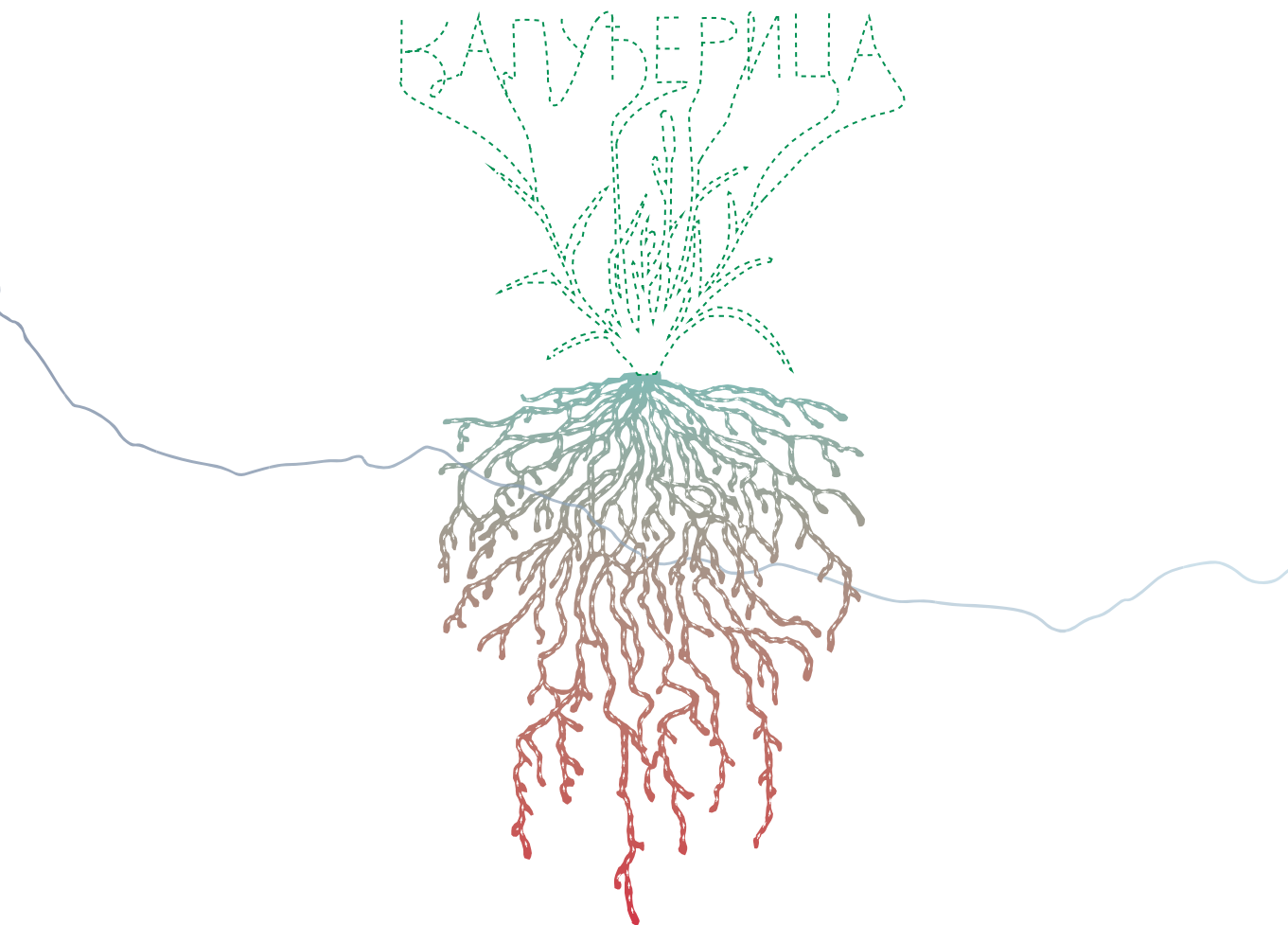


FROM URGENCY TO CARE

THE INVISIBLE STREAM OF KALUDJERICA





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From Urgency to Care
The invisible Stream of Kaludjerica

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FROM URGENCY TO CARE THE INVISIBLE STREAM OF KALUDJERICA

ABSTRACT

Water quality in urban spaces is a reflection of the political power of their inhabitants, especially in informal settlements where marginalized groups have limited access to water and deal with water pollution and management issues. Non-human actors who are integral parts of all urban ecosystems and who suffer the impacts of urbanisation, also deserve recognition and protection of their rights and agency. Informal settlers have the potential for collective action and innovation to challenge the dominant paradigms of urban governance and create more equitable and sustainable urban environments that respect the needs of all forms of life

The aim of this work is to start a debate around the theme of the right to water within the Kaludjerica neighborhood, an informal suburb of Belgrade, which can lead to the reclamation of the polluted stream that crosses the settlement.

Keywords: Informal settlements, peripheral urbanization, environmental humanities, Belgrade, Serbia, Kaludjerica, ecological urgency, stream, post-socialism

DALL'URGENZA ALLA CURA IL TORRENTE INVISIBILE DI KALUDJERICA

La qualità dell'acqua negli spazi urbani è un riflesso del potere negoziale dei suoi abitanti, soprattutto negli insediamenti informali, non ancora giuridicamente riconosciuti, dove i soggetti più emarginati hanno un accesso limitato all'acqua e si trovano ad affrontare problemi di rifornimento in un contesto spesso inquinato. Anche gli attori non umani, che sono parte integrante di tutti gli ecosistemi urbani e che subiscono gli impatti dell'urbanizzazione, meritano il riconoscimento e la tutela dei loro diritti e della loro agency. Tutti questi abitanti hanno il potenziale per intraprendere un'azione collettiva tesa a sfidare i paradigmi dominanti della governance urbana e creare ambienti urbani più equi e sostenibili, che rispettino le esigenze di tutte le forme di vita.

L'obiettivo di questo lavoro è quello di avviare un dibattito attorno al tema del diritto all'acqua all'interno del quartiere di Kaludjerica, un sobborgo informale di Belgrado, che possa portare alla bonifica del torrente inquinato che attraversa l'insediamento.

ACKNOWLEDGEMENTS

We are deeply grateful to Prof. Milica Topalovic and her team at the chair of Architecture of Territory, Metaxia Markaki, Nazli Tümerdem for their time, support and invaluable guidance in the first steps of this project. Their extensive research and insightful advice provided the foundation of our work and shaped the direction and quality of our thesis.

Our sincere appreciation goes to Prof. Angelo Sampieri for believing in, and encouraging us, and for helping us navigate this whole experience with crucial advice and tireless feedback.

We extend our heartfelt gratitude to grandma Vera for her generosity in lending us her car in Belgrade and for the delightful lunches she prepared.

A special thanks to Nebojša Milikić for his endless work on Kaludjerica and for the many stories and words he shared with us during our stay, as well as Milena and Marijana for presenting us to a big part of our interviewees and sharing their thoughts and experiences in Kaludjerica with us.

Lastly, a thank you to Fabio Lapaoło for being a great friend and for the patience, advice and support throughout this year, Zeynep Yavasan for her meticulous proofreading skills and her precious friendship and all our loved ones for their encouragement.

Svetlana and Miloš, Louloudia and Grigoris, this work is dedicated to you.

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FOREWORD

It is common knowledge nowadays that the world is experiencing a steady rise in hydroclimatic extremes caused by rising temperatures and altered precipitation patterns. The intensity of drought and flood events pose a threat to human and environmental well-being and are making it harder to harvest the water that is needed to cover the needs of a continuously growing world population. Intense droughts and flash floods mean both reduced capacity of the ground to absorb water through normal cycles and recharge groundwater reserves. Also, higher evapotranspiration rates cause surface bodies to dry up. Naturally, in order to level the insufficient supply of available surface water, the demand for it is covered by over-extracting it from underground and karst aquifers, creating an unsustainable cycle of consumption which is very alarming for the future.

It is imperative, therefore, to think and act towards healthier ecosystems that can equalise the divergencies we have created through our need to urbanise the world. Our interference with and efforts to tame ecosystems have only brought disasters upon them and eventually upon us, underlying the co-dependence at play. We can see here how important it is to treat our non-human counterparts as equally significant social actors, as they are integral in defining our social context.

Rights and agency are inherent to political discourse and through this lens we uncovered an alignment of interests between two unconventional parties. The rights of a stream and the rights of informal settlers or better the significance of agency for both; for the former being its recognition as a vital agent in the context of the neighbourhood while for the latter, the ability to make claims and negotiate their needs in the socio-political context of Belgrade. In this work we try to bridge the gap between two parallel fields of study, namely the vast research on informal dwelling and in particular the perspective of peripheral urbanisation coupled with the multidisciplinary body of work of the environmental humanities. Our case study seems to leave space for this exploration as it embodies both self-governance and the severe impacts of urbanisation on the environment. This work studies the informal settlement of Kaludjerica, a south-eastern suburb of Belgrade, Serbia, with a population of 30.000 and the small stream that runs through it which, through time, has become an open-air sewer.

In Serbia, issues related to water distribution and management are symptoms of a wider and complex heritage of erratic governance, rooted in the country's turbulent political past. Nonetheless there are many instances, in the shortcomings of the Yugoslav experiment, that can be of great value and inspiration in the search for contemporary solutions to the problematique of the city and the environment. The role of planning institutions and the active participation of citizens have been examined in order to offer a pragmatic analysis of the evolution of Belgrade's urban landscape and its relation to water and waste. Ultimately, we argue the thesis that an ecologically conscious and self-managed society can only be achieved through unbiased scientific information and promo-

tion of the values of personal and collective effort in the process of ecological restoration.

This work, which lasted one year and two months, was a joint effort of Ana and Georgios and saw us spending over one month of on-ground investigation in Belgrade and two months of research at the Swiss Federal Institute of Technology in Zurich with the chair of Architecture of territory and Prof. Milica Topalovic. All of whom have offered us crucial insights on the discussed subjects. The project was initiated and completed at the Polytechnic of Turin, under the supervision and advice of Prof. Angelo Sampieri, whose tutoring was pivotal in the composition of this work. For the purposes of the study we used a combination of qualitative methods, including fieldwork and interviews. We explored the perspectives of informal settlers and the potential for collective action and uncovered the state of ecological urgency at play. Quantitative methods of numerical and statistical data analysis and relevant literature studies have been used to create an all-encompassing background for our work.

PART A

BELGRADE'S HYDRO-POLITICAL HORIZON

CONTENTS

Belgrade and its waters

Water management in Serbia

Belgrade's informal periphery

The socialist communal experience

Informal waste management in Belgrade

Urban waters & emancipatory practices

BELGRADE AND ITS WATERS

Summers in Belgrade have always been infamously warm, which made Belgradians resourceful in seeking refuge and cooling down from the scorching sun and radiating asphalt streets. For over a century, the city's waters have provided that refuge to its inhabitants. While the upper class was enjoying the "modern hammam" in Droćol¹, bathing in the thermal springs rising from underneath Belgrade's grounds, the average Belgradian took comfort on the sandy shores and refreshing waters of the Sava and Danube rivers.

One such location was the Nice beach, borrowing its name from the bustling city of the French Riviera. Unlike its exuberant homonym, Belgrade's Nice wasn't reserved for "the few", on the contrary, it was a place of connection, one the Belgradians who couldn't travel to the distant seaside so desperately needed in the summer days, with amenities for all - playgrounds, cafes, changing cabins...

✕ [1] The oldest surviving neighbourhood of Belgrade, inhabited since Roman times of Belgrade's predecessor Singidunum.



✕ Fig. A.1:
'Come down
to the river' -
Belgrade's Nice,
Unknown author

Suddenly in the 1970's, as the city grew rapidly, concrete consumed the sandy beaches, as well as the whole of Sava's west bank when the robust blocks of New Belgrade quickly started rising. Although bathing spots like Ada Ciganlija or the Lido, a sanctuary of the Great War Island, remain active, the overall relationship of the people with their city's water has changed radically.

Today, while walking along the paved promenade of Belgrade's waterfront, no trace of Nice can be seen, its place has been taken up by make-shift, often illegal, party rafts. Overcrowded and often sources of pollution for the river, yet seminal in the formation of Belgrade's infamous nightlife (Topalovic 102).

✕ Fig. A.2: The great War Island beach overlooking Zemun, Unknown author



✕ Fig. A.3: The infamous "splavs" of New Belgrade, Unknown author



✕ Fig. A.4:
A view from
New Belgrade
towards the old
town in the 70's,
Unknown author



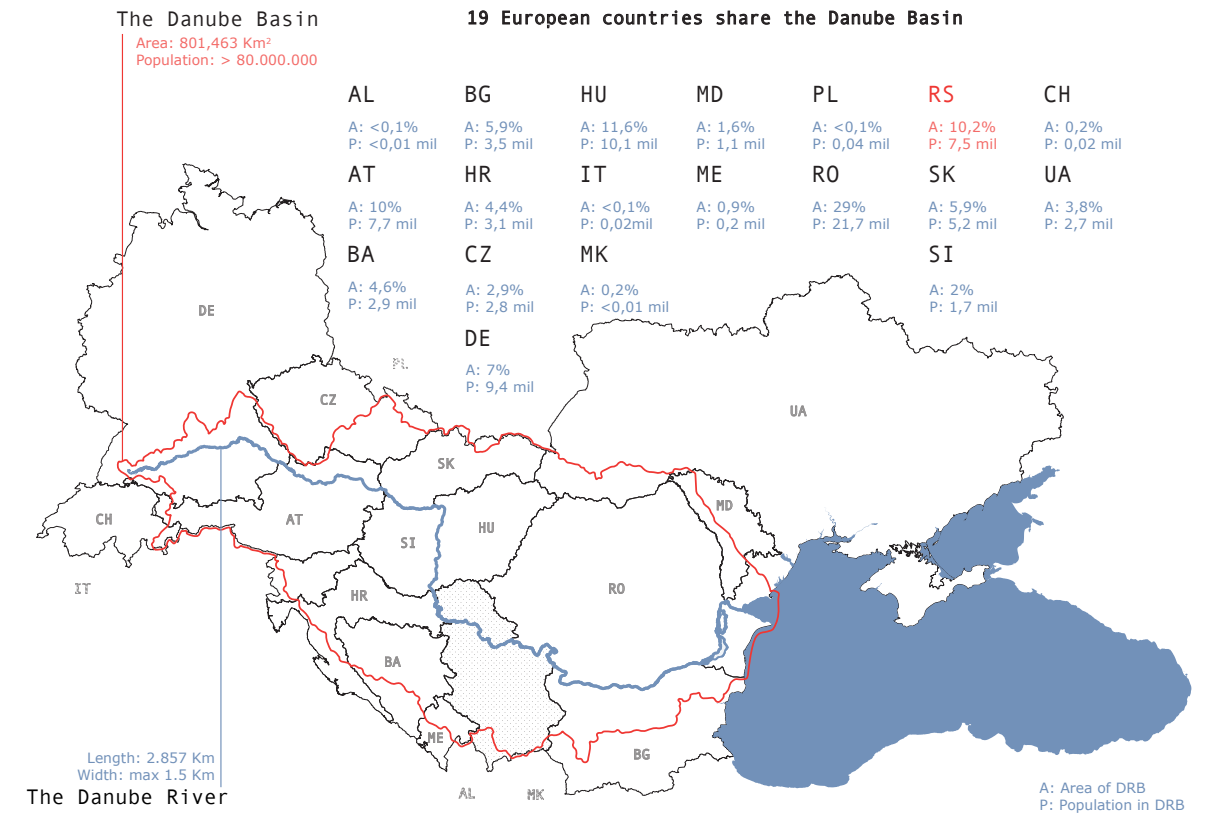
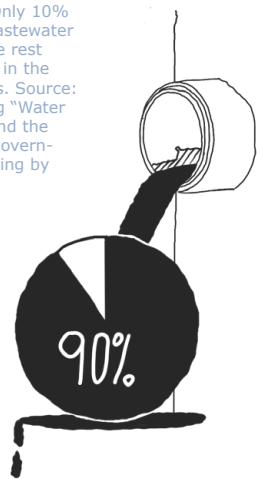
✕ Fig. A.5:
A view from
New Belgrade
towards the old
town nowadays,
Unknown author

WATER MANAGEMENT IN SERBIA

Freshwater ecosystems are vital for biodiversity and human well-being; once teeming with life and vitality, in our days they are experiencing an unprecedented decline and sustaining more loss of species and habitats than their terrestrial or marine counterparts. The main drivers of this decline are the deterioration of water quality and the unsustainable and intensive use of water across different sectors (OECD, 2021). Water scarcity has become a major challenge in many regions, making water a strategic and valuable commodity.

Serbia's environmental policies are shaped by EU accession negotiations, but reports indicate that more progress is needed in water and wastewater management, as well as nature conservation. Waste management persists as a major problem in the country. The main sources of freshwater pollution in Serbia are untreated wastewater, agricultural and industrial pollutants. Only ~10% of wastewater is treated, while the rest goes directly into rivers, creating environmental black spots with harmful pollutants such as heavy metals and organic matter.

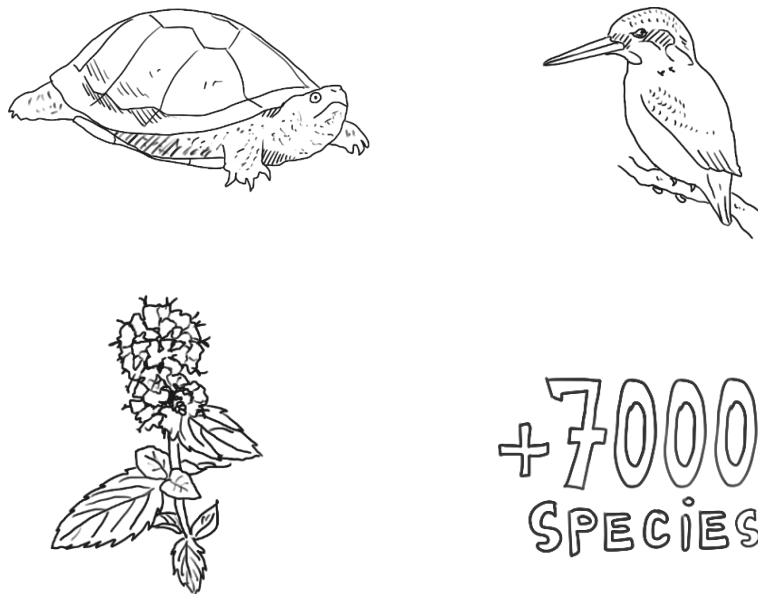
✕ Fig. A.6: Only 10% of Serbia's wastewater is treated, the rest flows directly in the water courses. Source: public hearing "Water purification and the role of local governments", Drawing by the authors.



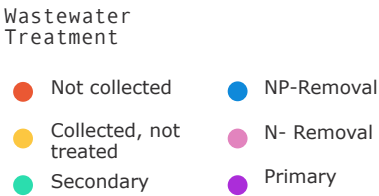
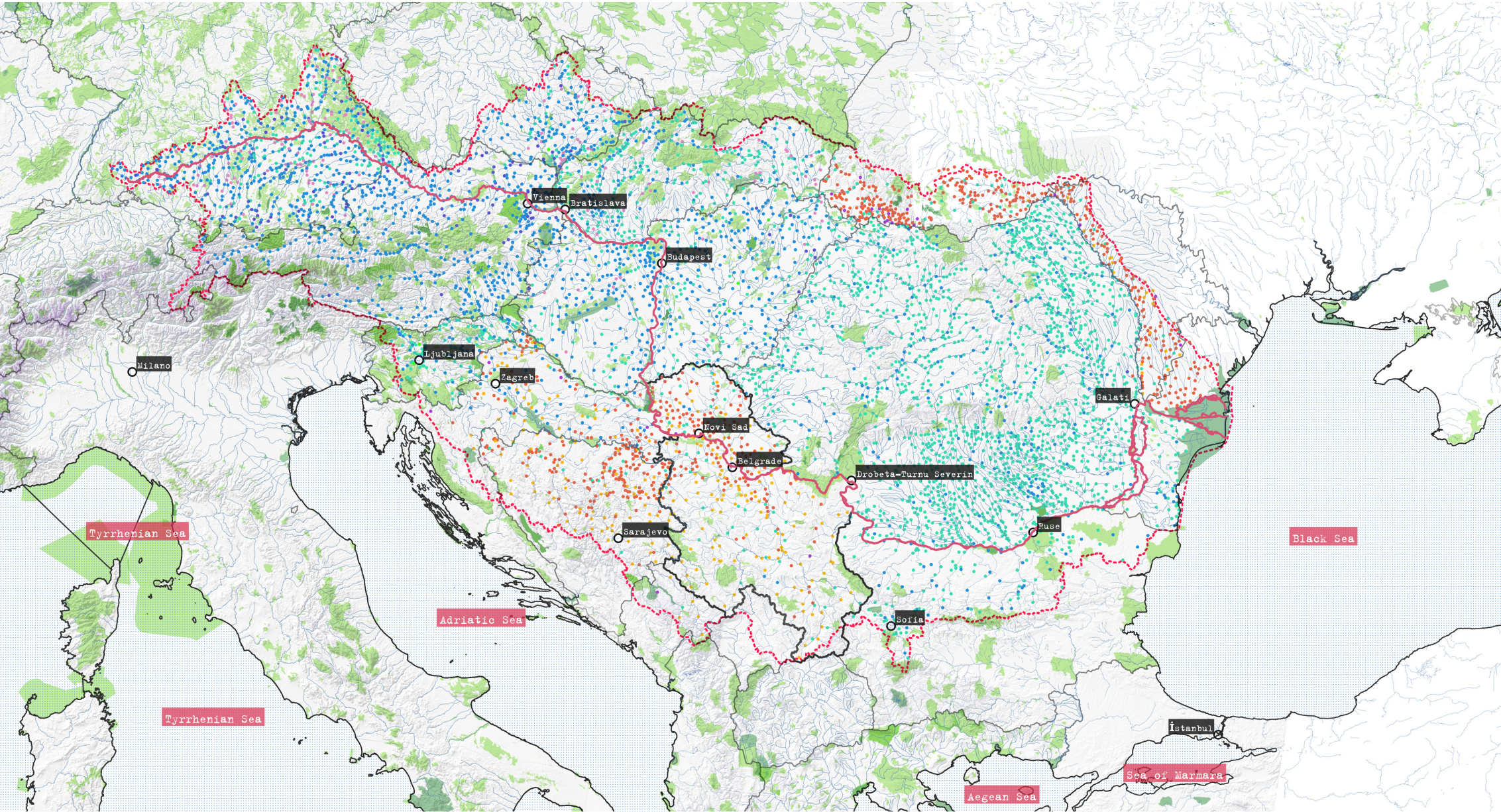
The Danube is Europe's second longest river and its basin is shared by 19 European countries making it the most international river basin in the World. It is home to more than 80.000.000 people and all the countries it touches depend on its water as an economic resource. The 10 countries it flows through are contracting parties of the ICPDR (International Commission for the Protection of the Danube River), an organisation that deals with all issues relevant to the river and its basin.

