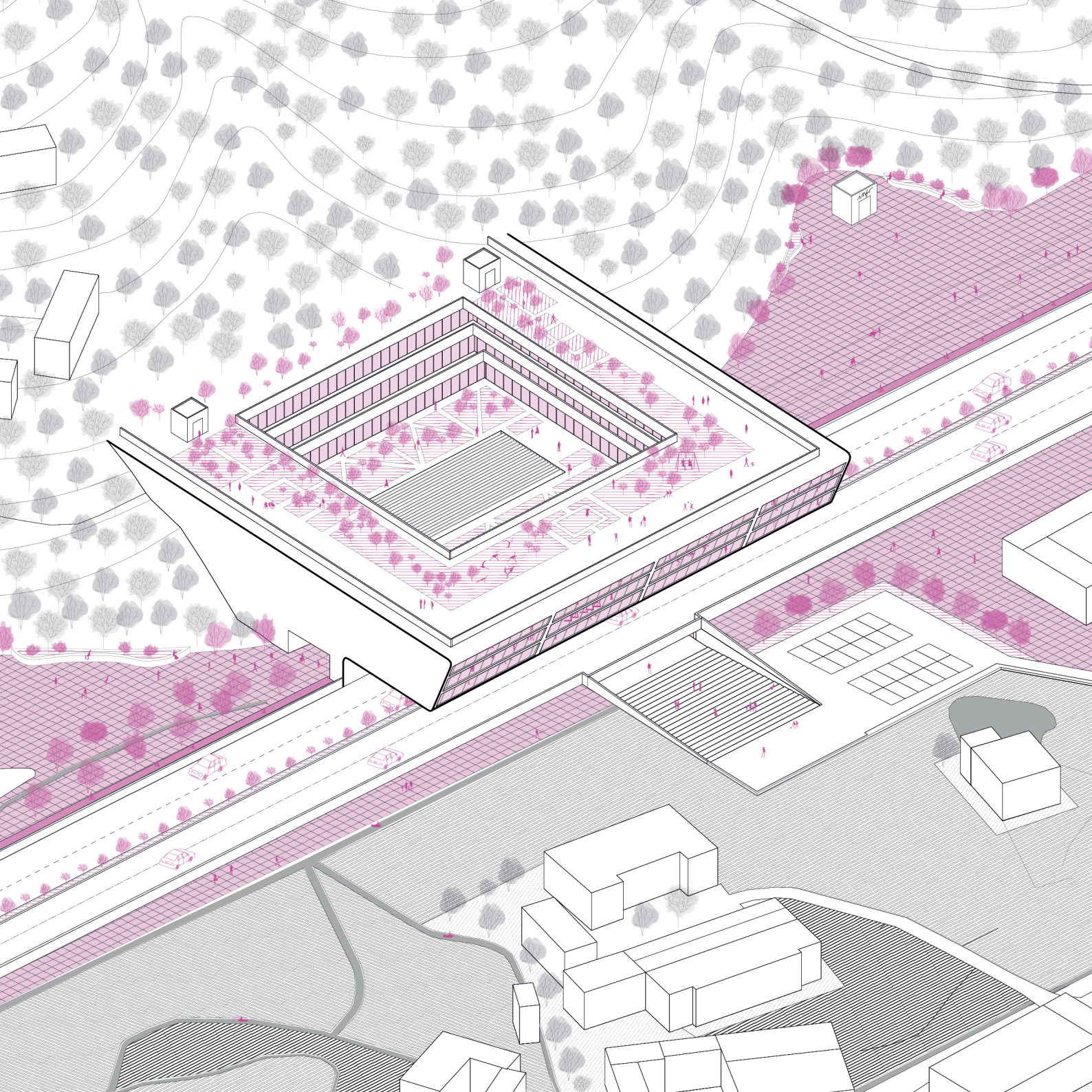



0
5
10
15
20
25



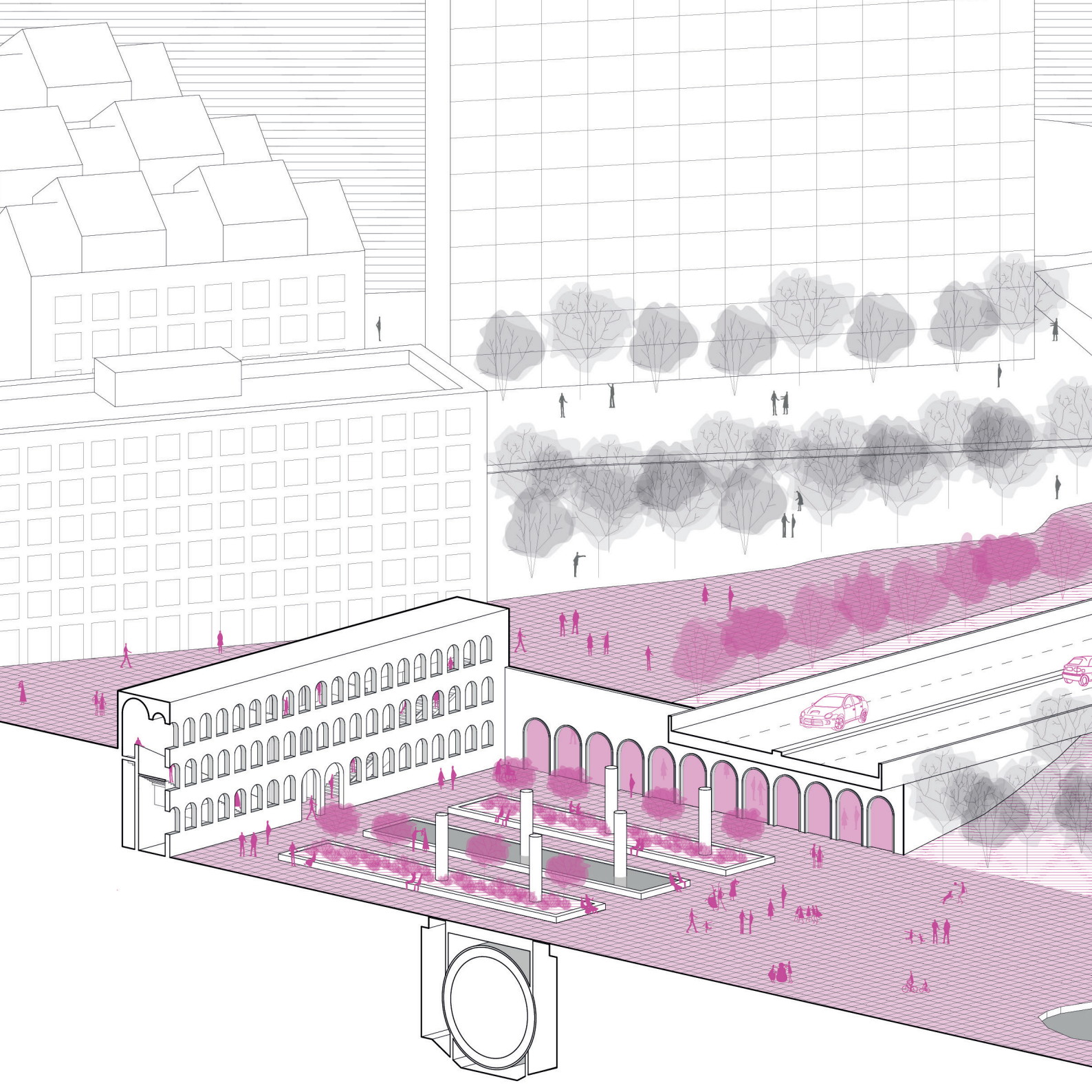
The courtyard building is designed to create connections between all parts of the area. It imposes itself on the infrastructure with a cantilevered structure that pushes towards the landscape and the agricultural village.

It becomes a square, a commercial space, a residential building and at the same time it allows access to the underground both from outside and inside.



The underground square is intended to connect two opposing contexts by giving them a common space to live in.

It is conceived as a large green commercial space that develops below the street.



结论
conclusions

The research aimed to investigate the role of infrastructure in China to address some of its issues. We saw how the rapid economic rise of the PRC has led to intensive urbanisation phenomena with the consequent devaluation of certain territories that are important for the sustainability of the Chinese territory.

The aim was to devise ways of solving these problems, and a list of possible measures to be implemented in cases such as Lishui was drawn up.

The proposed solutions are intended to be a guide to the development of the suburbs that will implement the figure of the infrastructure and give it a new look: each device is designed to resolve precise conditions and is accompanied by a few simple rules that define the methods of application.

The devices introduced make it possible to build new land above, below or next to the infrastructure, thus helping to heal the fracture between infrastructure and land: pedestrian space regains part of the land that normally constitutes the impenetrable buffer zone between infrastructure and land.