✕ Fig. A.7: International composition of Danube's basin, drawing by the authors.
Information source: <https://www.icpdr.org/>

The Danube and its tributaries form many diverse riverine habitats, including intricate networks of water bodies, creeks and channels, floodplain forests, water meadows, lakes, gravel islands, sandy banks and the unique delta habitats by the shores of the Black Sea. The basin hosts a rich diversity of plant and animal species, including 2,000 vascular plants and over 5,000 animal species. However, human activities such as damming, irrigation, rapid urbanization and agricultural activities have exerted severe pressure on the river and its ecosystems. (ICPDR) Since the late 19th century, some of 80% of Danube's floodplains and wetlands have been lost which put a number of species under risk. (World Wetlands Day: WWF celebrates Danube restoration projects, 2014)

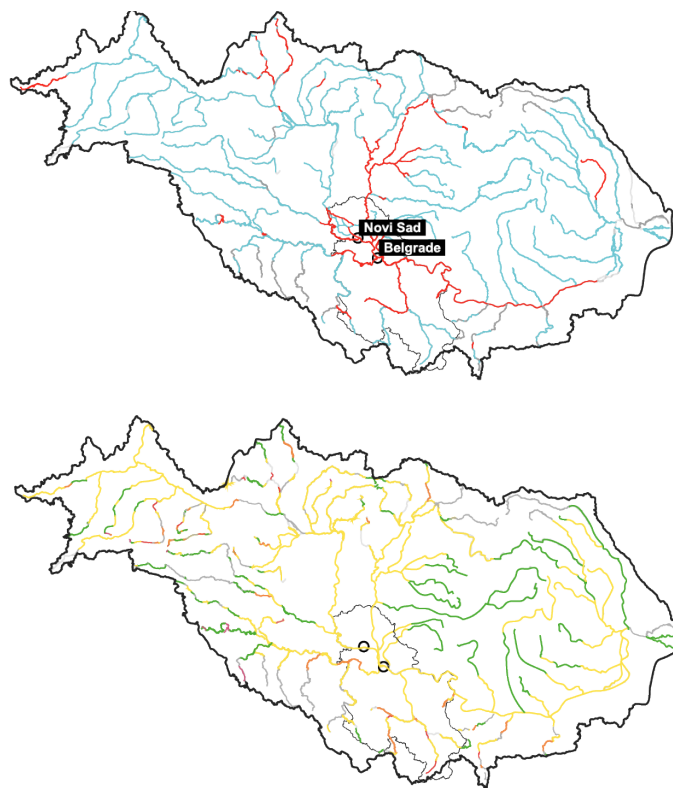


× Fig. A.10:
The Danube
flows through 10
countries while its
basin covers 10%
of the European
continent and
is shared by
19 countries.
Making it the most
international river
basin in the world.
Drawing by the
authors.



× sources:
<https://www.danubegis.org/>
<https://www.eea.europa.eu/>
<https://ec.europa.eu/>

Among other activities, the ICPDR *works to ensure the sustainable and equitable use of waters in the Danube River Basin* (ICPDR). Their aim is to reduce pollution from settlements, industry, and agriculture, protect rivers as ecosystems, and provide drinking water and flood safety services. For that reason the JDS (Joint Danube Survey) is conducted every six years to assess water quality, characteristics, organisms, and raise awareness about restoration and protection efforts. Their findings show that microbiological pollution of the Danube is a concern in the downstream regions of Belgrade and Novi Sad, the main source of this pollution is wastewater, while the second source is the runoff of its numerous tributaries.



× Fig. A.11:
Chemical status of
surface water bodies in
the Danube basin(top).
× Fig. A.12: Ecological
status of surface water
bodies in the Danube
basin(down). Source:
<https://www.danubegis.org/>, 2015.



× Fig. A.13:
The waterline,
where Sava
meets the Dan-
ube in Belgrade
by Oliver Bunić.

These smaller streams and rivers in the cities do not have enough power and waterflow volume to filter their waters from the anthropogenic residue deposited in them, unlike their larger counterparts. This results in many streams becoming open wastewater channels that discharge directly into the Sava or the Danube.

Natural habitats that are integral parts of these riverine ecosystems have been completely destroyed by being converted into construction and agricultural zones. The ecosystems in and around Belgrade have been subjected to a lot of pressure from neoliberal and unregulated urbanization and neglect, so much that the natural characteristics and functions of these waterflows have almost vanished.

⌘ Fig. A.14: Topcider river being prepared for its new concrete basin after intense floodings, Screenshot from drone footage, <https://beobuild.rs>



ES: Ecological status. Assesses the key indicators of ecosystem health which, for rivers, includes fish, plant life and __, as well as well as the physical, chemical and hydrological conditions that support them

The Danube
No samples comply with the water quality standard



7 samples compliant with the water quality standard
The Sava

ES: Bad Zeleznik

ES: Bad Topcider

ES: Bad Veliki Lug

ES: Weak Bolecica

⌘ Fig. A.15: The Ecological Status of streams and rivers in the Belgrade metropolitan Area, Drawing by the authors.
⌘ Source: Belgrade environmental quality atlas, 2019.

BELGRADE'S INFORMAL PERIPHERY

Rogue construction in Belgrade has been persistent through the years despite the ideological or legal framework in which it took place. The informal has always co-existed with the formal as if in a feedback loop. Be it during the socialist regime of the SFRJ or the post-socialist, market-driven democracy, it has been the spatial manifestation of the administrative shortcomings towards real inclusion. Though often it has been a means to an end of necessity, its constant proliferation has also elevated it into an extremely efficient tool for extraction of private profit. All this has contributed to the creation of a culture of inaction towards collective issues, especially when it comes to pressing matters outside the realm of profit.

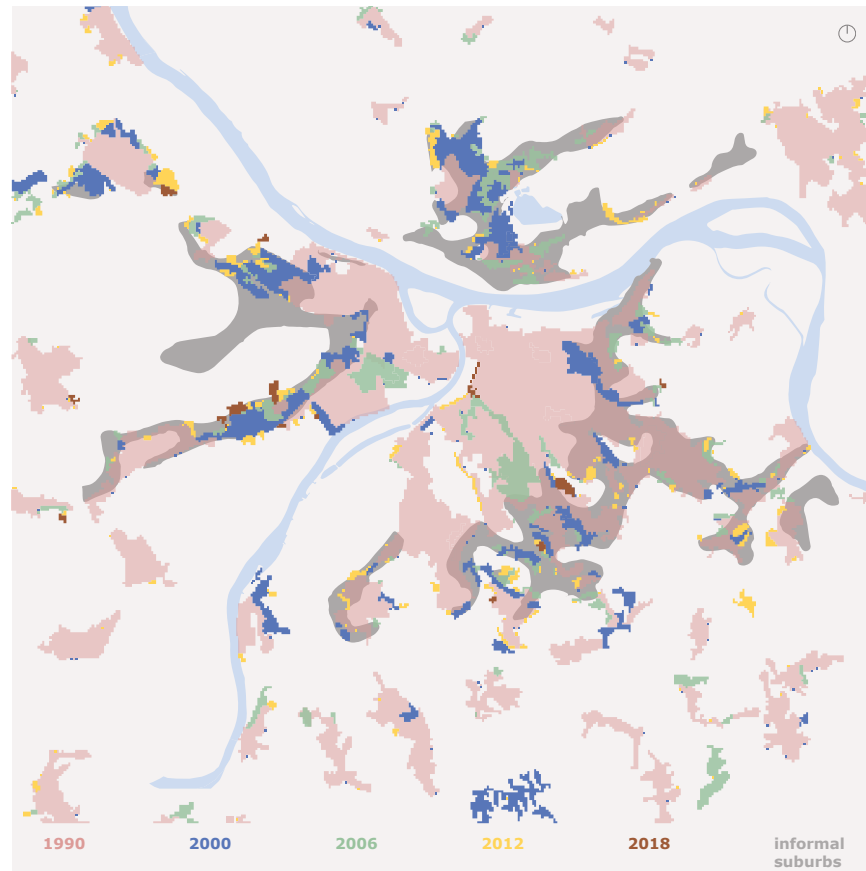
Serbia, as many other Eastern European countries, experienced its industrial growth later than most developed western countries. In fact Serbia's industrialization happened very rapidly and under the Socialist Federal Republic of Yugoslavia which was instituted right at the end of WWII and after the axis' devastating bombing of Belgrade, which tore down

✕ Fig. A.16: Eagle studded gates, a classic detail in informal architecture, Drawing by the authors.



✕ Fig. A.17: Construction of an Illegal multi-storey building, Eastern Gate of Belgrade in the background by Stefan Stojanović, Mondo.rs

Urban expansion 1990-2018 & Area of Informal Suburbs

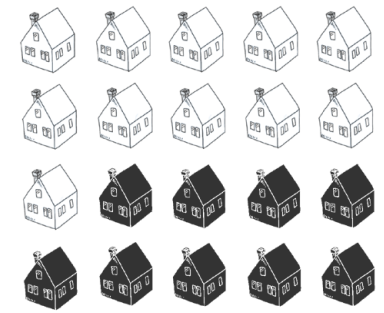


× Fig. A.18: Urban expansion of Belgrade, 1990-2018. Drawing by the authors.

0 10km

half of its building stock. The urgent need for reconstruction gave way to massive migrations from the countryside to urban centers of people who, until then, lived a rural lifestyle and moved to the city to work in the newly built factories, guided by the promise of prosperity.

The narrative of the new government was the end of classes and, to enforce that vision, it installed the egalitarian model of self-management; industries, institutions and businesses would be socially owned and managed, while the state's involvement would be limited to providing regulations; no private property was allowed. A policy that accompanied the end of class was one that concerned housing: every working citizen would have access to a socially owned apartment through their place of work by giving up 4% of their monthly income. The worker then would be granted an apartment and the order of access to this would be based on ranking systems, including factors like family size, level of education and length of employment. This policy failed dramatically due to corruption, unemployment, bureaucracy and inefficiency. The offer never matched the demand, so unserved workers (that had also paid their 4%), unemployed citizens and basically whoever wanted to own a house resorted to building their own dwellings on vacant or agricultural land in the outskirts of the city, without obtaining official permits or following planning regulations. These informal settlements were often tolerated by the authorities as a temporary solution to the housing shortage and, at times, were also subject to relocation when they interfered with urban development plans or political interests.



× Fig. A.19: 44% of total number of structures in Serbia has been built illegally. Drawing by the authors.

× Source: <https://www.mgsi.gov.rs>

× Fig. A.20: 'Our youth! Be the first in the construction of the homeland!', Yugoslav propaganda poster, Unknown author.



In the 1960's further reforms in response to the emerging housing crisis shifted the economy from a planned economy to market socialism, which presented more flexibility in the housing sector and allowed for a sort of private property. However, this new consumer-oriented market increased social and spatial inequalities as, naturally, some benefited more than others. On a further note, the legal bank loans that were now being allowed by this reform, gave further moral legitimacy to extralegal construction and so informal settlements continued to grow and diversify as they offered a cheaper and faster alternative to legal procedures. From that point on, the city's expansion obtained a dual character - planned urban development controlled by the state and private, mostly unregulated growth that came to be known as "wild" construction.

This process usually occurred in existing villages that were not equipped with adequate infrastructure and as the numbers grew they became underserved suburbs of a city which saw them as an expression of its failure to plan efficiently. This produced "abandoned" communities and gave way to a long-standing conflict between informal dwellers and formal institu-

× Fig. A.21: Illegally built house, 1960's, Source: Urbanizam Beograda 03, 1969, Belgrade urban planning office.

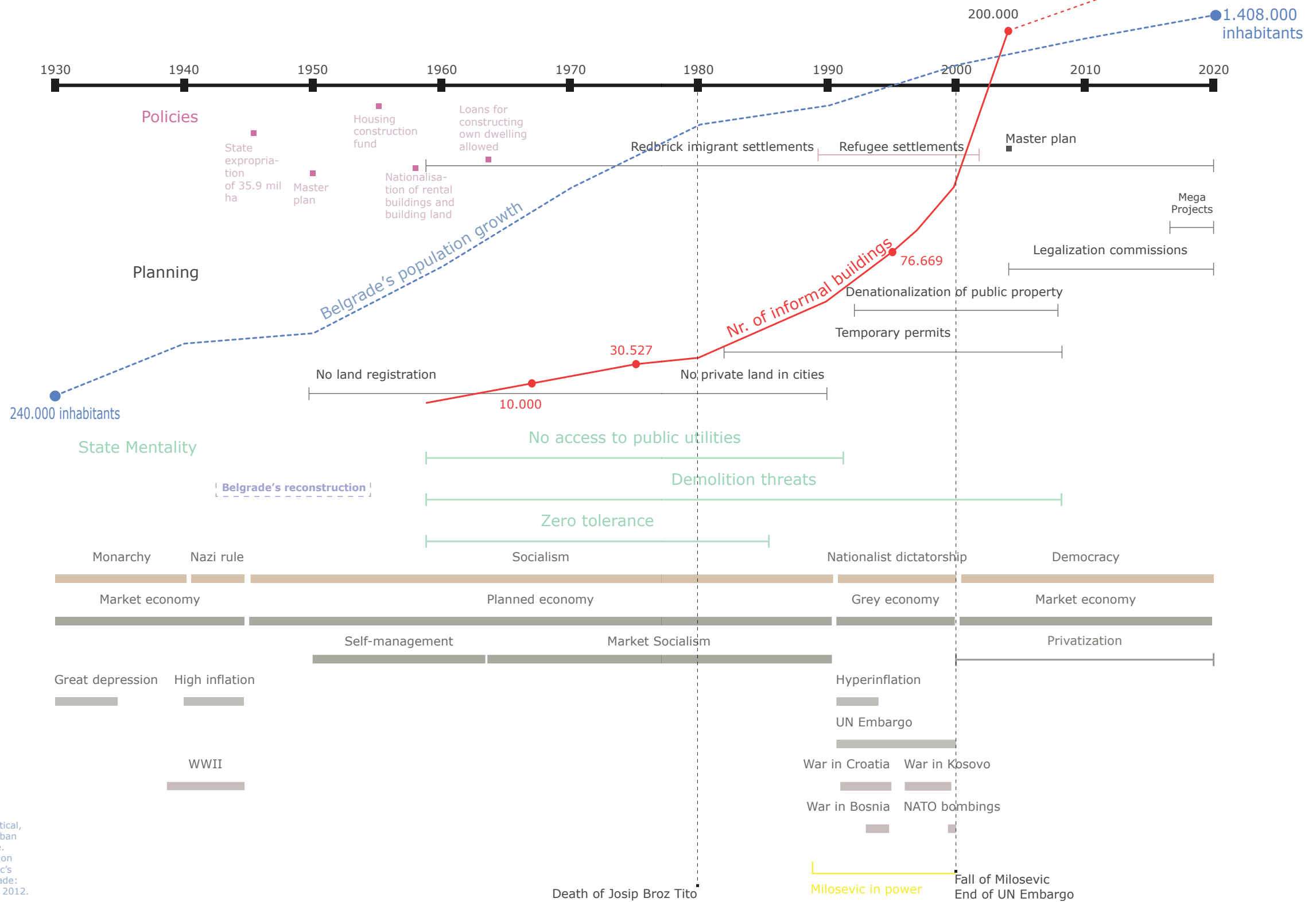


× Fig. A.22: Roadside fruit and vegetable vendors on Belgrade's outskirts, Drawing by the authors.

tions that still stands to this day.

40 years after the beginning of its co-existence with official planning processes, informality in the 1990s was well established in Serbia and had also infiltrated many other aspects of the social and economic life of urban populations.

1992 marked the end of the SFRJ and the introduction of the United Nations embargo. In times of severe economic crisis and hyperinflation, state-owned property was privatized and the profits exported from the country. The extensive military conflicts between ex-Yugoslavia's member-states, that ended with the NATO bombing of Belgrade, produced a disproportionate number of refugees and internally displaced people (IDPs) that fled their hometowns and sought shelter and better living conditions in urban centers. This all meant a dramatic increase in informal housing construction which, throughout the 1990's, which went as high as 10.000 units per year; what was also the highest rate of public housing construction in the 60's and the 70's in Belgrade (Topalovic, 83).

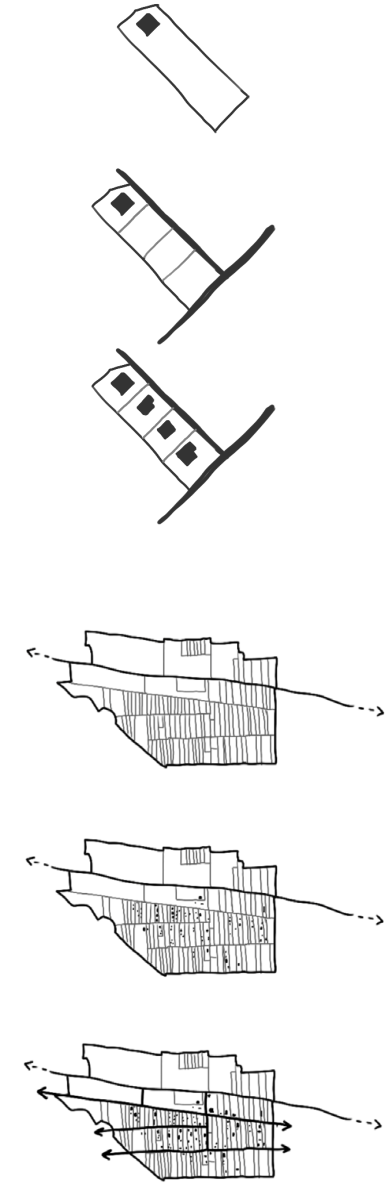


✕ Fig. A.23: Political, Economic and Urban planning timeline. Authors' adaptation of Milica Topalovic's timeline in Belgrade: Formal Informal, 2012.

This expansion of the informal sector enforced the grey economy caused by Serbia's economic collapse and scarcity of legal employment and saw people involved, among other, in smuggling, illegal trading of goods and services and recycling of materials.

In the 2000s, Serbia was democratised and started a process of conformation with EU regulations which aimed at its future integration thus gaining some political and economic stability. With the narrative of the government shifting towards "order" many strategies aimed at upgrading or even legalising informal settlements were introduced and, regardless of their outcomes, this meant that the formal institutions finally acknowledged informal urbanity as a part of the body of the city. However, yet another time, the strategies foreseen by central planning were not adequate and many found them inconsistent and exclusive.

Today, informal settlements comprise 5.430 ha (22% of building land) of Belgrade, occupying 43% of the surface of residential areas in compact settlements in 34 urban zones, 18 informal settlements of low density, and in slums. Belgrade's "wild" periphery is extremely diverse. Informal settlements are not homogeneous or static entities, but rather intricate and evolving spaces that accommodate different types of people, activities, and interactions and present great spatial inequalities. Some settlements have been transformed into formal or semi-formal neighbourhoods with improved infrastructure, services, and amenities. Others have remained in marginal or vulnerable conditions facing problems like overcrowding, pollution, flooding and crime. While some have become sites of social innovation and cultural diversity where residents organize themselves to address their needs and aspirations, others have become sources of social conflict and tension, where residents face discrimination or hostility from other groups or authorities.

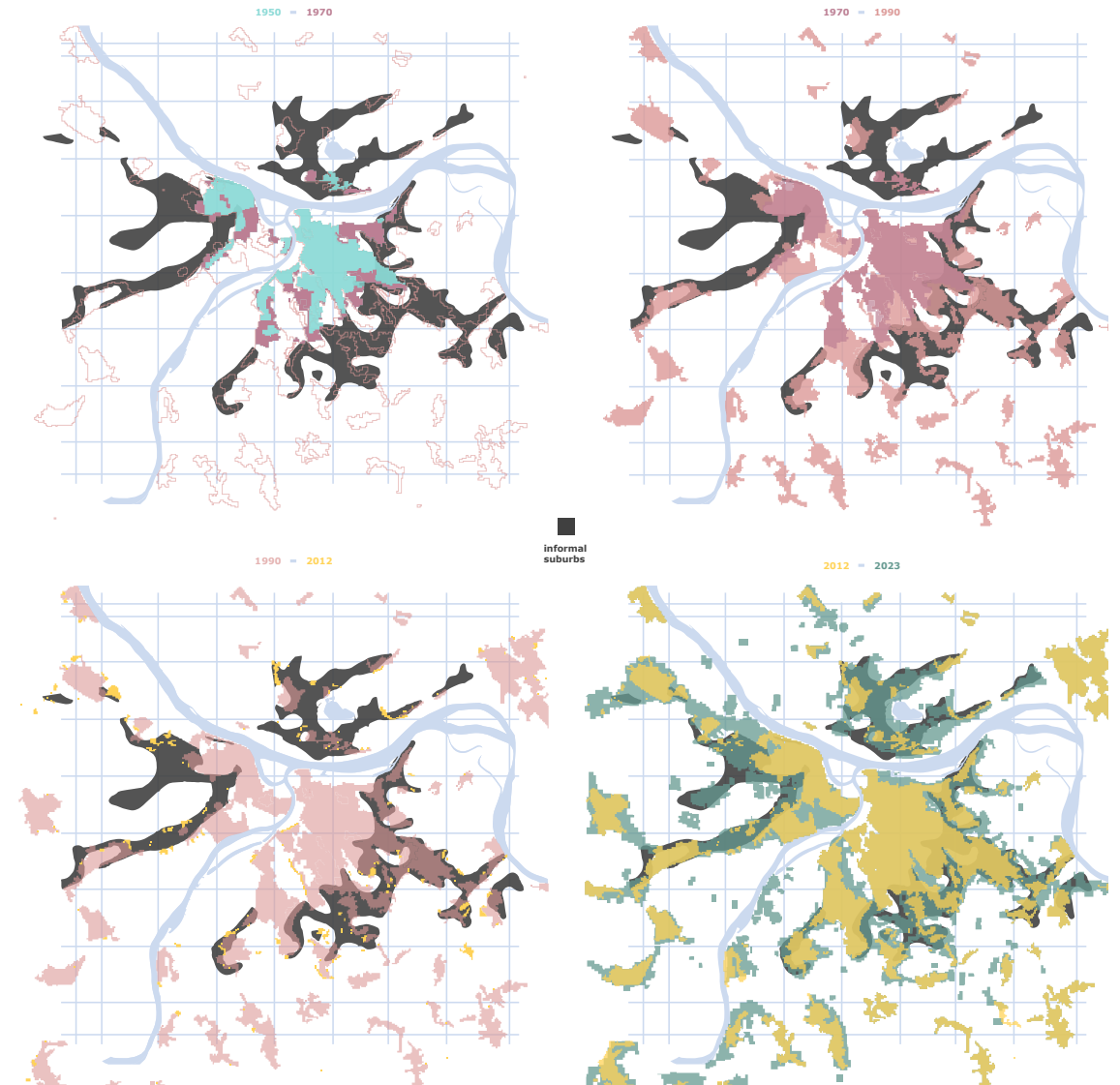


× Fig. A.24:
Agricultural plots
parcelized and built
upon + infrastruc-
ture reaching them
after completion.
Drawing by the
authors.

Socialism

War

Capitalism



× Fig. A.25: Urban
expansion of Belgrade,
1950-2023. Drawing
by the authors.
Source: Copernicus.



✕ Fig. A.26 (up)
Mirijevo, suburb of
Belgrade, known for
illegal construction
Photo by Marija
Jankovic

✕ Fig. A.27 (right)
Architectural solu-
tion in Kaludjerica,
Google Earth.



THE SOCIALIST COMMUNAL EXPERIENCE



× Fig. A.28: Schematic drawing of a planners and the citizens designing together. Drawing by the authors.

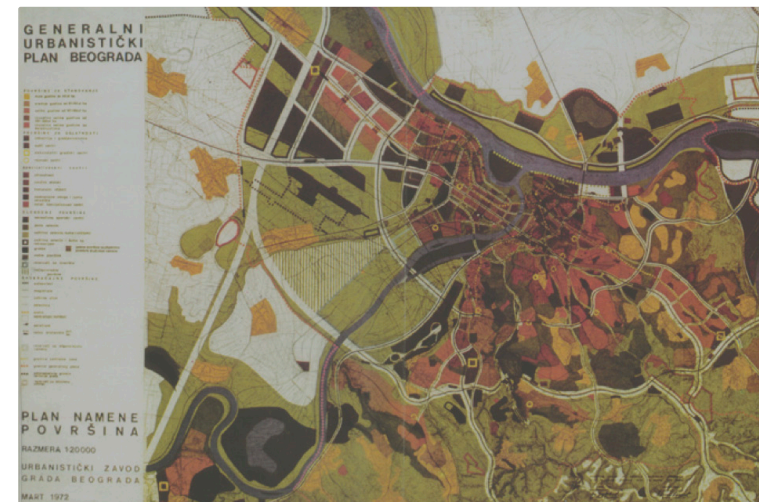
Yugoslav self-management was a form of socialism that aimed to be more liberal, democratic, and human-oriented than the Soviet model. It was the basis of socio-economic governance in the Yugoslav Constitution of 1953, which envisioned workers as the main decision-makers in Yugoslav firms independent of centralised power structures. This also led to the decentralisation of the territorial administrative structure and created two parallels between societal and economic planning. (Blagojevic, Peric, 2020).

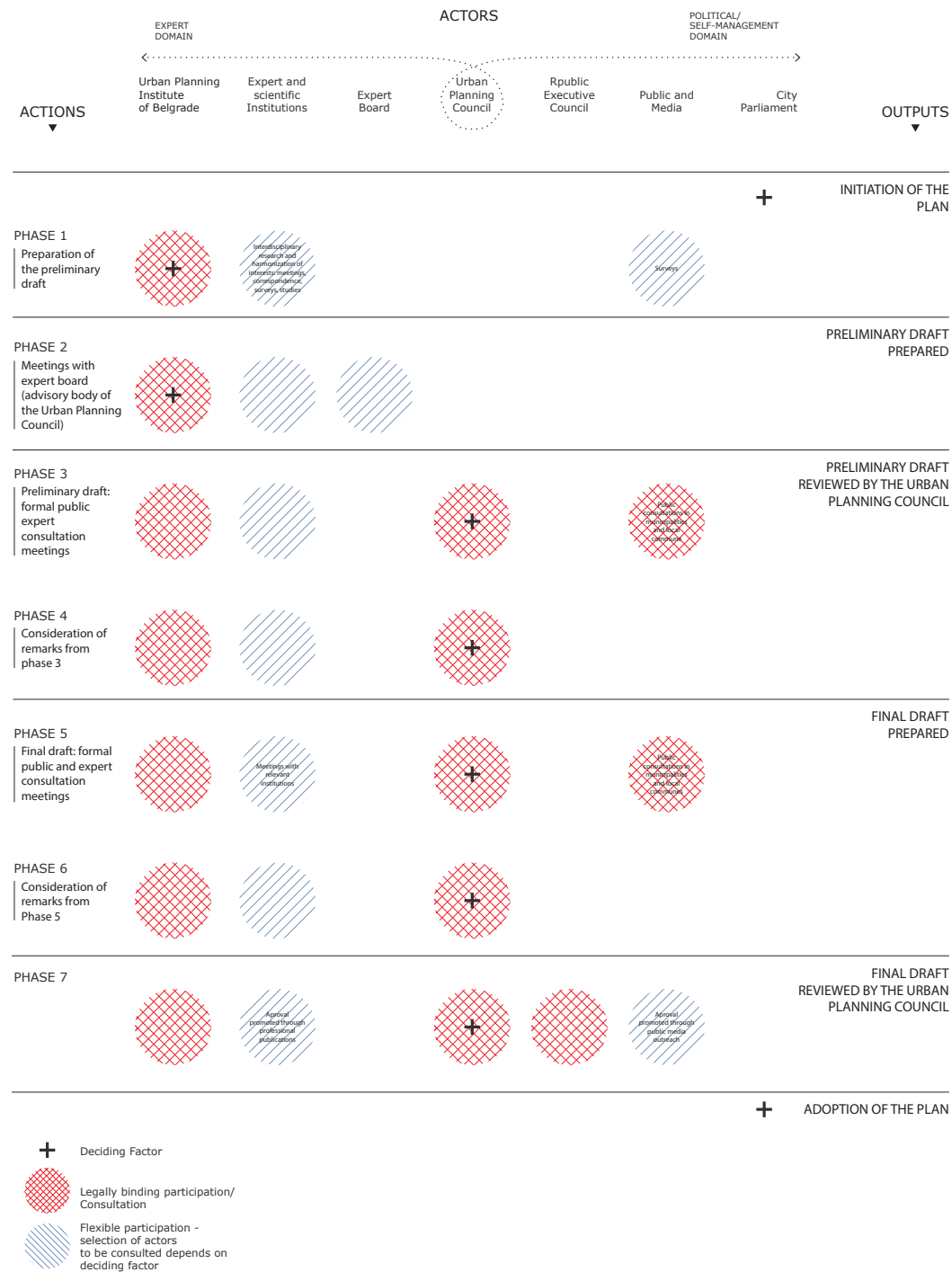
The lowest administrative unit of the decentralised system was the "local commune" or "mesna zajednica". Legitimized with the 1963 constitution, it was part of the municipality (opština) and functioned as a unit of planning at a very local level. According to Edvard Kardelj, the ideator of the self-management model, "Every shared human activity in a neighbourhood that brings people close and develops solidarity, self-help and awareness of togetherness is significant for creating a local commune". So, in theory, the local commune embodied the core principles of self-management as per decentralisation of decision-making for spatial-related issues by involving local actors in decision-making processes.

However, in the 1960s the power structures that emerged in the local communes impeded the correct functioning of citizen participation. As members of the communist party (single-ruling party) were the majority of the actors involved in local communes, the interests these structures were serving were not genuinely public. On these grounds the 1974 constitution aimed at toppling the top-down character of this implementation by excluding the federal level from local spatial planning and moved towards a more democratic re-distribution of power among interested parties by improving citizens' access to planning-related information. Furthermore, the 1976 Act on the Foundation of the System of Societal Planning and the Societal Plan of Yugoslavia engaged in regulating collaboration between citizens, experts and local politicians with the "agreement on plan's foundations". Even though for some years citizen participation increased, "higher interests" of the political elite remained an exuberant input in the local commune's spatial planning discourse and technical expertise maintained a certain



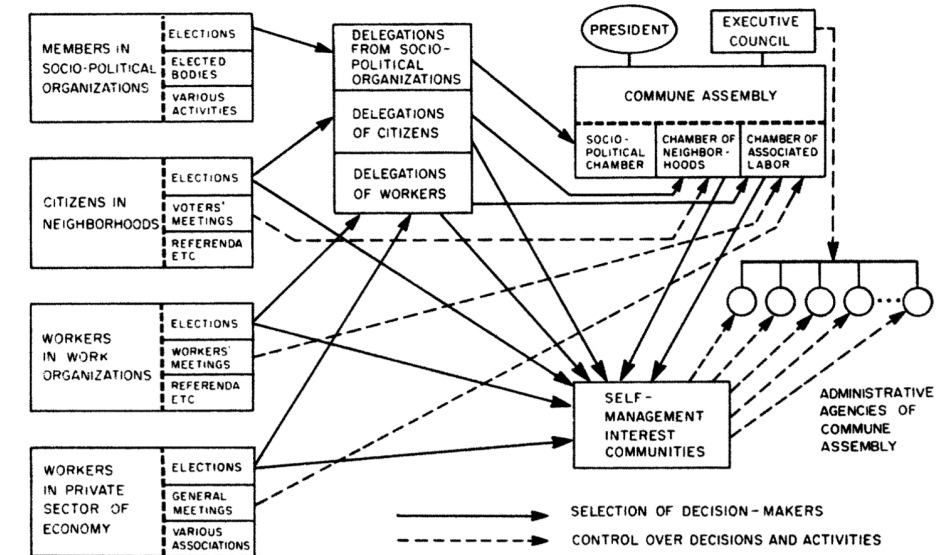
× fig. A.29: Edvard Kardelj, source: BBC archive.
× fig. A.30: Belgrade master plan, 1972. Source: Urban planning office of Belgrade.





degree of inaccessibility for the general population. Gradually these structures lost the support and trust of citizens as well as most of their funding and morphed into their current state of being offices of civic competence, validating marriage contracts, but at times also activating local collaboration.

Unfolding in the same period, officially from 1961 onwards, decision-making in informal urban configurations became a highly collaborative effort of solely residents. Official records do not include this kind of information given the illegal status of these processes, nevertheless many independent sociological researches and oral testimonies from our field research indicate that merely all of the informally built infrastructure in extra-legal settlements is the product of direct collaboration between the residents of those settlements and implemented through independent agreements with private companies and, at times, through negotiations with the government. Some of those interventions, as we will explain further in this work, backfired due to the lack of technical expertise among the inputs of this informal planning process.



× Fig. A.31: (left) The overview of the main phases and participants in the process of creating the Belgrade Master Plan of 1972. Source: The Diffusion of Participatory Planning Ideas and Practices: The Case of Socialist Yugoslavia, 1961-1982. Mina Blagojević and Ana Perić.

× Fig. A.32: Self-Management Institutions and Organization at the Local Level: 1963 Constitution. Source: A Structure for Participatory Democracy in the Local Community: The Yugoslav Constitution of 1974, Gene S. Leonardson, Dimitar

Combining various parts of our research and despite the shortcomings of each of the individual processes we studied, we consider that a combination of the lessons learned from these experiences can provide for adequate solutions to space-related issues at a local scale. In short, the need for multi-actor involvement in the planning decision-making processes, the importance of knowledge diffusion for non-expert groups and the capacity of residents to build political agency and negotiate terms for the solution of their common issues.



✕ Fig. A.33
“The Fountain”,
the first “mesna
zajednica” to
open in New
Belgrade, 1963,
Unknown author,

INFORMAL WASTE MANAGEMENT IN BELGRADE

Although socialist Yugoslavia had relatively developed environmental legislation, the practical implementation of advanced legal solutions was not always feasible. The government prohibited any non-institutional environmental action, which hindered informal environmental action. Consequently, legal environmental protection frameworks were gradually introduced in socialist and post-socialist countries, including Serbia.

In recent years, EU integration processes have increased environmental awareness in Serbia and more NGOs have been advocating for environmental action. This has been a common phenomenon in the region following a model of what the literature calls 'transactional activism' (Petrova & Tarrow, 2007; Cisar & Navratil, 2011; Cisar, 2010; Fagan, 2010a; 2010b; Cisar, 2018). Unlike participatory activism, which relies on mass mobilization, transactional activism involves creating networks between civil organizations ("organizacija civilnog društva" in Serbian) that exchange information, material resources and collaborate in project implementation (Petrova & Tarrow; Cisar & Navratil, 2011; Cisar, 2010). The main problem with this form of ecological movement is that it is initiated, guided and funded from 'the outside'

✖ Fig. A.34: Roma people on converted car for recyclable material gathering. A staple means of waste collection in Belgrade. Drawing by the authors.



and has a weak connection to citizens, their needs and the challenges they face. Studies have shown that in this part of Europe it is improbable that mass membership in environmental organizations will occur in the near future, which makes these organizations depend on private funds, limiting their autonomy in their areas of work (Petrovic, 2020). This has given rise to grassroots movements and civil actions, as citizens have started to seek out their own solutions in face of the government's failure to act on the burning question of environmental pollution.

Some well-known and successful citizen platforms and movements have also evolved in different directions, depending on their strategies and goals. For example, the famous "Don't let Belgrade D(r)own" (sr. Ne Da(vi)mo Beograd) movement started as a movement of mass protests against the controversial Belgrade Waterfront project, but later became a political movement that ran for the Belgrade City

✖ Fig. A.35: 'Don't let Belgrade d(r)own' protests against the construction of a riverside megaproject on the Sava banks, source: <https://neda-vimobeograd.rs/>

Assembly elections in March 2018. Others have, however, kept their focus on small-scale civil actions by creating citizen platforms for people to organize and promote clean-up and restoration actions. These initiatives use social media as their main platform for organization and crowd mobilization, as well as informing citizens of ecological emergencies in place by using relevant scientific references. One of the currently most prominent grassroots movement is the Ecoguard (sr. Ekostraža), which has gained significant following through Instagram and organizes protests and clean-up actions while strongly and publicly criticizing the government's anti-environmental decisions. Their most recent public action was a nation-wide clean-up, which was entirely promoted through social media, until the national and regional television networks reported on the online buzz. The campaign was very successful, with actions in 160 locations, 5500 participants and 70 tonnes of waste collected with almost no budget for the campaign itself.



× Fig. A.36: Another successful clean-up initiative of an international character - "Trash Hero" on their mission in Belgrade, source: <https://trashhero.org/network/trash-hero-beograd/>

An EU-funded public opinion survey was conducted in 2021 by POLEKOL (The Organization for Political Ecology) and revealed the citizens' awareness and attitudes towards environmental urgency. The main findings indicate that:

1. Most citizens in Serbia perceive the level of pollution as very high and identify air pollution, waste management and water pollution as key problems
2. In terms of responsibility for environmental pollution, a very small percentage of respondents mentioned industry, while they were mostly divided between the responsibility of citizens and the responsibility of institutions.
3. Most citizens think that Serbia does not manage its water resources adequately, oppose their privatization and think that it is better to invest in prevention to avoid environmental problems.
4. The main problems related to water pollution that the citizens mention are the pollution with untreated wastewater and the lack of sewage systems
5. The vast majority of citizens would support the initiative for the constitutional and legal protection of water as a public good and drinking water as a human right.
6. The vast majority of citizens support holding environmental protests.
7. Citizens have more trust in representatives of environmental associations and initiatives and environmental protection experts than in institutions.
8. Citizens are mainly informed about the state of the environment through social networks and through direct conversations with friends and acquaintances, while among formal media, national television and cable television stand out.
9. Compared to other regions, respondents from Belgrade are more informed and ready to engage in water and environmental protection.

Informal citizen organization doesn't stop here. The exact population of Roma people in Serbia is unknown due to major gaps in the census every year, but Roma activists estimate that there are at least half a million of Roma people in the country. One of the main activities of this demographic is the collection of glass, plastic, copper, aluminium, old bread, but mostly paper and cardboard which are later re-sold. Many families, in past years, depended entirely on this endeavour and base their whole livelihoods around it. This business, while low-paid, exhausting and often extremely unfair, is an example of diffused, bottom-up and profit-oriented ecological action outside of any official logic.

✕ Fig. A.37: Still from the film *Pretty Dyana*, 2003, directed by Boris Mitic. <https://vimeo.com/66811641>



✕ Fig. A.38: House with pool over scrap metal collection yard. Source: Google Earth.



URBAN WATERS AND EMANCIPATORY PRACTICES

"Water materially connects individual bodies to the collective body politic; for example, by transporting vectors of disease and pollution. For this reason, the regulation and control of water-borne bodily wastes, the disposal of which has become an intensely private activity under modernity, is thus an inescapably collective act, and is essential to the health of the population, as well as the individual"^[1]

Urban spaces are not just physical environments, but also social and political arenas where diverse actors and forces interact. If we examine urban populations through the lens of Karen Bakker's perspective, we can see how water quality, as a political agent, expresses a community's political strength. It doesn't come as a surprise that one of the most basic and most frequently encountered problems in unregulated settlements is access to water and scarce water quality. What also is not surprising is that these areas are often occupied by largely marginalised groups with little to no political power.

In Serbia the issue of water pollution and water management as a whole is still far from being rectified. Our hypothesis is that the increased neg-

✕ [1] Bakker, Karen. "Water: Political, Biopolitical, Material." *Social Studies of Science* 42, no. 4 (2012): 616–23. <http://www.jstor.org/stable/41721344>.



ative impacts on the environment of cities like Belgrade are symptoms of a wider and complex problem of governance rooted in the country's turbulent political past. The Socialist Yugoslavia's experiments in decentralised governance may have failed in this sense as their practical implementation was affected by ideological incongruences between the people and the ruling party's exponents in an otherwise authoritarian state. Nonetheless, the concepts developed during that period form a very solid base on which new models can emerge, informed by the mistakes of the past and the present's necessity to rediscover the strength of collective effort.

Informal settlements are spaces where dwellers build not only their homes but also the urban context in which they will be spending their lives. Basic infrastructure, public space, even the color of the curbs on

✕ Fig. A.39: Urban Green Frog | Illustrated for DK Skelly, AZA Arietta, M Lambert. "Green frogs thrive in the suburbs." *Feral Atlas: the more-than-human Anthropocene*, edited by Anna L. Tsing, et al., Stanford University Press, 2020. doi.org/10.21627/

the side of the road- everything outside of the privacy of their home is the result of negotiations (in larger or smaller scale) between various parties. These negotiations also occur between informal settlers and state institutions and while individual problems of bureaucratic nature can more easily find ways of being resolved, bigger scale, collective problems, such as sewerage for a settlement of 30.000 inhabitants, not only are inherently much harder to solve but are, more often than not, exploited for greater political interests; deepening the void between formal and informal or between dignity and illegality.



Even though there can be infinite debates about the exact share of responsibility and the demographic it belongs to, there is a large group that is directly affected by these processes yet it holds no responsibility whatsoever.

Our non-human counterparts, even though they speak languages most of us cannot understand, deserve to be heard as they are integral parts of our society at large. Our urban life cannot be separated from its dependence on non-human beings and non-beings as these shape our physical properties and our social context. If the compromise of the integrity of these entities stems from a political nature, then it's a political solution that has to be

provided to fix what we have broken. This is why this work aims to recognize and defend the rights of non-human actors and their need for agency in our urban environment.

Furthermore, we find that this, if you might, experimental process, has a greater potential to be applied in unregulated urban spaces as "They operate inside capitalist markets of land, credit, and consumption, but usually in special niches bypassed by the dominant logics of formal real estate, finance, and commodity circulation." (Caldeira, 2017). By gaining political agency in their neighbourhoods, informal settlers can choose to shift the narrative from a focus solely on human agency to a more inclusive and balanced approach to urban planning and governance that considers the needs of both human and non-human actors, aiming for a more resilient and equitable urban context. It's our view that by acknowledging the co-evolution of species in urban ecosystems we can strive towards more just and sustainable cities where all needs are respected and valued.

× Fig. A.40: Discarded second-hand clothes line the beach in the fishing community of Jamestown in Accra, the capital of Ghana, by Muntaka Chasant, Shutterstock

PART B

CASE STUDY: KALUDJERICA

CONTENTS

A Nun

Self-building in a double periphery

Beograd favela

Kaludjerica today

Structures of self-government

A NUN

[sr. latin: Kaludjerica, sr. cyrillic: Калуђерица]

Belgrade's southern periphery lies in the crevices of the lush, hilly, lower Šumadija region, rich with slow-flowing rivers and streams, clasped between the tame plains of the Sava and Danube rivers. In one of these foothills, right on the border between Šumadija and Podunavlje (the Danube region), lies Kaludjerica, Belgrade's largest informal settlement.

'The village is at the spring of the Bujanj stream, which is called "The Pond" in its lower course - the small left tributary of the Bolecica river. The houses are spread across the gentle sides of the valley. The village itself is split in two smaller parts, the Upper and the Lower Kaludjerica. The houses are most densely placed in the centre of the village. There are a couple of houses separated from the village and spread around.' – This is how ethnographer Rista T. Nikolic described Kaludjerica in an anthropogeographical survey from 1893.



× Fig.B.1: View of Kaludjerica. Photo by the authors.



✕ Fig. B.2: General staff map of the Kingdom of Serbia, Belgrade and Avala regions, source: National Library of Serbia

It is said that village of Kaludjerica came to be when the inhabitants of old Kaludjerica inhabited the place of today's settlement because of the black death. Even the first village, along with the second is not so old, It was founded by the settlers from Levče and East Serbia. Newer settlers were looking for refuge, coming from Serbian towns and villages under the Turks such as Prilep in that time, according to Nikolic (1893)

This makes it possible to follow the development of Kaludjerica from the middle of the 18th century when the core of the settlement was formed, while its' further development was guided by the main roads connecting the cities of Nis and Smederevo with Belgrade and the valley of the 'Bara' (sr. pond) stream, today commonly known as the Kaludjerica stream. Following these morphological guidelines, new parts of the settlement started forming and slowly merging with the oldest part of the settlement, with the most intense expansion taking place in the 1960's, when the mentioned 'boom' of informal building put Kaludjerica's name on the map as one of the largest informal settlements of its kind in the Balkans and in Europe.

Five main stages of Kaludjerica's evolution can be singled out (Jovanovic, 1978), illustrated on the right. (Fig. B.3)

1.The first consists of the evolution of the settle-ment's core in the 18th century, around what today is considered the centre of Kaludjerica when, accord- ing to stories that have been passed down, inhabit- ants moved to the area because of the plague (Black Death).