In the design phase at the architectural scale, the devices guarantee total customisation of open spaces and buildings, thus leaving the designer complete freedom; this is also evident from the drawings, where the same device can be developed in umpteen opposed solutions.

In the case of Lishui and within the framework of this research it was not possible to verify by design the application of each device in all combinations of geomorphological conditions, but to verify the reliability of the remaining solutions it is possible to apply the same procedure, bearing in mind that the objective is to reactivate the places facing the street by restoring a physical connection between them.

This research, therefore, aims to propose a new method of interpreting the territories: analysing the fabrics that relate to the infrastructures and studying activating devices to arrive at a design solution.

To complete the study, and to understand if this method of approach is valid, it would be useful to study another place with the same procedure; in fact, it is taken into consideration that the geomorphological combinations, and therefore the resolving devices, could be different but still effective.

This interpretative method, however, has as its fixed characteristic the desire to create places of stasis and movement that connect two different urban fabrics divided by a barrier

In conclusion, we believe that the study could open up to broader verifications on a large scale, taking into consideration not only the Chinese context.

结论
bibliography

bibliography_

urban planning in China_

texts

T. J. Campanella , *The concrete dragon : China's urban revolution and what it means for the world*, Princeton Architectural Press, 2008

J. H. Chung, *Cities in China - Recipes for economic development in the reform era*, London, 1999

L. Shiqiao, *Understanding the Chinese City*, SAGE, London, 2014

F. Wu, *Planning for Growth - Urban and Regional Planning in China*, Routledge, New York, 2015

M. Bonino, F. Governa, M. P. Repellino, A. Sampieri, *The City after Chinese New Towns*, Birkhäuser Verlag, Basel, 2019

B. P.Y. Loo, *Unsustainable Transport and Transition in China*, Routledge, New York, 2019

E. Bruno, *Reaching the sea, Contemporary peri-urban transformations in Guangzhou between planning visions and local negotiations* [PhD thesis], Politecnico di Torino, Turin, 2017

articles

Chien, The isomorphism of local development policy: A case study of the formation and transformation of national development zones in post-Mao Jiangsu, China., *Urban Studies, Volume 45*, 273–294, 2008

A. P. C. Chan, P. T. I. Lam, D. W. M. Chan, M.ASCE, E. Cheung and Y. Ke, Critical Success Factors for PPPs in Infrastructure Developments: Chinese Perspective, *Journal of Construction Engineering and Management*, 484-494, 2010

H. Yu, Motivation behind China's 'One Belt, One Road' Initiatives and Establishment of the Asian Infrastructure Investment Bank, *Journal of Contemporary China*, 26:105, 353-368, 2017

F. Chen, The design dimension of China's planning system: urban design for development control, *International Planning Studies*, 21:1, 81-100, 2016

Z. Liu, Seth Schindler and Weidong Liu, Demystifying Chinese overseas investment in infrastructure: Port development, the Belt and Road Initiative and regional development, *Journal of Transport Geography*, Volume 87, 2020

Zhang Li, Urban Ergonomics: An Emerging Field of Cross-Disciplinary Studies, *World Architecture*, Volume 369, 8-9, 2021

M. Mancini and M. Bonino, Reconnecting Human Body and Urban Space: Reading Tools and Design Practices, *World Architecture Magazine Publications*, Volume 69, 2021

Politecnico di Torino - China Room, South China University of Technology, Prosperous Lishui, *final presentation document for the International Competition "Future Shanshui City"*, 2020

western urban planning_

texts

D. Hayden, *Seven American Utopias - The Architecture of Communitarian Socialism, 1790-1975*, The MIT Press, Massachusetts, 1976

R. Venturi, *Learning from Las Vegas*, The MIT Press, Massachusetts, 1988

R. Koolhaas, *S,M,L,XL*, Jennifer Sigler, 1995

A. Lehnerer, *Grand urban rules*, 010 Publishers, Rotterdam, 2009

A. Mikoleit Moritz Piirckhauer, *URBAN CODE 100 Lessons for Understanding the City*, The MIT Press, Massachusetts, 2011

F. Cacciatore, *Il muro come contenitore di luoghi. Forme strutturali cave nell'opera di Louis Kahn,* LetteraVentidue, Milan, 2016

F. Jullien , *Living Off Landscape - or the Unthought-of in Reason,* Rowman & Littlefield, 2018

sitography_

Beltroad-initiative, https://www.beltroad-initiative.com/belt-and-road/, consulted on 3rd August 2021