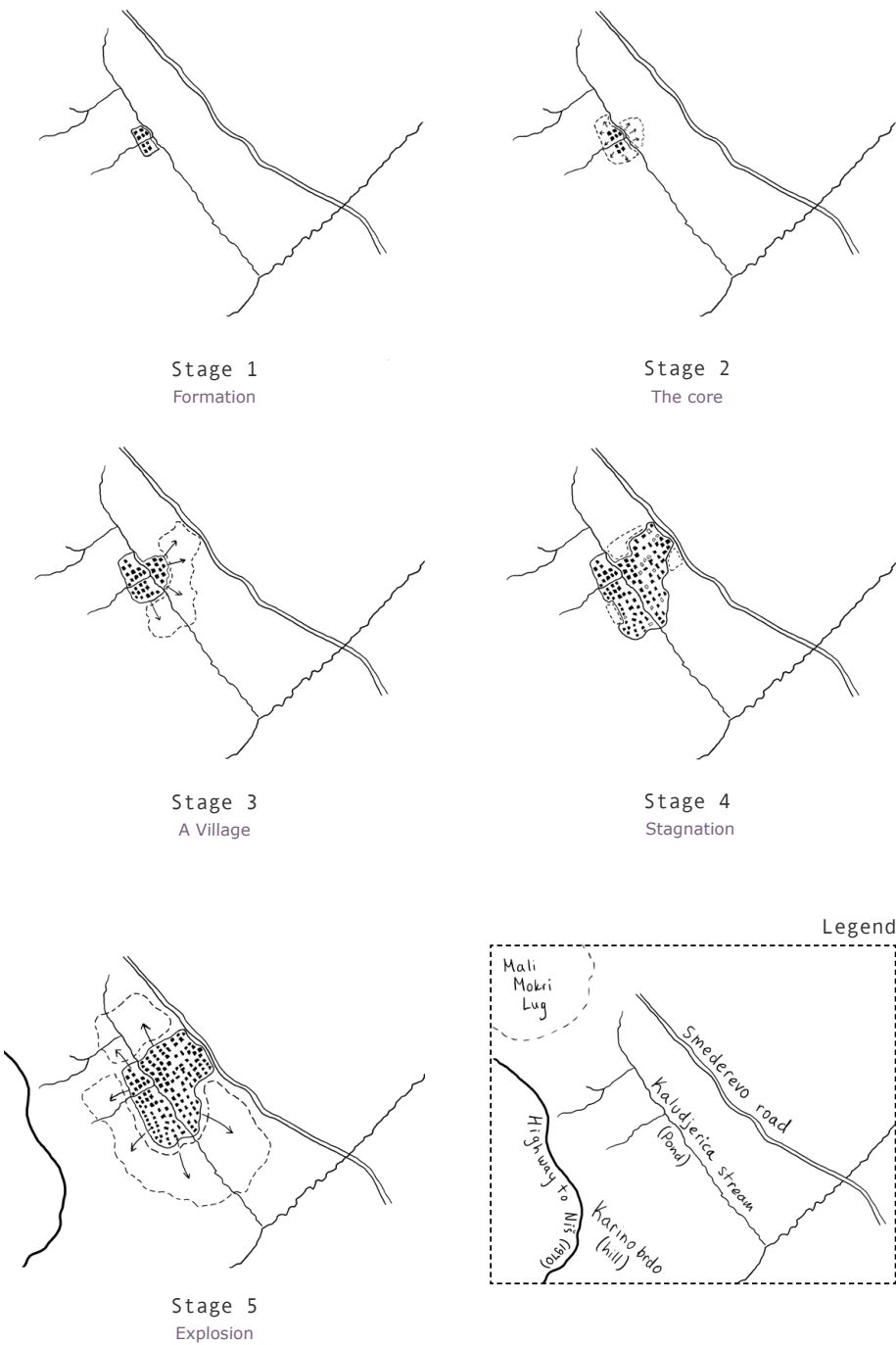
2. The second phase lasts until the end of the 19th century when the evolution of the rural settle- ment was guided by the division of family coopera- tives and an influx of new settlers. New houses are being built around the existing core, between today's school, the stream and Karino hill. In this way the Up- per and Lower Kaludjerica are formed with the largest concentration of dwellings in the central part of the settlement.

3. The third phase, which lasted until the 1940's, is characterized by the densification of the existing perimeter, having its most intense growth between the two world wars when the settlement's south-east expansion began. During this period the formation of the nucleus ocured around the Smederevo road.

4. The fourth phase saw a stagnation in expan- sion until the mid 1960's when Kaludjerica was still maintaining the appearance of a rural settlement. The expansion character was localized to the already par- celed land in the central area.

5. The start of the fifth phase was marked by the intense informal expansion of the 60's and exten- sive dispersion of residential construction towards the Smederevo road and the Niš road towards Veliki Mokri Lug. The development that followed the same trend in the 70's shaped the Kaludjerica we see today.

Five stages of Kaludjerica's evolution

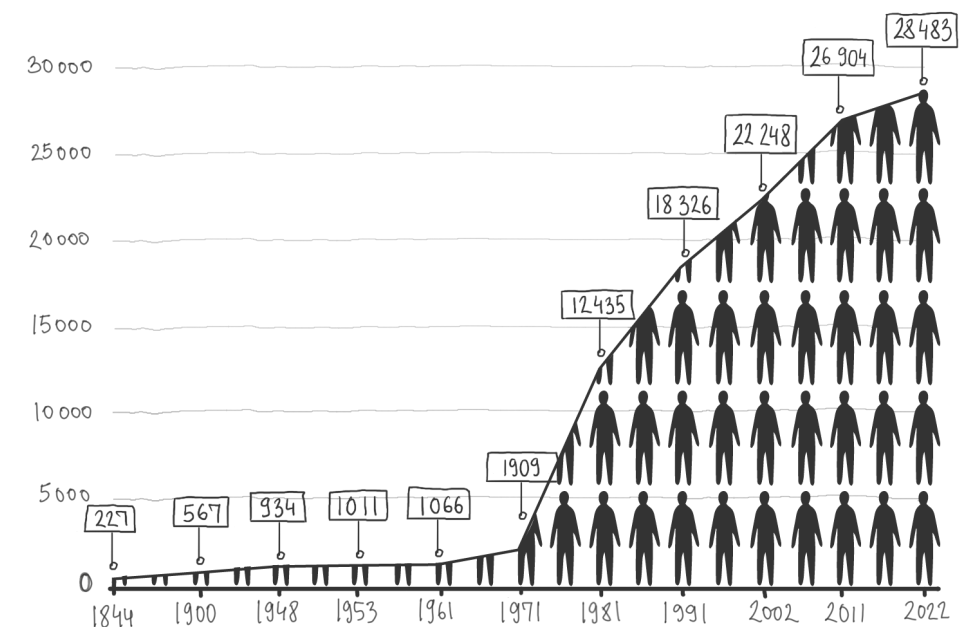
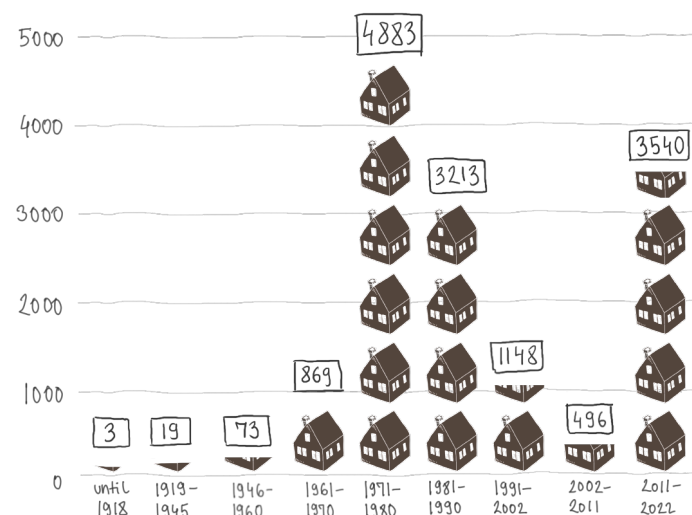


× Fig. B.3: Kaludjerica spreading accross the valley. Authors spatial interpretation of description (Jovanovic,1978)

The rise in population numbers naturally fluctuated with the five phases of development. From steady growth until the mid 60's, to the dynamic boost in population numbers throughout the 1970's. During this period, Kaludjerica's population increased by 6,5 times and from then onwards followed a moderate increase (Martinovic, Ratkaj 2009). Today, Kaludjerica has a population of 28,483 inhabitants according the results of the population census of 2022. The actual number of inhabitants is presumably higher, given the difficulty and major omissions of conducting census polls in informal areas. What is more, results show that on average, the age of Kaludjerica's residents is lower than the total average of the Belgrade region, making Kaludjerica one of the 'youngest' settlements in the area of the capital. It is composed of people who migrated from various parts of Serbia and the Balkans for a multitude of reasons.

Be it the black plague, the Turks, work opportunities, fleeing from war, after 2 centuries of movement Kaludjerica has become a home of a diverse group of people who have had no one else to rely on but themselves.

✕ Fig. B.4: Number of houses built in Kaludjerica until 2022. Drawing by the authors.
✕ Source: National institute for statistics of Serbia



✕ Fig. B.5: Population graph of Kaludjerica. Drawing by the authors.
✕ Source: National institute for statistics of Serbia

✕ Fig. B.6: Kaludjerica spreading across the valley. Photo by the authors.



SELF-BUILDING IN A DOUBLE PERIPHERY

Ana: Does it make sense then that Kaludjerica belongs to the municipality of Grocka?

Baka: Well I don't know, it's better if it went to Zvezdara.

Niece: Well, you know where the border is, two streets above mine is already the municipality of Zvezdara.

Baka: I don't have a car here, I finish everything in the city, no matter what, to me it's like going to Leskovac when I go to Grocka, maybe I went once or twice.

Niece: To the center of Grocka, if you don't have a car, God forbid you go there, brother.

Baka: They send you to Vinča, they send you there to Grocka, and then they send you back to the city. But we can't do anything about it.

✕ Excerpt from the interview series in Kaludjerica: Grandma and Marijana (2022.)

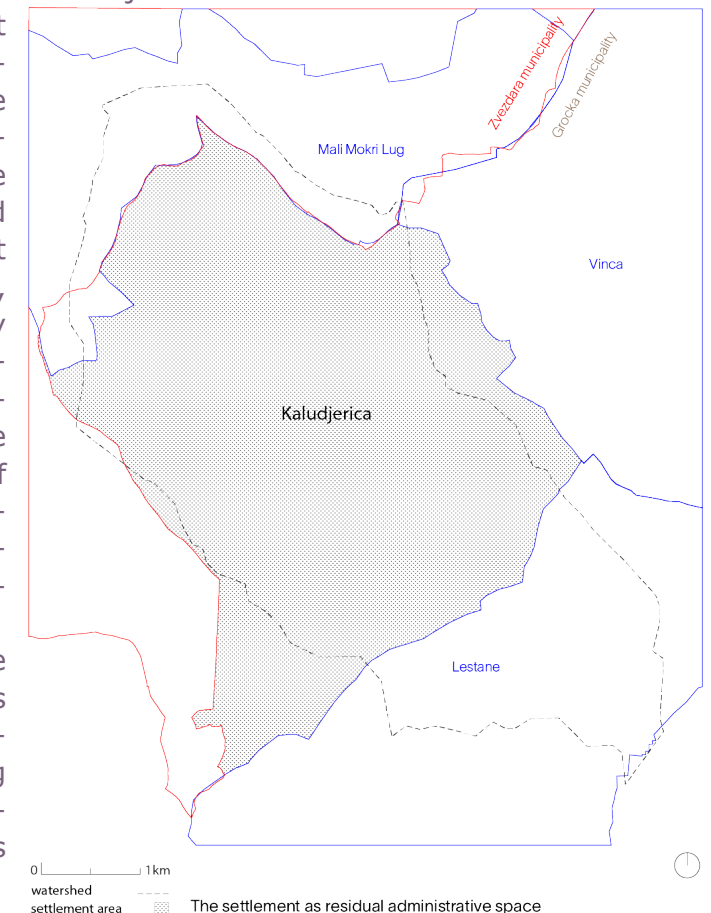
The area of Kaludjerica belongs, juridically, to the municipality Grocka, 20 Km away from it. The town of Grocka, the administrative center of the municipality, houses a fourth of Kaludjerica's population and even though it is hypothetically responsible for the 50.000 of residents of Kaludjerica, it is a much larger endeavour than one it can handle.

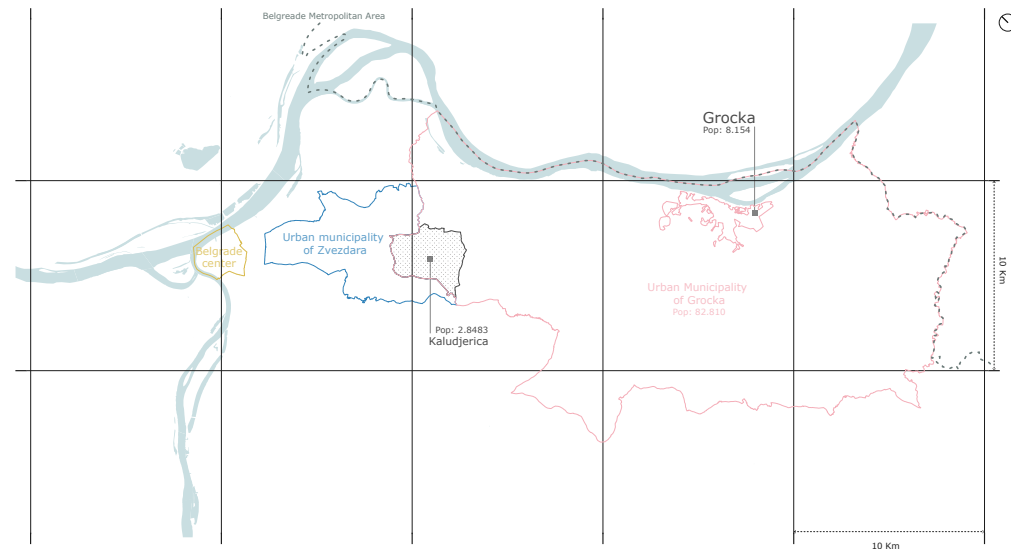
Naturally, being an informal settlement, Kaludjerica doesn't have its own administrative borders, rather it is defined by the limits of the surrounding administrative structures. On the north and north-west it borders with Mali Mokri Lug, the southernmost settlement of the Zvezdara municipality and actually part of the north-western section Kaludjerica falls under that municipality. The west

border is defined by the Belgrade-Nis highway and on the East the limit is set by the Vinca municipality, home to the Vinca nuclear Institute, and the Vinca landfill, the largest unmanaged landfill in Europe, closed in 2021 and on its way to stabilisation. The south border is set by Lestane, a suburban settlement under the Municipality of Grocka most of which is designated for industrial use and where the Kaludjerica stream meets the Bolecica river.

From the interviews we conducted with the residents of Kaludjerica, the most common pattern of home-building that emerged during the settlement's expansion was as follows:

✕ Fig. B.7: The settlement as residual administrative space, Drawing by the authors.





× Fig. B.8: The spatial relation between the settlement, Belgrade and Grocka, Drawing by the authors.

Groups of relatives with their families after emigrating from their villages arrived in Belgrade and rented out an apartment as subtenants, in the city or in Kaludjerica. They stayed there all together and the adults took on jobs as soon as possible, mostly as construction workers. Then, (after realising they wouldn't get a socially owned apartment) they purchased land and materials and started construction. Usually through their salaries, savings and in many cases loans. They would dedicate all their free time and even part of their working hours to the construction of their homes. All the while, contributing 4% of their salary to the public housing fund. When a sufficient part of the house was built they would move in, again all together as a "surviving unit", and continue working on the rest of the building. Once the building could house permanently some members of the family, they would proceed on building the next house for the rest of the relatives on nearby allotments, all helping each other. This process could last up to 30 years. In most cases the materials they used were

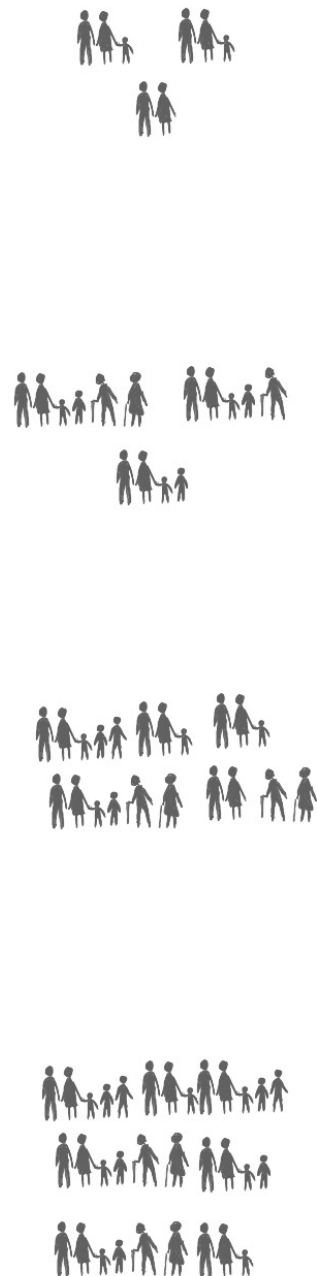
the cheapest they could find and it was common practice to not complete construction in order not to be liable to taxes put on completed buildings.

So why did people choose to go to Kaludjerica to build their households?

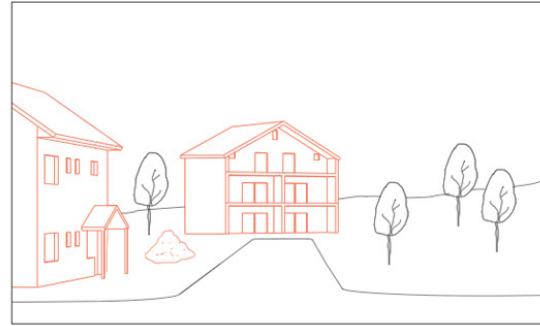
A broad set of factors contributed to this choice among which the most significant were cheap land, proximity to Belgrade and no utility fees. Basically the best solution for people who found themselves in



× Fig. B.9: Unfinished facades - Typical architecture of Kaludjerica. Photo by the Authors



✕ Fig. B.10: Diagram of evolution, correlation between family and neighborhood development



extreme conditions and were trying to provide the basic need of housing for themselves.

Up until the 1960s Kaludjerica was primarily agricultural, made up of farmland. The farmers owning these lands started to parcelize it when the trend of immigrant influx became evident. Newcomers bought this land at very low rates but with an important setback; no infrastructure. So when the numbers of newly-settled residents started to grow the absence of basic infrastructure needed to be dealt with.

These were also the years in which the prominent ideology in all of Yugoslavia was self-management, it was just how communities functioned at the time. One of the first common actions the residents made was the construction of the community center. There they discussed and organized voluntary labour campaigns and addressed common issues like sewage building and street-cleaning. This is how most of the infrastructure was built.

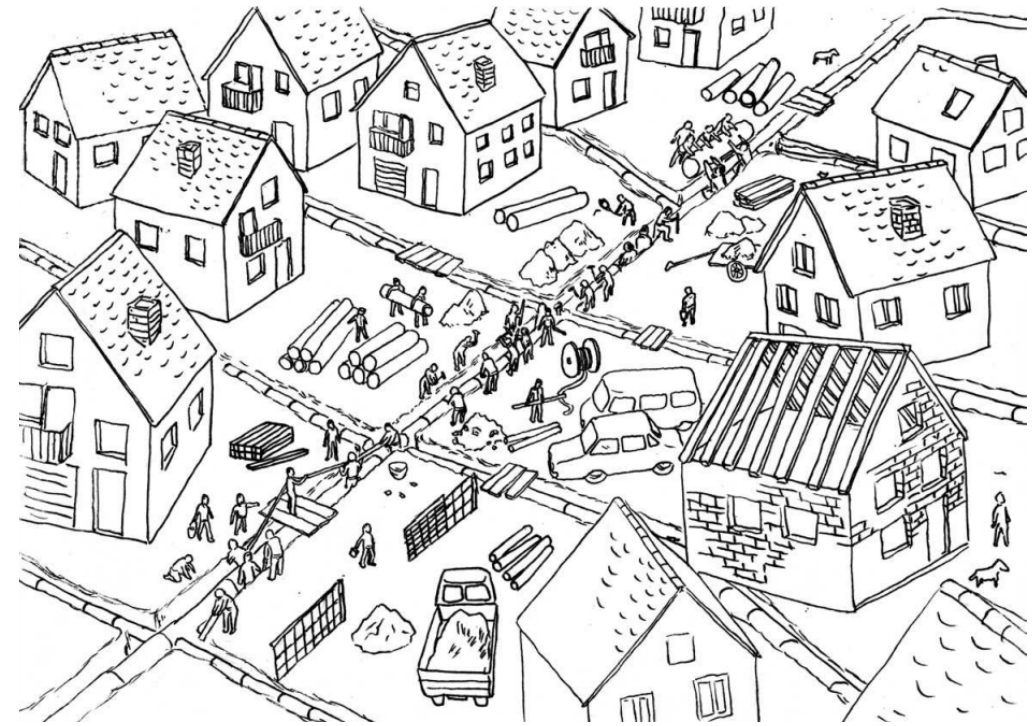
As Ljilja told us in our interview:

"We did the plumbing ourselves, so the police used to come, I remember that, I was little, wait, I have to explain this to you first. They lowered a water pipe down to the school and there were 4 fountains, it was the city's water supply. So people started digging and attaching to the water supply, and people would be digging standing in the hole, the police came, they'd jump out, it was a circus. So we all connected to the water supply illegally, for example, and then they just legalized it and started charging the bills. Those pipes, God forgive, so you have some asbestos pipes, then metal, then plastic...the plumbing is a disaster."

Not everyone built out of necessity in Kaludjerica though. Many people who already had an apartment in the city took advantage of the favourable economic conditions of building without a permit to procure themselves with vacation homes close to the city. With Kaludjerica being immersed in nature coupled with cheap and spacious allotments that could hold big houses and gardens, the attraction for people on the individualistic side of the spectrum became notable.

The growing presence of parties uninterested in common issues of the various neighbourhoods created incoherence in the community and their contrasting agendas made it more difficult for the residents of Kaludjerica to organise legally and advocate for their interests. In a time when people without adequate political agency would plan lobbying actions in state organizations to achieve agreements on obtaining communal infrastructure, for example water pipes, the indifference of home owners that periodically used the area for vacation, ultimately became a setback.

Parallel to this, despite of growing numbers, the urbanistic institutions and the state in general did not offer any kind of solution, adequate or inadequate, and just ignored the matter in its entirety. This clash between people (exhausted from the hardships of migration and self-building while working) who were trying to negotiate their basic needs and institutions basically not acknowledging them, proliferated until our times but it also evolved into a much more corrupt mechanism. These days, Kaludjerica's residents' need for sewerage is being used as leverage from politicians who promise the fulfilment of the people's needs in exchange of votes and basically retract on every promise made after their election.



The overall feeling of Kaludjerica's residents, after passing years of cold winters cramped in humid basements, spending endless hours of putting one brick over another only to watch them torn down by prisoners on police orders and ultimately voting for mayors who give out empty promises of providing basic infrastructure, is complete and utter apathy, and no one can blame them.

× Fig. B.11: Drawing of the collective infrastructure building, by Vahida Ramujkic source: Kaludjerica from Šklj to Abc (Neel- en & Dzokic, 2012)

BEOGRAD FAVELA

"So from my childhood, I remember kids from Kaludjerica coming to school, and they were always different. You know, they had different accent, uh they, their shoes were always with some dirt, some mud, because they didn't have pavements and everything. Also, their clothes were full of smokes. They were different in terms of what is expected from a school kid in a broader sense. And of course, they were the kids of the most ambitious parents that were not lazy to bring them 10 kilometers to school."

✕ Excerpt from the interview series in Kaludjerica: Nebojsa Milikic (2022)

As we have established until now, the residents of Kaludjerica built their own houses as well as important infrastructure of their settlement. Even though this process resolved some basic issues of the residents at the time, the non-professional approach of self-building coupled with inadequate planning, generated defective infrastructure that creates many troubles for the settlement even to this day.

Most residential buildings in Kaludjerica have self-built septic tanks with shallow walls and more often than not they overflow and spill, on one hand contaminating the surrounding area and on the other entering the drainage system and contaminating the Kaludjerica stream. The households that don't have a septic tank for their wastewater have instead pipes that unload black and grey waters directly to the stream.

"When they were starting to build this shopping mall they had to dig a lot for the underground garage, and you could see at least 20 sewage outlets that were unloading into the stream and were now cut for this new construction.."

Coupled with strong rainfall and the particular morphology of the Kaludjerica valley this sewerage problem not only made the environment around the stream hazardous for people and animals but also created a very bad image of the settlement and its residents to their Belgradian neighbours.

After these prolonged periods of self-construction with many sacrifices, exhaustion and moral disillusionment, the residents focused on the interiors of their homes and left the outside world take its own turns. And even if some remnants of nostalgia for the good old days, when people would find joy in working with one another for a common purpose, could still be traced in the elder generations; the younger

ones, the kids that grew up in Kaludjerica and their own kids, don't see that anymore. So now Kaludjerica has turned from being the material manifestation of self-management to an individualistic jungle where no one is sure of the intentions of their neighbour. As for the youngest, Kaludjerica is in no way a place with its own identity but merely an underserved suburb of Belgrade which only sets them back.

✕ Fig. B.12: Transition lines between formal and Informal. Drawing by the authors.



✕ Fig. B.13: Sturdy walls and tall buildings are slowly taking over Kaludjerica. Photo by the authors.

KALUDJERICA TODAY

These days, Kaludjerica does not resemble a typical informal settlement, a short walk through its streets reveals the tame nature of the neighborhood. Colorful houses with wide gardens, each offering different activities ranging from improvised football fields and playgrounds to small gardens with seasonal fruits and vegetables, children playing in the streets, neighbors chatting across the garden fence...

There is a sense of peace and tranquility in Kaludjerica. The bus line connecting the settlement with Belgrade passes often and brings you from the quiet valley into the city in 30 minutes. At a glance like this, Kaludjerica could be mistaken for any other suburb. Its biggest tell is the infrastructure - a leftover from the old days that never got resolved, the narrow streets with sporadic sidewalks, unpaved or badly paved roads with sudden twists and turns, makeshift electricity lines, unfinished homes and faulty water and waste management systems.

Still, these hitches don't discourage its inhabitants.

Ana: Were you born here?

Wife: Yes, I was born, and he (husband) was very young when they moved here, 3-4 years old. There were only fields here, it was really difficult. However, now for example, you literally have everything here. It takes me 45 minutes, maybe 50 minutes to get to work, to Dorćol in the morning when I catch the bus. And now you know, we are always in a 'fight' with the city, between houses and apartments, where is it better, but let me tell you, now you have everything you need on every corner.

Husband: There's everything, they could just widen the Smederevo road, so that there are two tracks in one direction... Because the influx is big there, you have a lot of settlements up to Grocka, at least 6-7 settlements, it can be a disaster.

Wife: But for me, if they let me choose Kaludjerica or somewhere else, I would never leave Kaludjerica.

Husband: I would go to Dedinje [laughs]

[everyone laughs because it's a luxurious neighborhood in Belgrade]

✕ (left) Excerpt from the interview series in Kaludjerica: Couple from Kaludjerica

✕ Fig. B.14 : (down) Visual interpretation of the wives quote. Drawing by authors.





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✕ Fig. B.15: Kaludjerica Ortofoto, source: Google



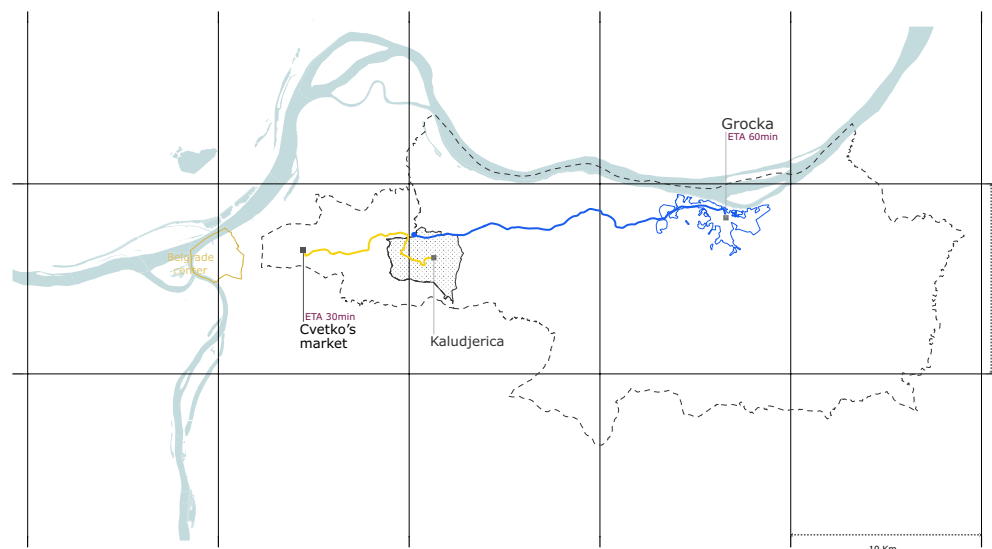
✕ Fig. B.16: Kaludjerica, built environment

In a way, what Kaludjerica offers is a sense of freedom and luxury. Having a big house with a garden 40 minutes away from the city center by public transport is not something most people in Belgrade can afford. Additionally, having the freedom to tip-toe around the construction laws allows for great flexibility and gives way to different transformations of the neighborhood- good and bad. Nevertheless, these are the things that the people of Kaludjerica managed to develop with their own hands and with a couple of negotiations with the government and for this reason a lot of them find comfort and a long-term home in it.

Aside from the native 'Kaludjericans' and early settlers and their families, the ever-growing prices of city living have brought new faces to the settlement with 6235 people coming between the 2000s and 2022. Based on the data provided by the Republic Geodetic Institute, during the winter of 2022, the average cost per square meter of new constructions in Belgrade was highest in Savski Venac, being 4,375 euros. For older buildings, the municipality of Stari Grad had the highest average price per square meter at 2,825 euros.^[1]

✕ [1] Kakve su prosečne cene stanova u Beogradu? - Ekonomija - Dnevni list Danas. <https://www.danas.rs/vesti/ekonomija/prosecne-cene-stanova-u-beogradu-2022/>

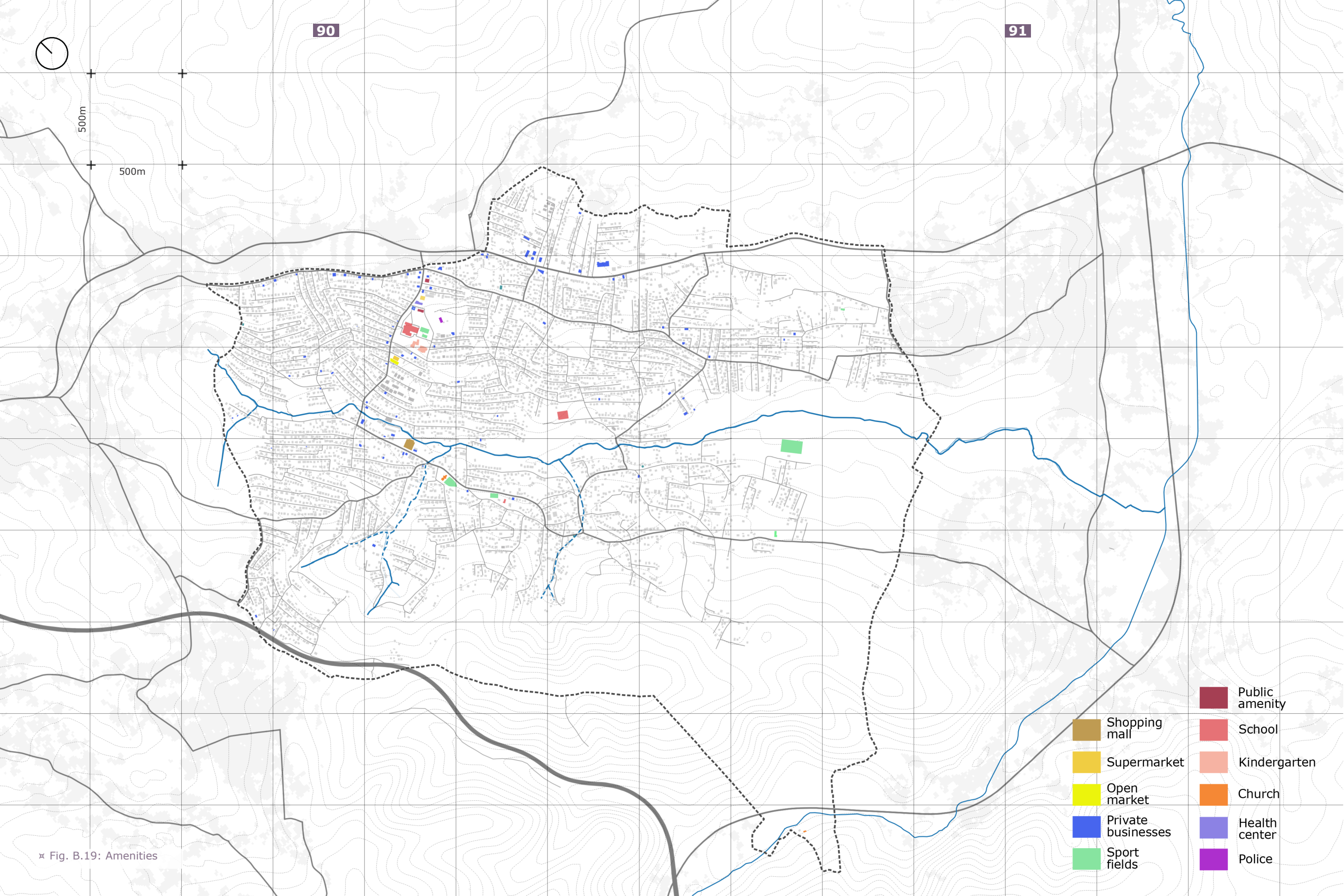
✕ Fig. B.17: Public transport travel time from Kaludjerica to Belgrade and Grocka, Information source: Google maps



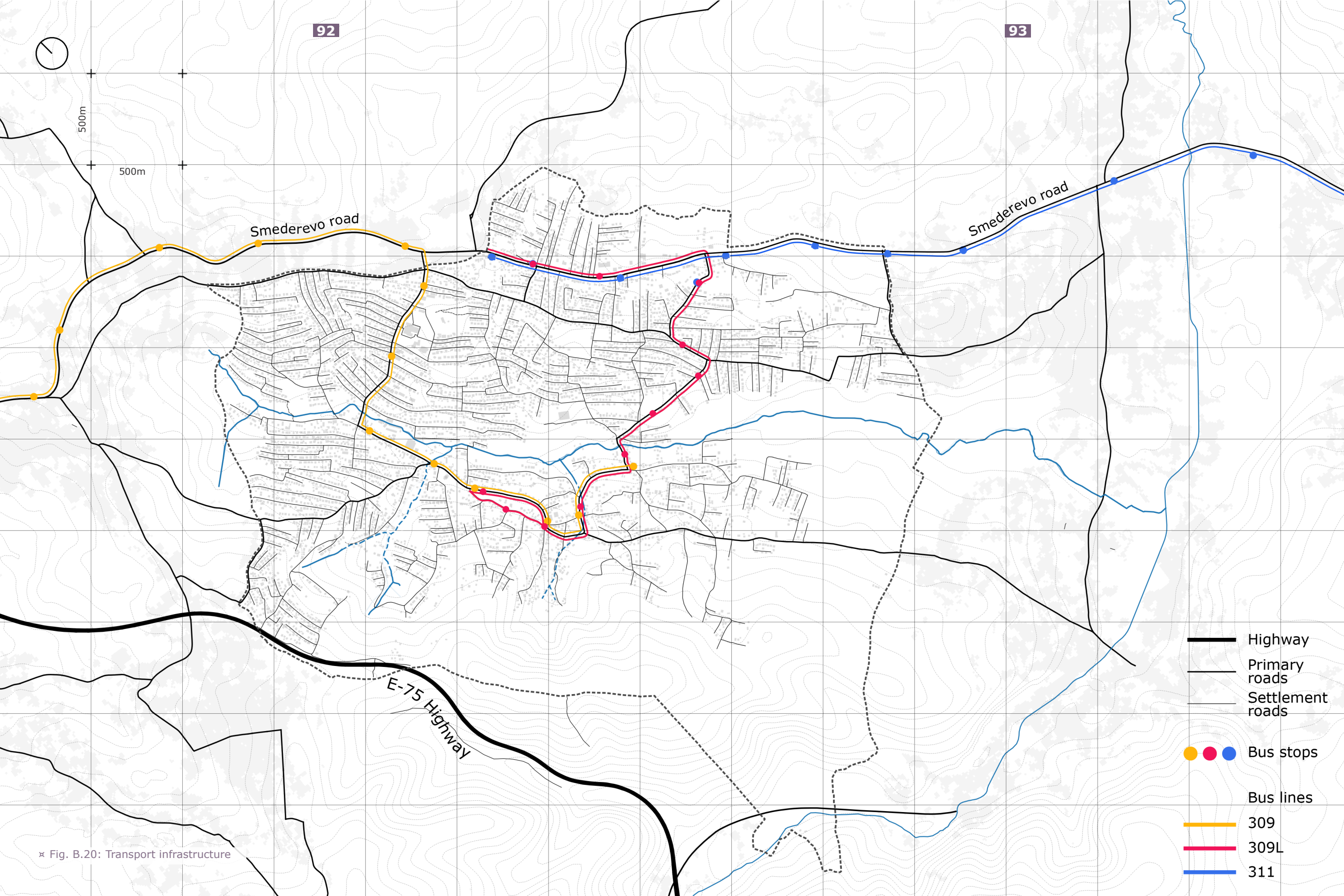
✕ Fig. B.18: Quiet village atmosphere in one of Kaludjerica's street. Photo by authors.

However, there are also those who see Kaludjerica as a temporary refuge, as is Nebojša Milikić, a Belgradian who rents a small apartment in Klenak (one of the sub-parts of Kaludjerica). He takes every opportunity he can to have a quick break from the city, making jam from the hiprose he harvests in the nearby woods and enjoying the peace.

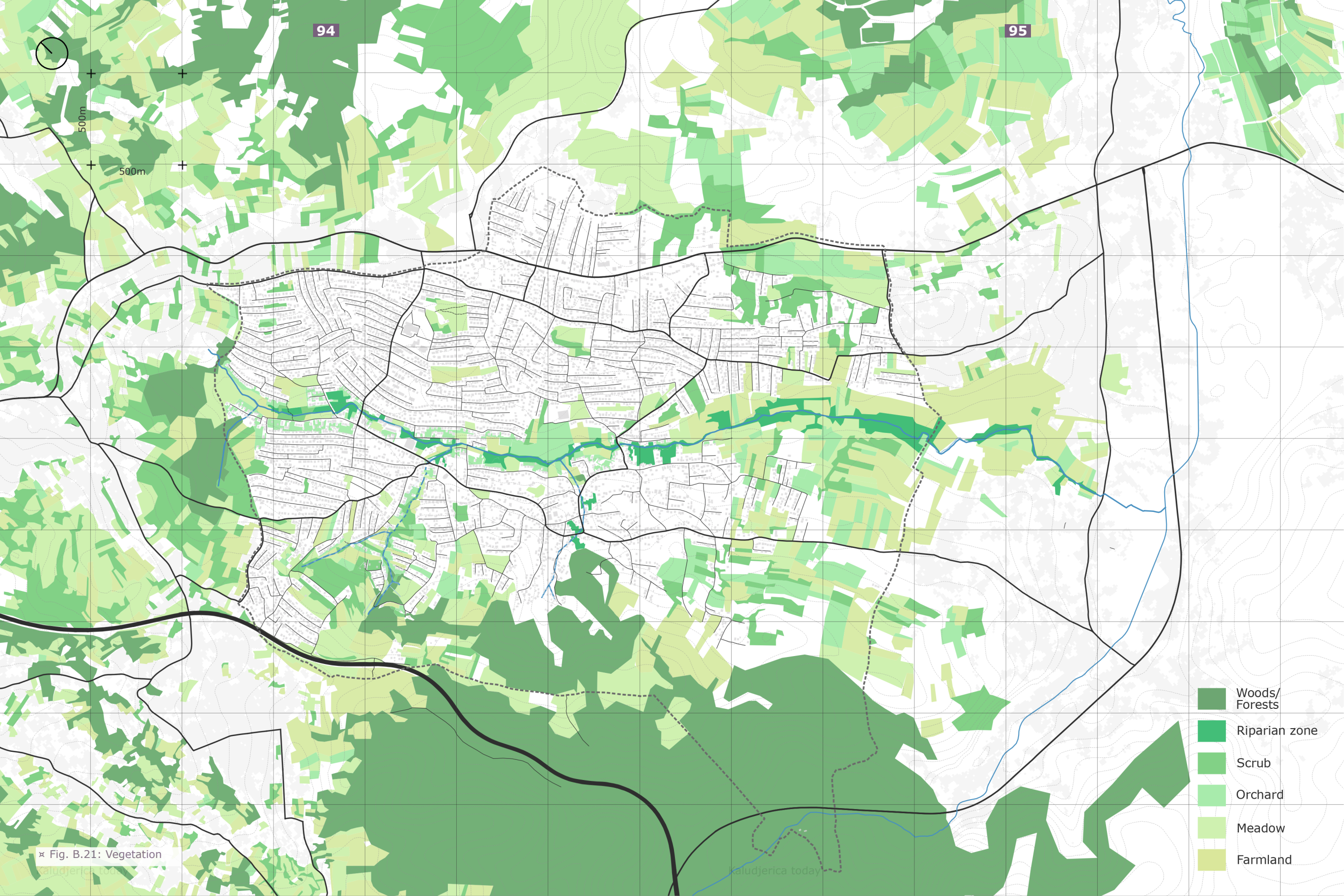
With a rise in population of course, came a level of economic development. Small shops, chain supermarkets and bakeries can be found in Kaludjerica's center in Kralja Petra I street, as well as the recently opened shopping center close-by. Along the same street modern multifamily housing is being developed and sold. Kaludjerica's steady development can be felt by the changes that happen even between two visits. New stores open, new buildings get built, suddenly there is a pathway where there was dirt.



× Fig. B.19: Amenities



× Fig. B.20: Transport infrastructure



94

95

500m

500m

× Fig. B.21: Vegetation

KALUDJERICA TODAY

KALUDJERICA TODAY

- Woods/
Forests
- Riparian zone
- Scrub
- Orchard
- Meadow
- Farmland

TRACES OF SELF-GOVERNANCE

Even with the apparent harmony described, Kaludjerica today seems to resemble more of an individualistic collection of houses than a place that came to be through the collective effort of its inhabitants. We set out to see if this is actually true, or if there are still traces of collectivism that can be salvaged. Conducting our field research and speaking to the residents of Kaludjerica we have gathered evidence of previous and ongoing collective efforts and modes of governance, as well as the issues that block these efforts from happening.

Examples of collective effort and self-governance in Kaludjerica that we found can be divided into 3 categories:

- Initiatives for the construction of public buildings
- Clean up activities
- Street organization

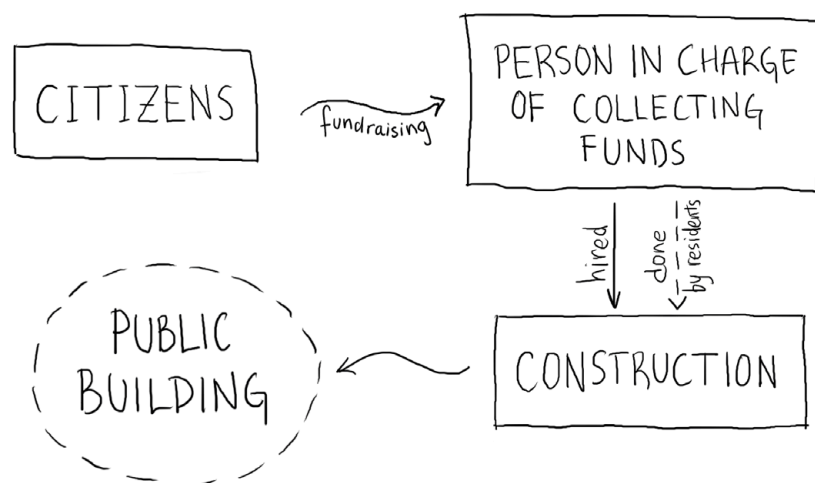


✕ Fig. B.22:
Table and
benches in the
open field, for a
moment of rest.
Photo by the
authors.

Initiatives for the construction of public buildings

For years Kaludjerica didn't have a church and all believers had to go outside of the settlement to Vinca for all church related activities such as mass, weddings, funerals. That was until the Patriarch proposed the construction of the new church on the plot of the old football field. Of course, even with an available plot, the question of funding the construction still remained. Because of this, they organized a fundraiser and gathered money for the construction themselves.

Another example is the current building of the local community (mesna zajednica) which was both funded and built by the citizens.



× Fig. B.23: Organizational diagram. Drawing by authors.



× Fig. B.24: Intervention locations - The church and the local community building. Drawing by authors.

Lily: This building (local community building) was built with citizens' funds. It was built by people and they gave money, the local community was not built by the municipality.

Ana: Can you tell me how that was organized?

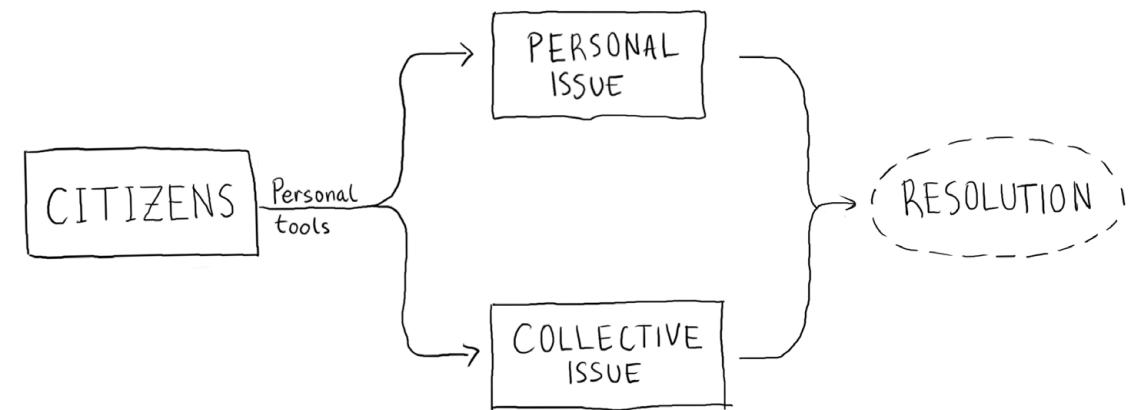
Lily: Well, you know, I don't know if it was just a contribution. I don't think so, for the official city water supply it was only a contribution, so it was deducted from the salaries, but for this building they collected by themselves. I can't remember completely... I mean, those who built died, most of them at least, but there are still some who worked who are alive. It was built by the masons, bricklayers, and painters from Kaludjerica.

× Excerpt from the interview series in Kaludjerica: Ljiljana Nadoveza, local community employee (2023)

Clean up activities

The problem of waste management is by this point an obvious issue and the residents are aware of that as well. For this reason some of them take matters into their own hands and organize their own strategies for efficient waste collection or even contribute to keeping the neighborhood clean. There are multiple comments on other people's efforts to clean the neighborhood too, such as the man who usually cleans a field next to the school where people frequently litter, or the two men who cleared the debris around the stream with their excavators when there was intense flooding and cut the overgrown foliage that was blocking the flow of water a couple of years back. Ivan, one of our interviewees has created his own way of managing household waste since the municipality wasn't handling it efficiently:

✕ Fig. B.25: Intervention location - the field next to the Miloje Vasic elementary school. Drawing by authors.



Ivan: I don't know if you realized we don't have a single container in Kaludjerica, only the small trash cans which the garbage collectors pass by and collect.

Ana: And is that one trash can enough for someone with a larger family?

Ivan: Well, we have a bigger family and you get that one container, but well, now we made a completely different thing for us, we don't use that can. We have a cage near the street so that the cats don't get into it and the wind doesn't blow it away. We throw garbage there, and every other house has a bin in front of it, and every Saturday and Wednesday, those bins are brought out to the street and they come and pick them up. But we had a problem, for example, they won't carry leaves and grass in the summer... That's now also a bit of politics between the landfill and Eko Grocka, which collects garbage for Kaludjerica. They have their own recycling, and the landfill has its own. Then they throw out the garbage in Eko Grocka and recycle what they can recycle and take the rest to the landfill, but the landfill didn't allow them and then they didn't want to accept their leaves and all that nonsense... All in all they caused us problems. But now Kaludjerica is much tidier than before.

✕ Fig. B.26: (up) Organizational diagram. Drawing by authors.

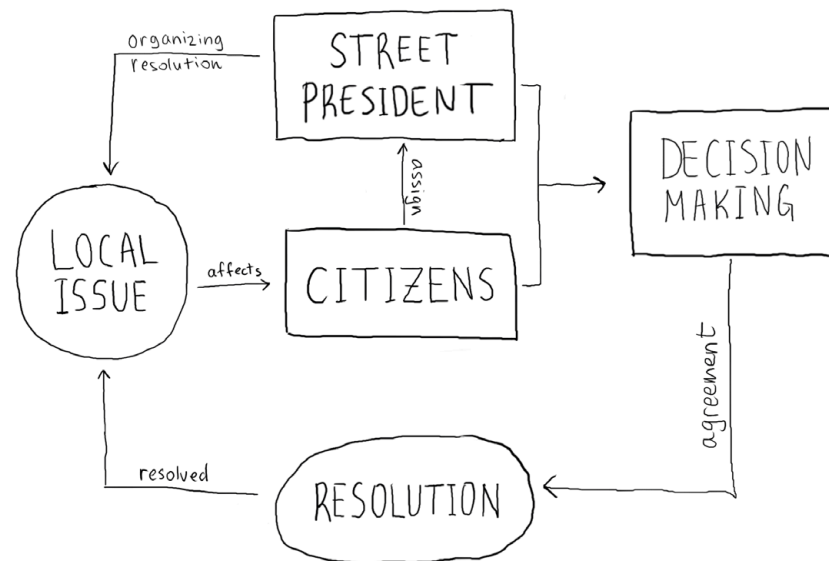
✕ Fig. B.27: (down) Intervention location - The stream-side. Drawing by authors.



Street organization

Another point of our interest was to see how and if neighbors collaborate on a small scale for issues of shared interest. The majority of their 'collaboration' so to say is brief, with small transactions being made between them, offering help or tools to each other when in need. One concept that stood out though was the idea of the street president. This was the way that Ivan and his neighbors organized for solving common problems in their street:

× Fig. B.28: Organizational diagram. Drawing by authors.



× Fig. B.29: Intervention location - Toplicka street. Drawing by authors

Ana: Let's say if some common problem needs to be solved that does not concern only your house but, for example, in the street, how do you resolve such things?

Ivan: Well, we solved all that ourselves. The whole street gets together and you form a committee, we had a president of the street, he died not long ago, that neighbor managed everything; asphalt and electricity, we introduced everything ourselves. He collected money for sewage, for asphalt, for water, for all that. We did all this ourselves in the 90s, we were even in the chronicle that we collected the money ourselves and paid for everything from our own pockets to do the sewage system and that. In that matter, the street is united, now the only thing they were arguing about was that one wanted a white curb, the other wanted a gray one.

[laughs]

Ana: That's the least of the problems

Ivan: Well, yes, but in the end, the whole street got into an argument because of the gray and white curbs, and then in the end, a couple of neighbors did gray and the others white curbs...



✕ Fig. B.30: Intervention locations in a wider context. Drawing by author.

Even if these successful traces exist, we have noticed an evident lack of their structure and possibility to persist as a common practice. Once a certain necessity is fulfilled, most of these structures are quick to dissolve, but there are still some that continue existing, at least passively, until a new issue arises.

Another problem that we have noticed between the people we have spoken to is that there is still care for the environment among certain residents but it is very fragmented and invisible, with the most common

phrase we heard being that they clean and take care, but it doesn't matter since others around them don't do the same.

Enhancing and visibilizing these existing practices of Kaludjericas residents could encourage the discouraged citizens who still have the will to act either as a group, forming a network of willing participants or just by implementing ideas in their own homes and surroundings.





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CEPANJE DRVA
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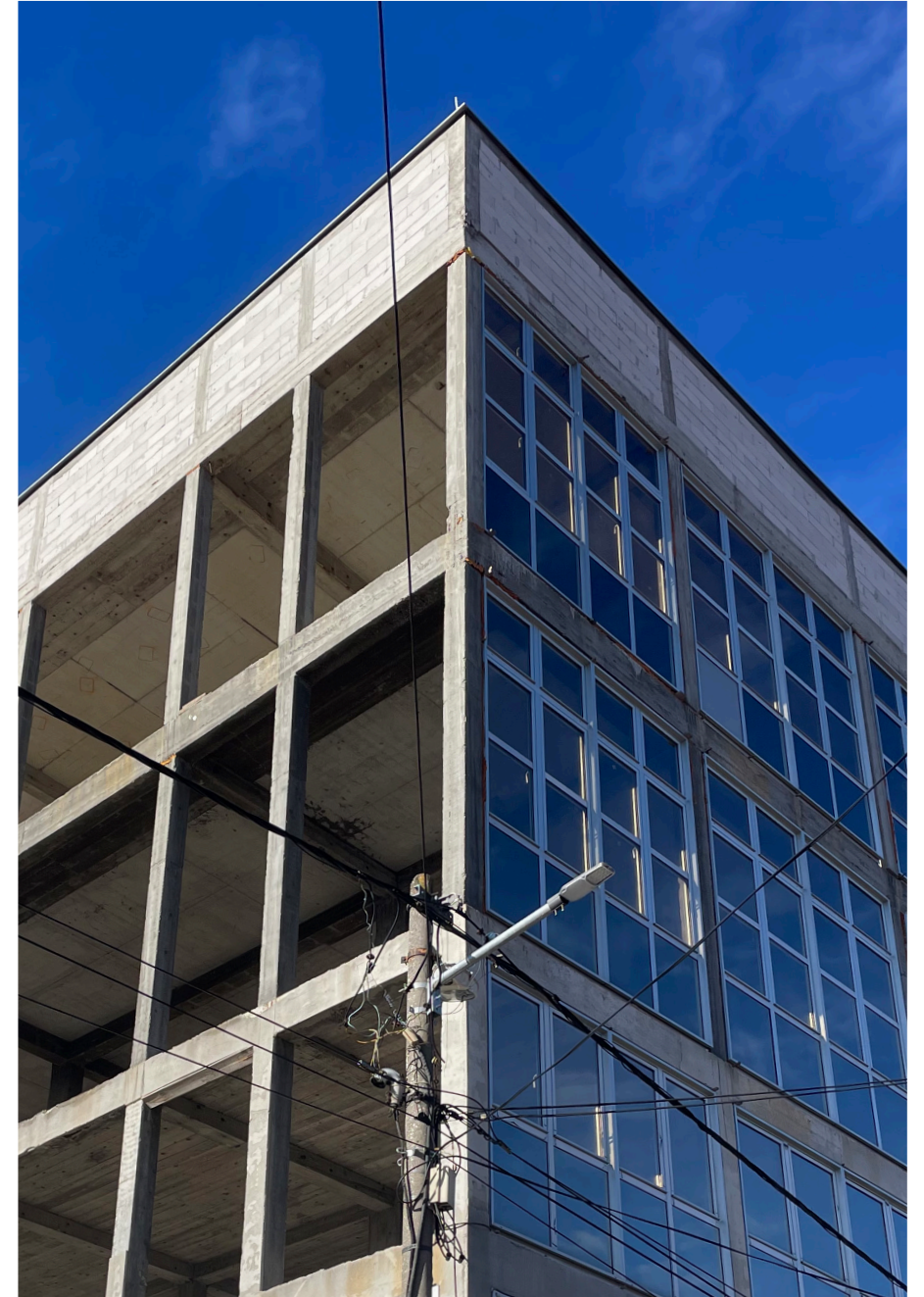


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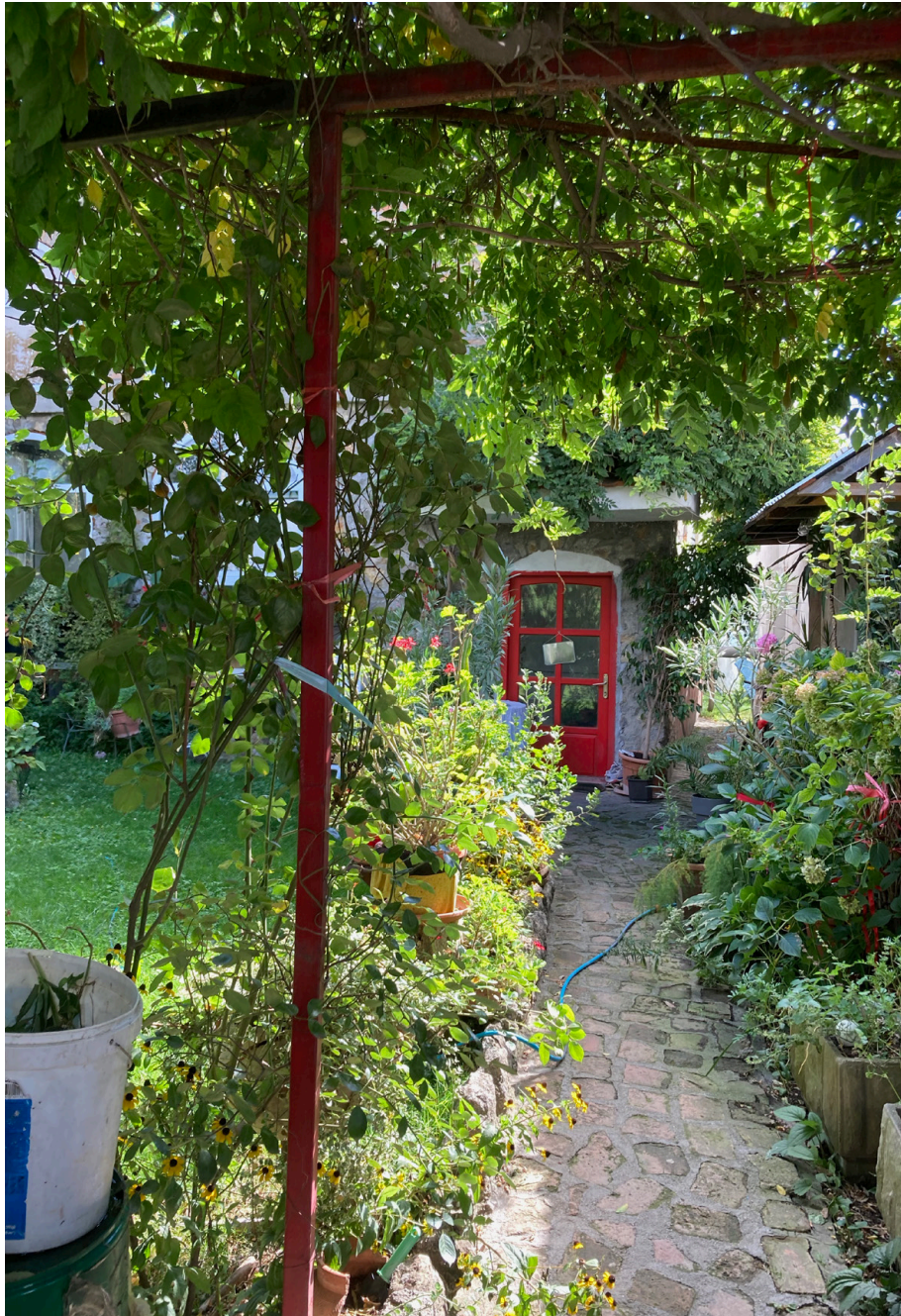
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PART C THE STREAM

CONTENTS

Physical characteristics

The springs

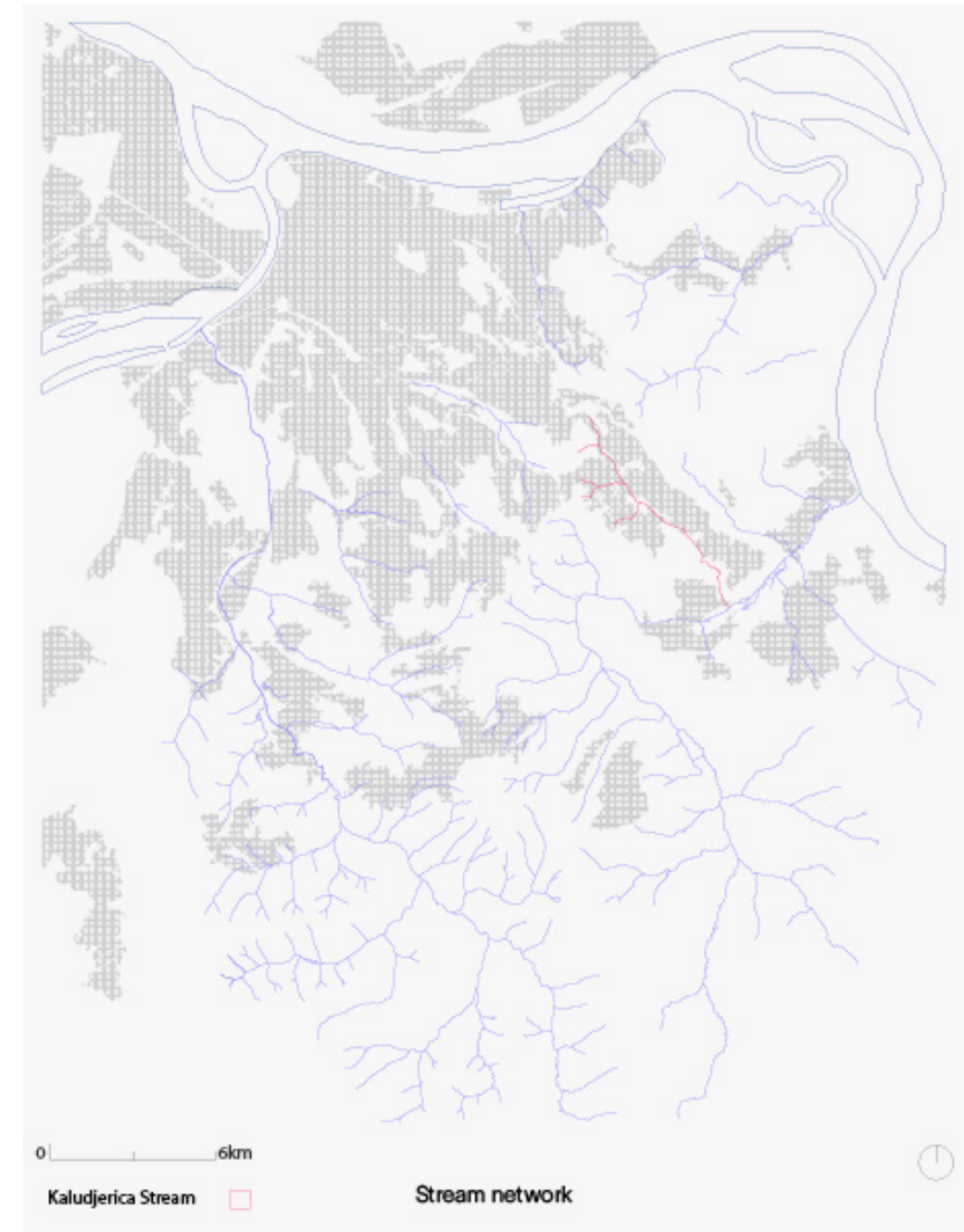
The stream's ecosystem

Anthropogenic factor

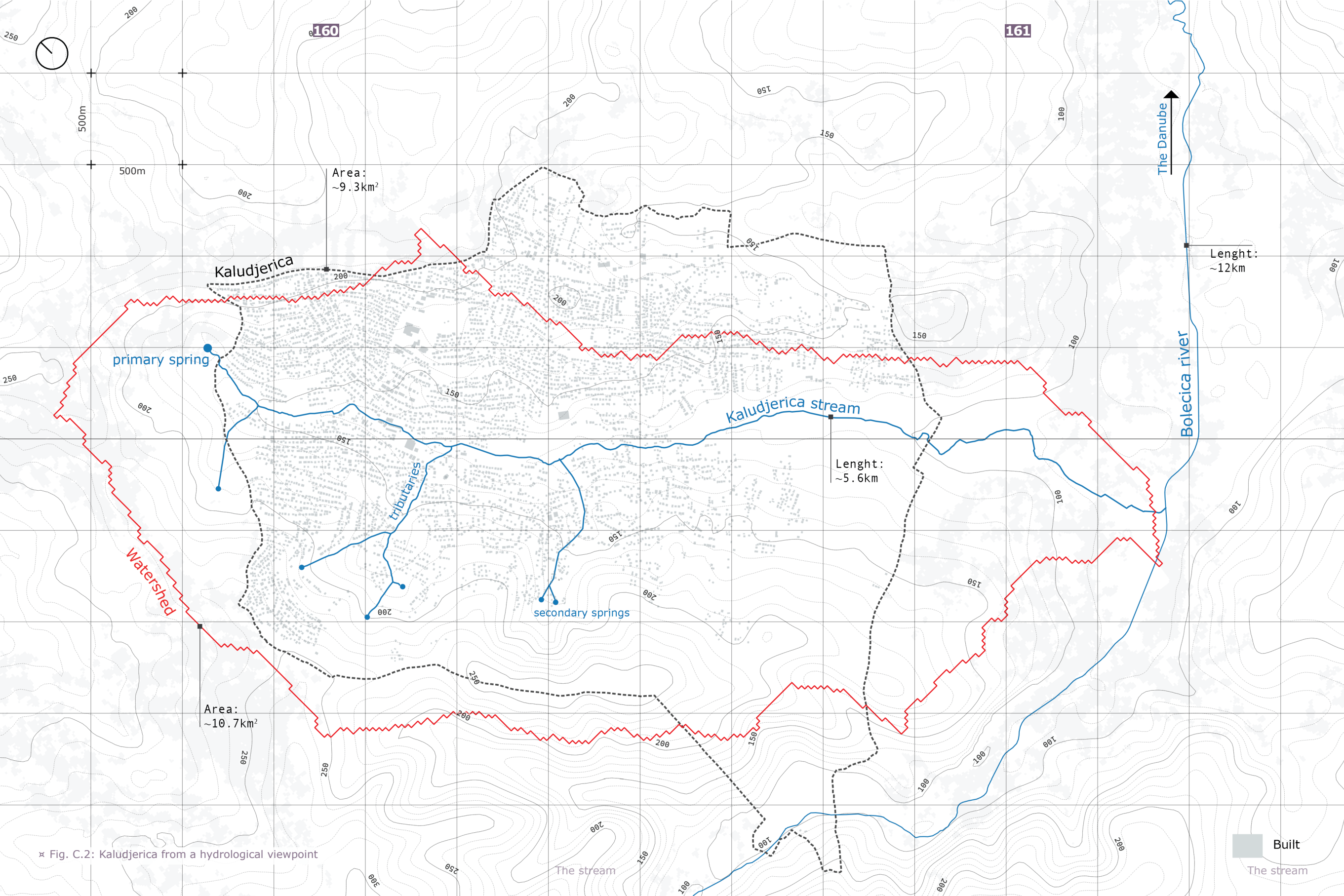
PHYSICAL CHARACTERISTICS

The Kaludjerica Stream is located at the bottom of the valley along which the settlement lies. It spans over 5.6 kilometers and flows into the Bolecica river which flows into the Danube soon after. The Kaludjerica stream (that being its current 'official' name) is currently facing a range of issues that are threatening its ecological integrity as well as the surrounding urban areas.

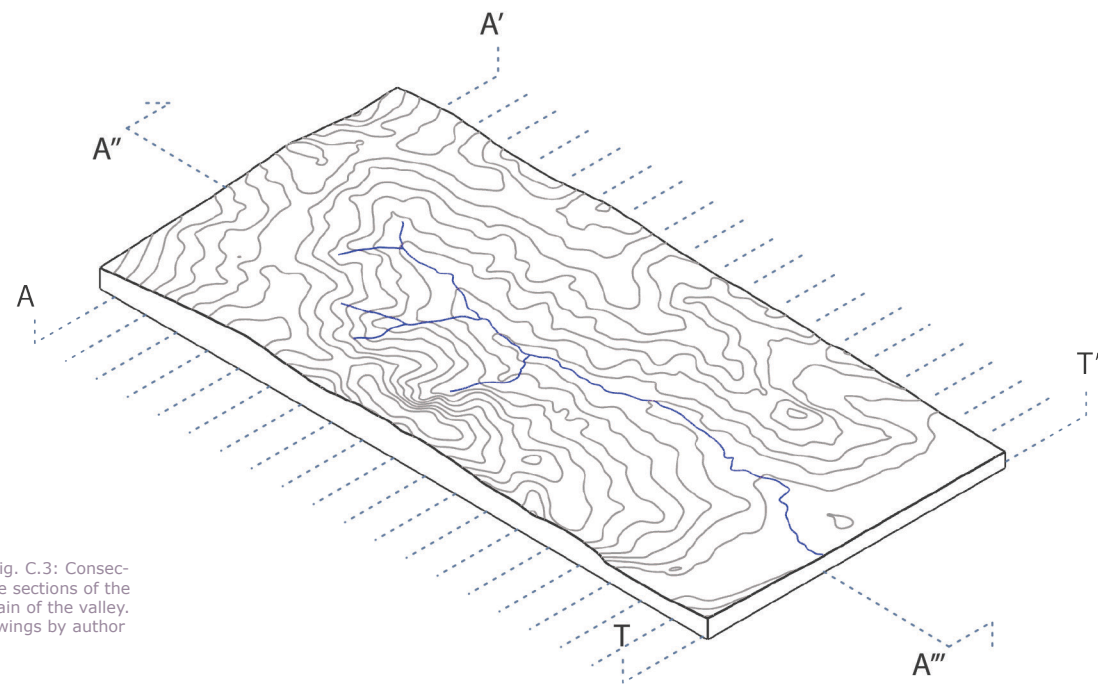
The stream's small size, the dense foliage covering the banks and the riverbed coupled with its curving route, are all factors that contribute to reduced permeability of the riverbed, hindering the flow of water. Additionally, the presence of numerous natural and man-made obstacles further restricts the stream's passage. These obstacles include alluvial deposits, vegetation and rock barriers that have been illegally constructed for irrigation purposes.



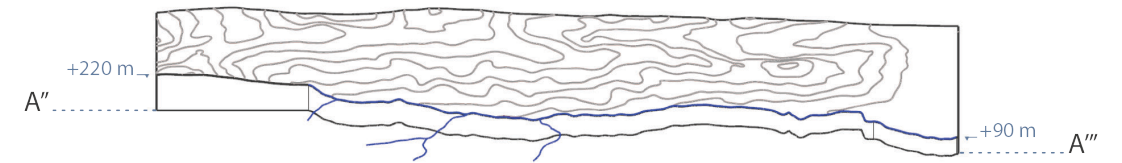
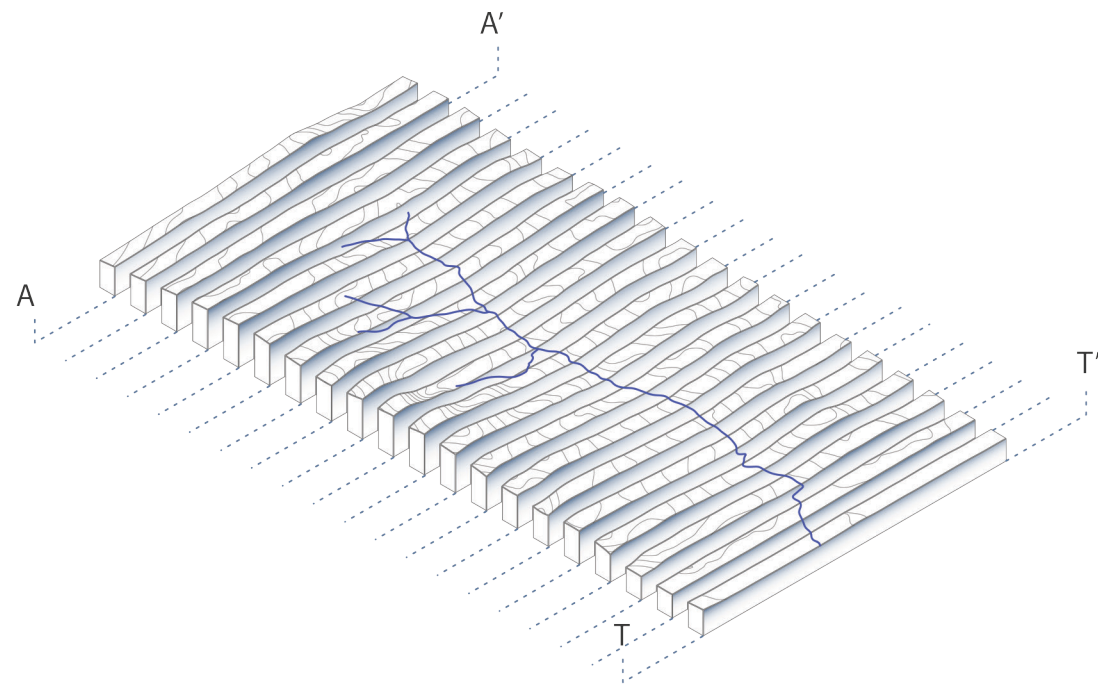
× Fig. C.1:
Position of the
Kaludjerica
stream in the
hydrographical
network of Bel-
grade. Drawing
by authors.



× Fig. C.2: Kaludjerica from a hydrological viewpoint



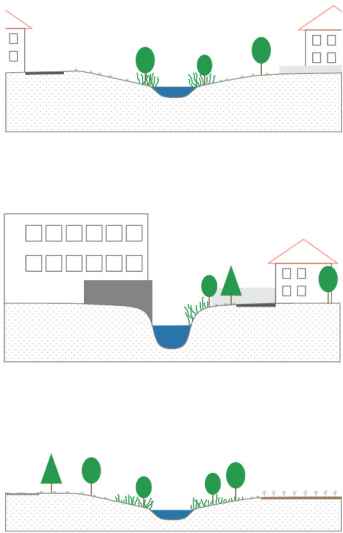
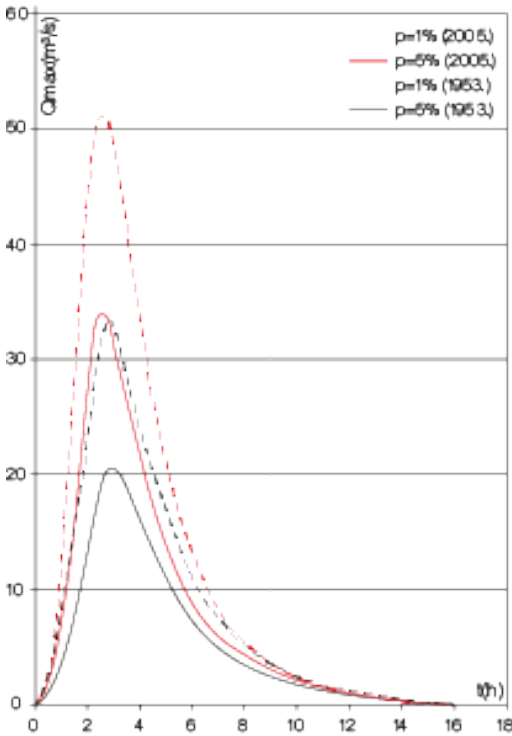
× Fig. C.3: Consecutive sections of the terrain of the valley. Drawings by author



× Fig. C.4: Longitudinal section of the stream. Drawing by author.

× Fig. C.5 (right): Hydrograph of maximum waterflow. Source: Ristić, R., & Malošević, D. (2011). Hidrologija bujičnih tokova

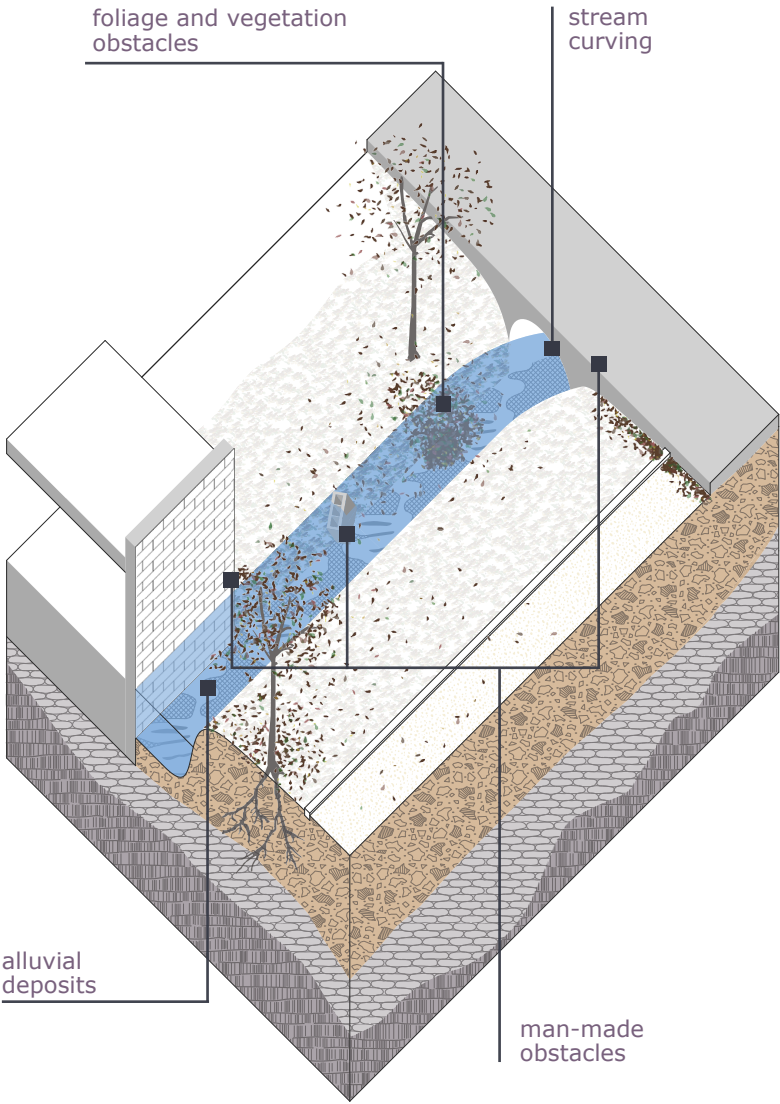
× Fig. C.6 (down): Schematic sections of the different cases of the streamside. Drawing by author.



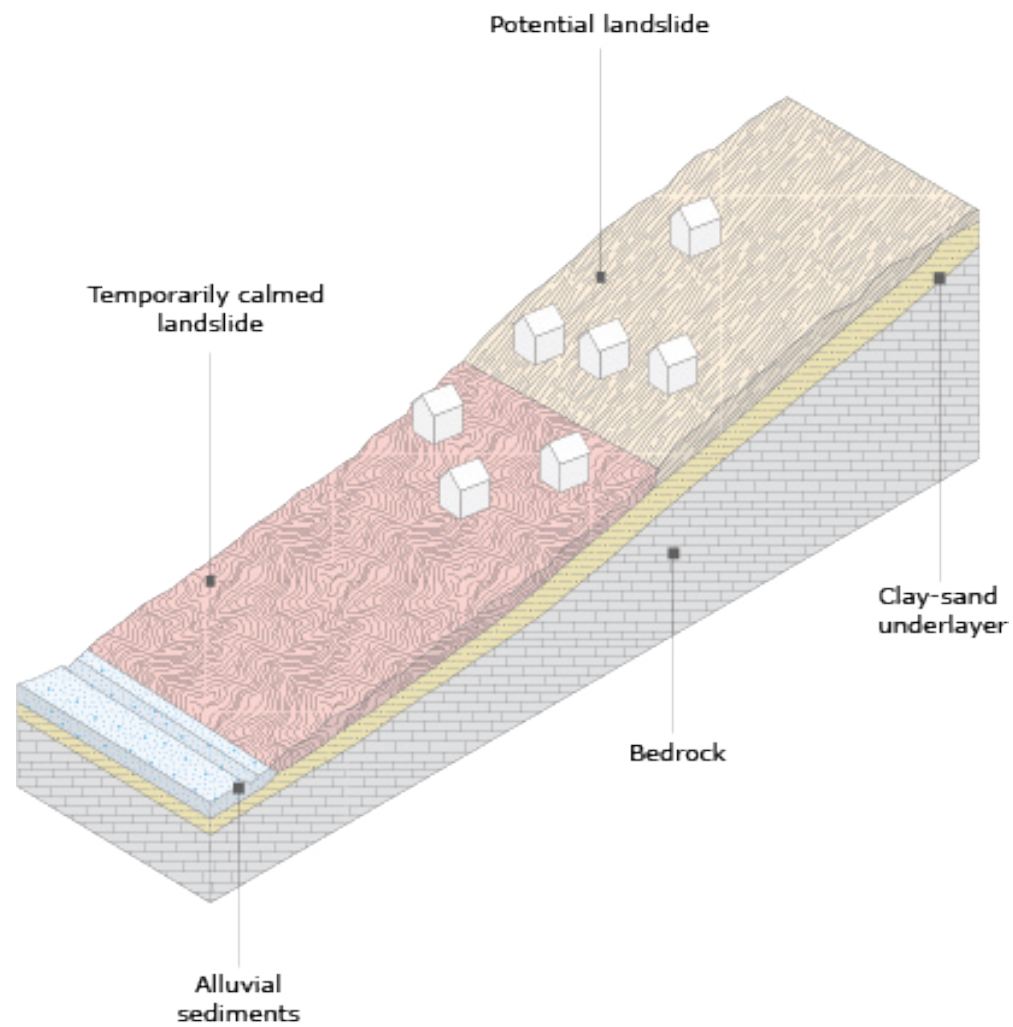
The section above illustrates the before-mentioned obstacles which interfere with the stream’s passage. The level of this interference can be seen in the chart (fig. x) where the flow pressure, in relation to daily hours, is shown, overlaying the year 1953, when Kaludjerica was a village with a few houses, and year 2005, when it had already taken more or less the form that we know today.

With its urban expansion, the hydrographic network of Kaludjerica was almost completely destroyed. Porous surfaces were lessened causing frequent and intense surface runoff, after heavy rainfall or melting of snow. Former flows with a return period of 100 years have become phenomena with a return period of only 20 years (Ristic, 2011).

× Fig. C.7: Axonometric view showing stream obstacles. Drawing by the authors.

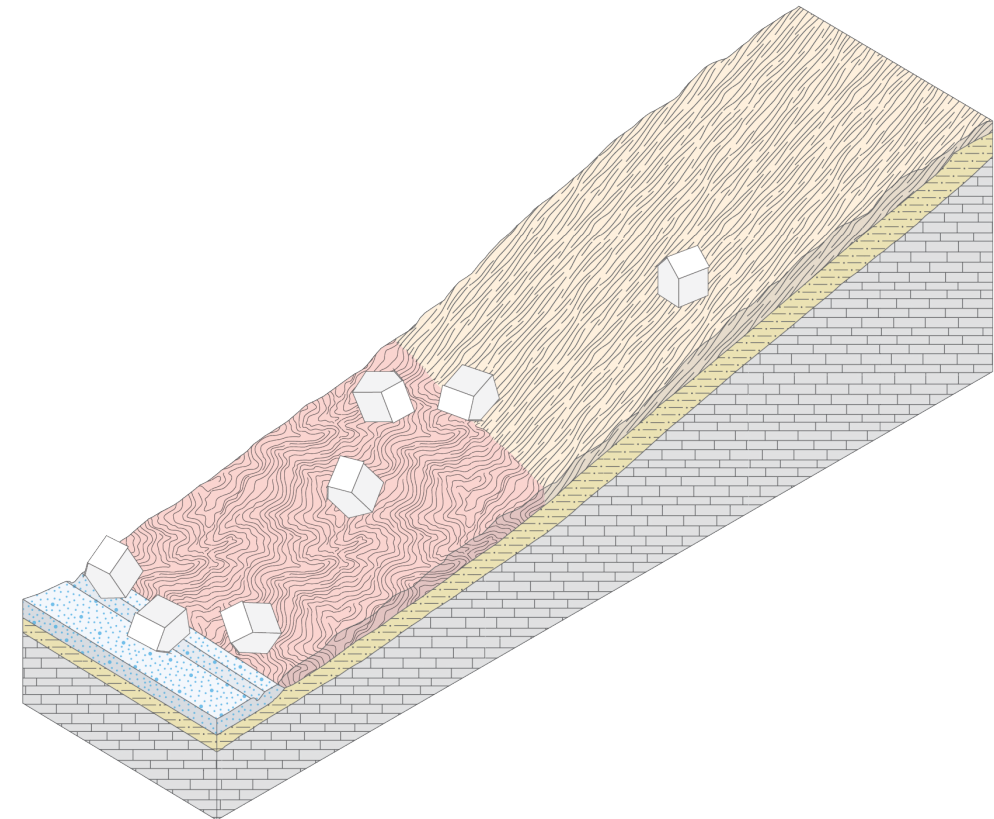


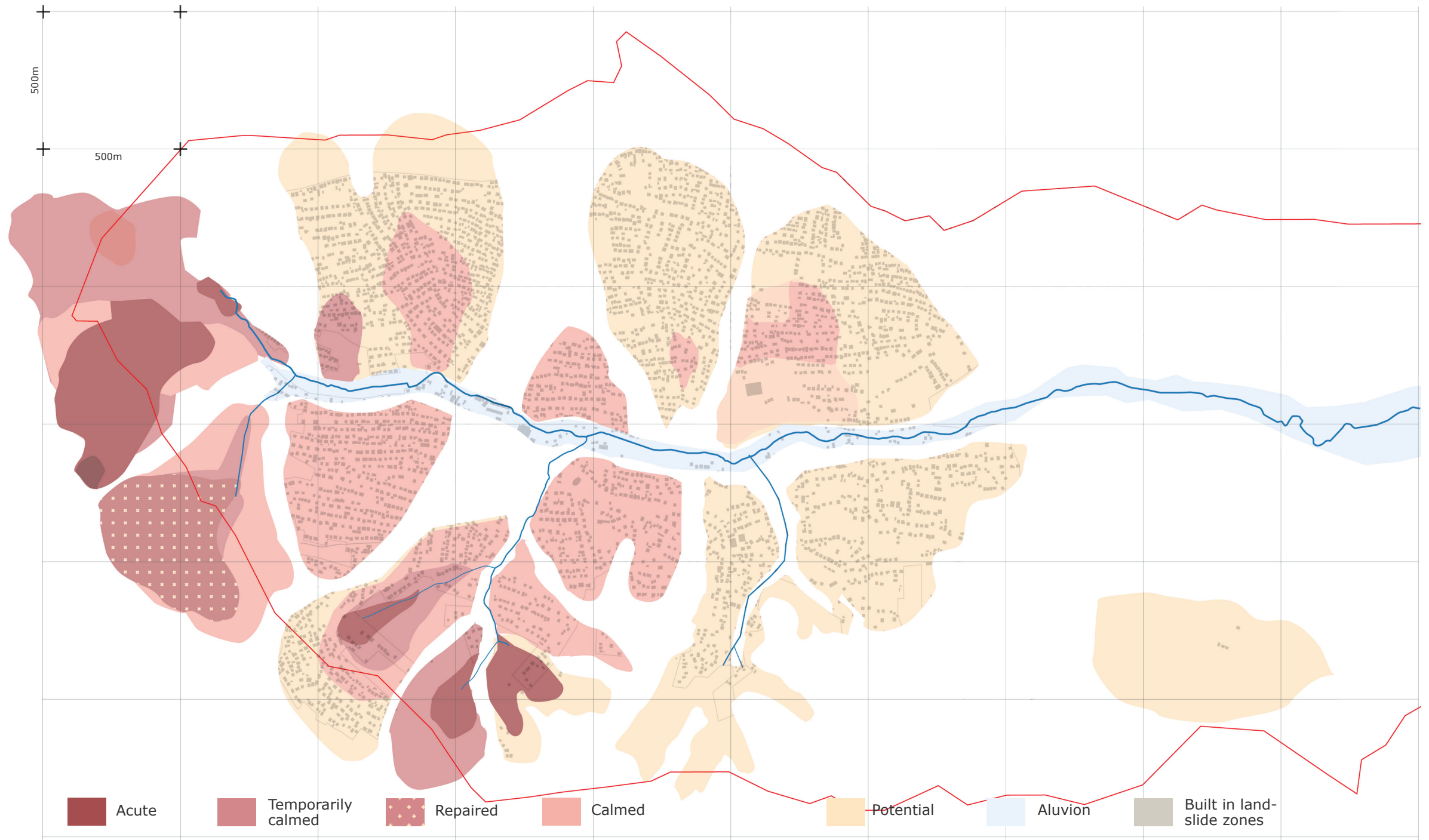
Another occurrence threatening the streamside when combined with intense urbanisation are the prevalent landslide areas. These areas are closely connected to the stream and valley system.



κ Fig. C.8:
(left) Stratigraphy of a landslide in Kaludjerica - Author's interpretation.
source: Beoslide

κ Fig. C.9:
(right) What happens after a landslide?
Author's interpretation.





× Fig. C.10: Map of landslides, source: Beoslide

Physical characteristics

The stream

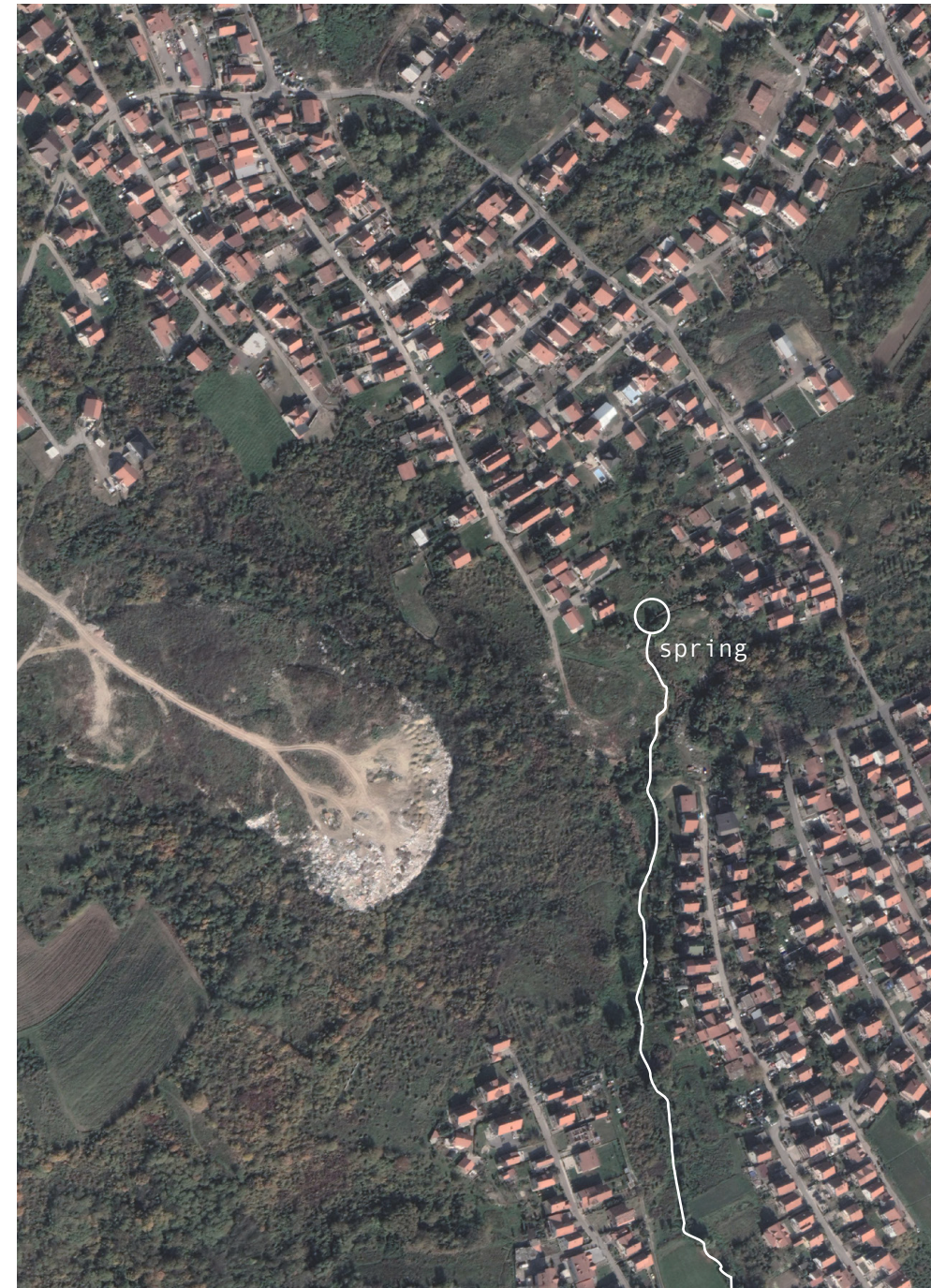
Physical characteristics

The stream

THE SPRING

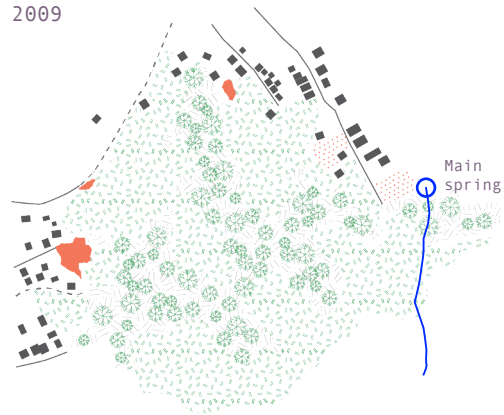
The stream literally springs out of garbage.

The main spring of the stream is located in the hollow between two hills that since 2014 (for what we know), started becoming sites of uncontrolled and illegal dumping of mainly construction waste but also other kinds. It seems that the accumulation of unwanted construction materials down the slopes of these two hills have also tighten significantly the shaft where the first part of the stream flows, putting it in direct contact with the debris and potentially hazardous elements such as metals and plastics. So even before reaching Kaludjerica the stream has already undergone through an initial contamination.

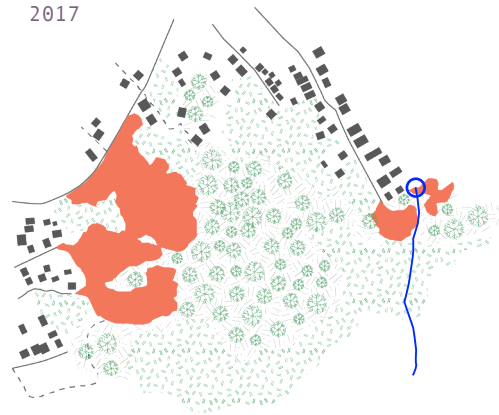


✕ Fig. C.11: Satellite image of the spring and landfills in 2022, source: Google Earth

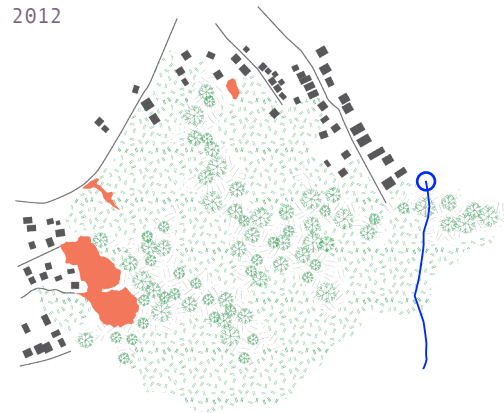
2009



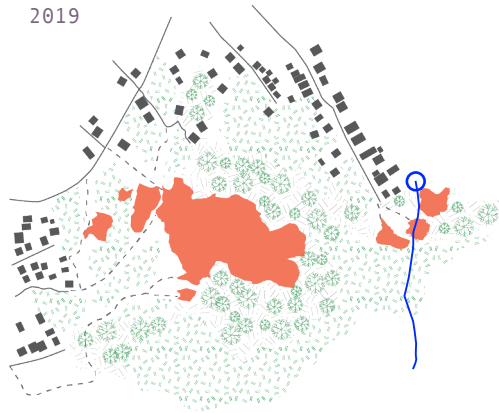
2017



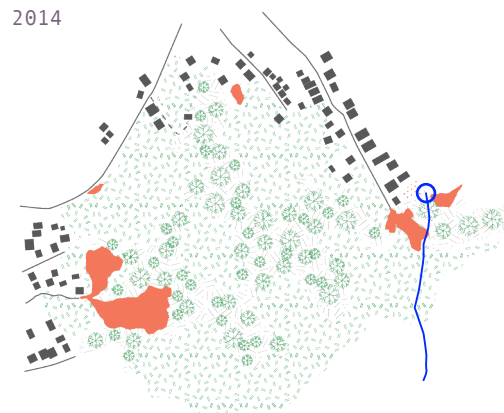
2012



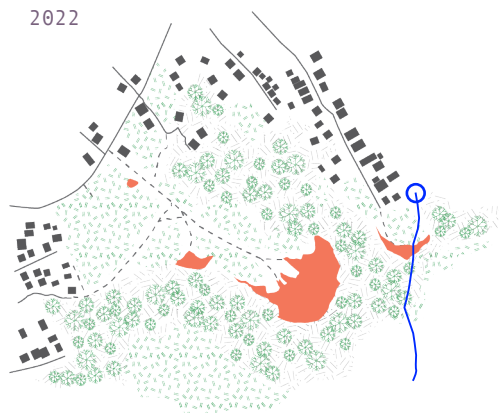
2019



2014



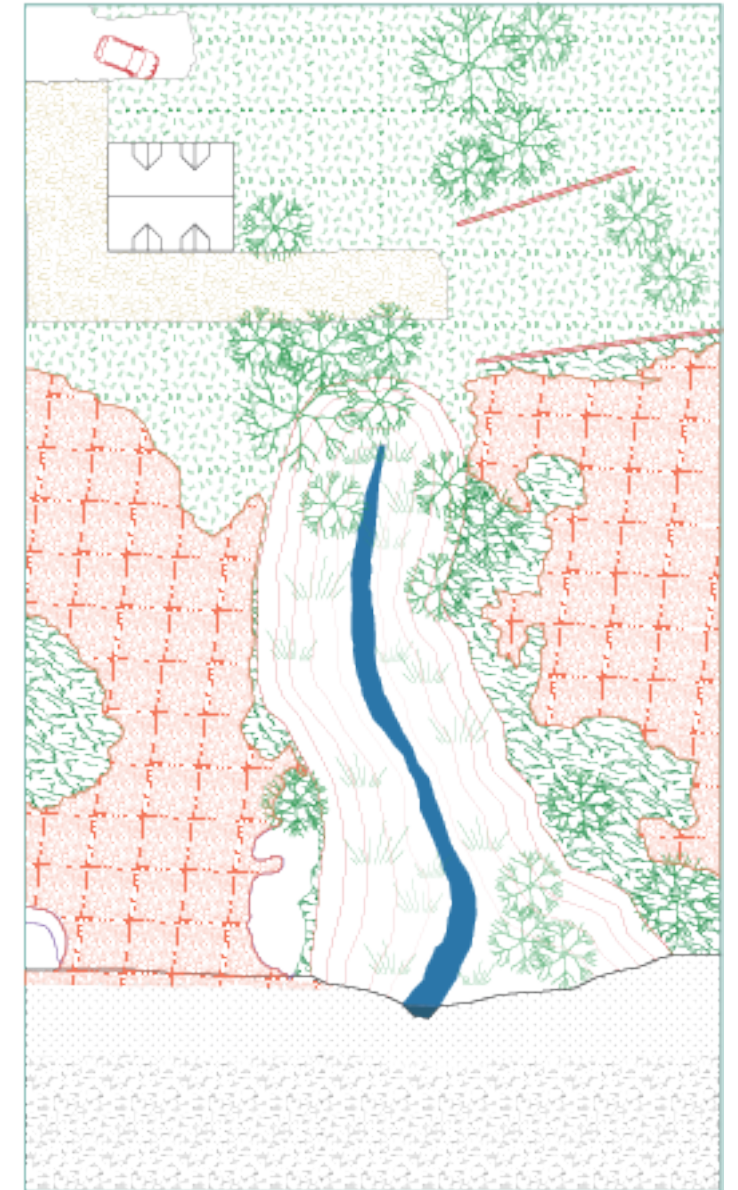
2022



- - - - - Unpaved paths — Paved streets ■ Illegal Landfills ● Low trees and scrub ■ Houses ■ Meadows

The springs

The stream



✕ Fig. C.12: (up)
 A zoom into the
 surroundings of the
 streams spring
 ✕ Fig. C.13: (left)
 Evolution of the land-
 fills, Drawings done
 by authors. source:
 Google Earth

The springs

The stream

THE STREAM'S ECOSYSTEM

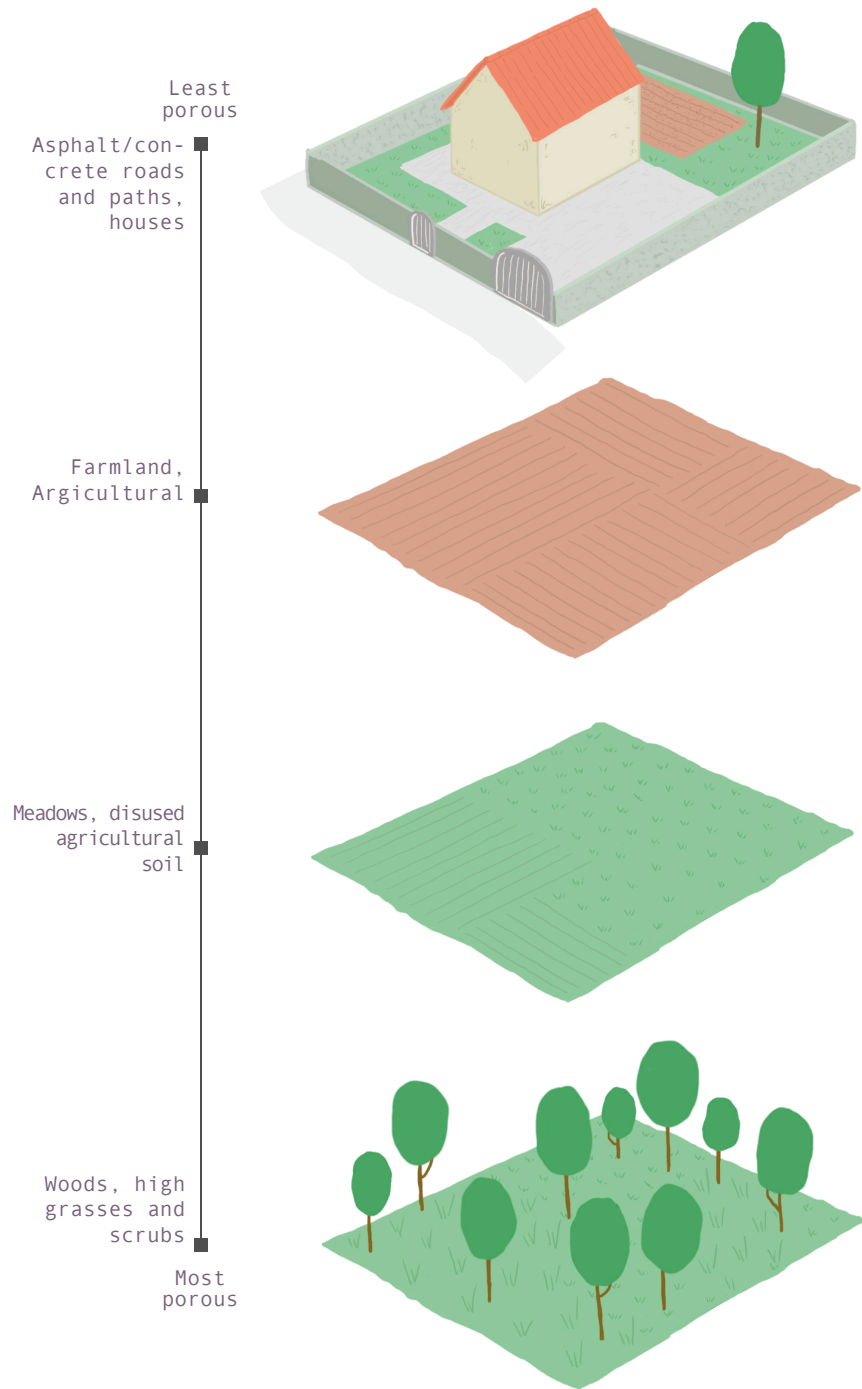
From an ecological perspective, the state of the Kaludjerica stream screams 'urgency'. It has become a collector of wastewater and it is devoid of life. In some locations, frequent water outflows have resulted in swamp-like conditions along the stream's sides, surrounded by swamp vegetation. The accumulation of pollutants and the absence of adequate wastewater management have severely impacted the stream's ecological balance.

A testing done on the Bolečica river, which the stream flows into, shows that the levels of BOD5 (Biochemical oxygen demands) and content of nitrogen compounds are constantly high. Based on control results, it has been observed that the primary issue in chemical terms is the elevated concentration of organic substances, which negatively affects the oxygen levels. In severe instances, this can lead to a shift towards a septic condition, causing the death of aquatic organisms and the emergence of unpleasant odors (Obradović-Arsić, D., & Filipović, D., 2010).



× Fig. C.14:
Biodiversity
of the region,
sources: Seek
application;
Beovodic: Guide
through Bel-
grade's bio and

Conditions of soil and Porosity in Kaludjerica



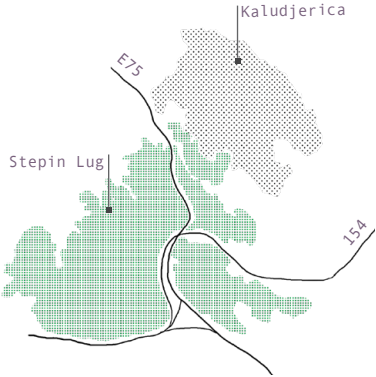
The water from the stream is used almost exclusively for agricultural irrigation, which can in some more extreme cases affect the quality and health of the vegetables.

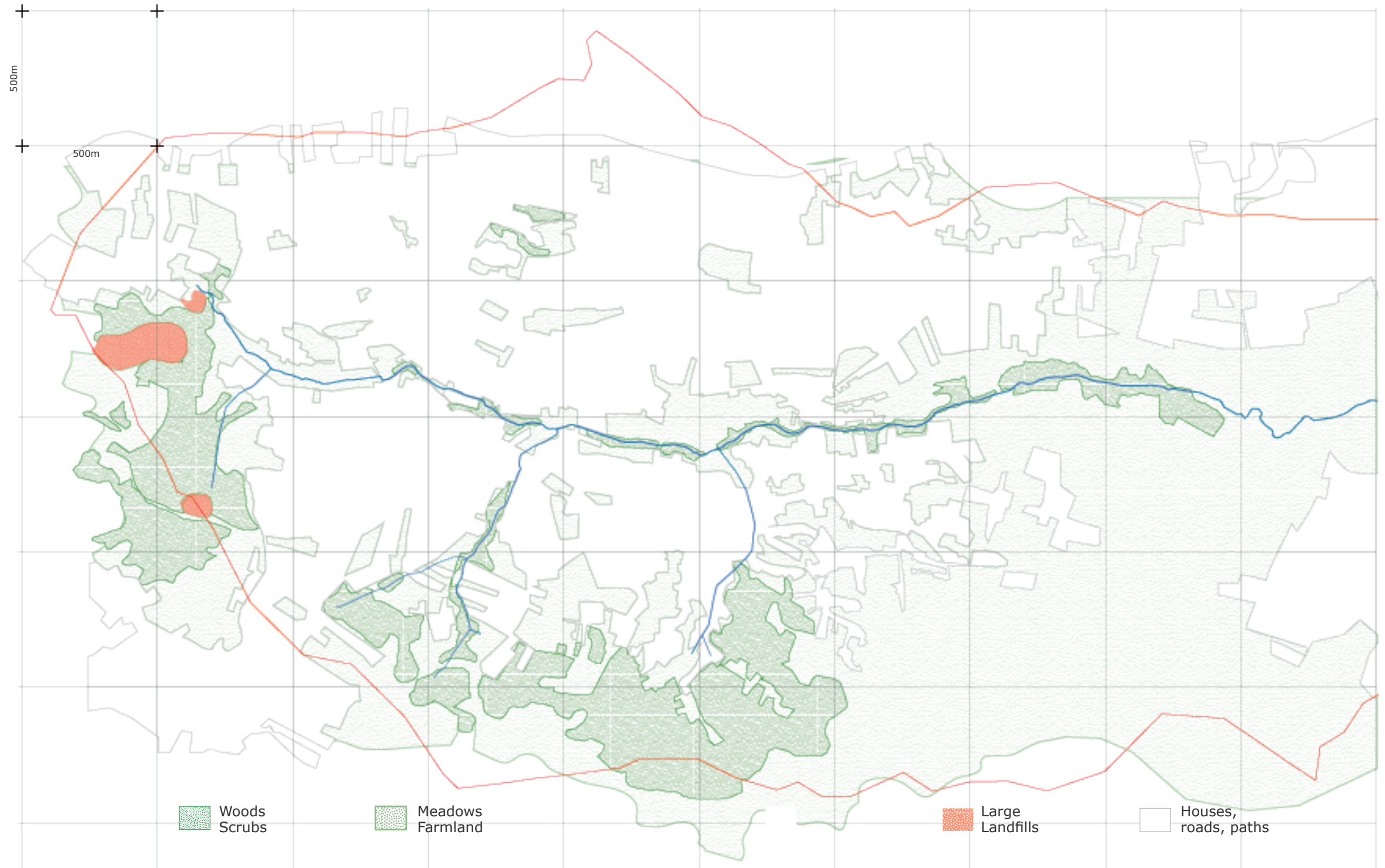
The valley of Kaludjerica was once connected to the Stepin Lug forest to the west. Remains of this connection can still be seen on the map (fig. x). The construction of the highway in the 1970’s has created a physical barrier between the valley and the forest cutting of access to the terrestrial non-human entities from both sides of the highway.

With the help of citizen science platforms and literature, we have composed a summary of species which still occupy the riparian zone and Kaludjerica’s green areas with reduced human activity.

✕ fig. C.15: Conditions of soil and porosity in Kaludjerica. Drawing by authors.

✕ fig. C.16: The E75 Highway and 154 Main Road dividing the forest. Drawing by authors.





× Fig. C.17: Surface porosity
The stream's ecosystem

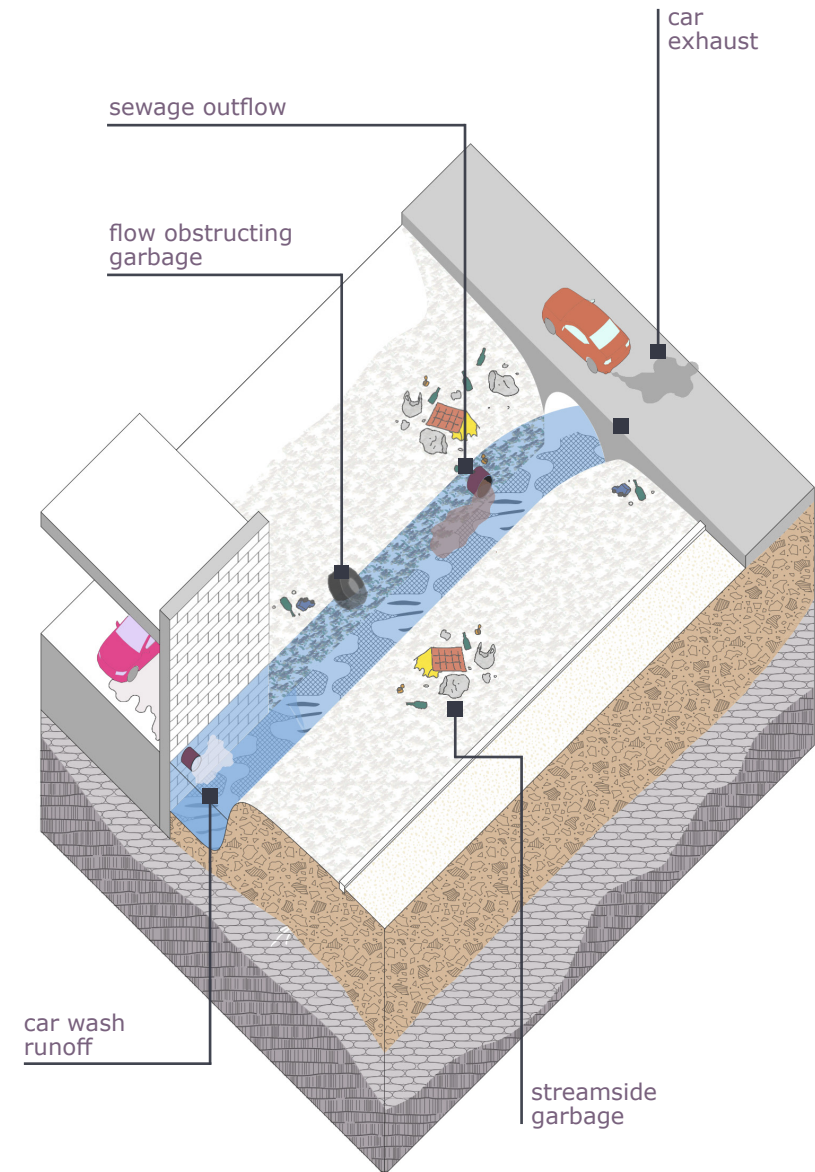
The stream

The stream's ecosystem

The stream

ANTHROPOGENIC FACTOR

From an anthropological perspective, urbanisation has had a significant impact on the relationship between the settlement and the stream. With construction covering a significant part of the river basin, many side streams have been interrupted, disturbing the natural hydrological processes of the valley, particularly the generation of substantial water masses. On top of that, the natural characteristics of the basin fail to ensure a continuous water flow without spillage, which turns the stream's riparian zone into a hygienic hazard. To get a clearer overview of the impact the anthropogenic factor has had on the stream we have put the focus of our field visits and partially our interviews on deepening our knowledge of the threats we learned about in the literature and trying to find out more undocumented or particular threats through peoples stories.



× Fig. C.19:
Anthropogenic
factors affecting
the stream and
streamside.
Drawing by
authors.

A journal of insights from the field

Our visits to Kaludjerica had a couple of goals, one of which was investigating the relationship between the stream and not only the inhabitants, but the settlement itself. We wanted to understand which decisions have led to the state that we find the stream in today and how these personal and collective decisions have morphed the current streamside, the density of the built environment or the lack of it. Additionally an important question we were set to answer was how the inhabitants view the stream and how they relate to it. Do they guard themselves from it or do they use the streamside? Do some of them know it exists? What do they call it?

We visited all of the accessible streamside in Kaludjerica, starting from the hidden spring, through the stream's quaint entry into the settlement, to where the streamside is squeezed between concrete walls and pipes, until its release from the settlement's pressure.

The spring itself wasn't easy to find. With a vague knowledge of its whereabouts we embarked on a search. On our way we passed by a sizable illegal landfill with plastic barriers. It seemed as if it was someone's attempt to block trucks from leaving their garbage on the site. Further down the road we were met with an array of smells. It was November and the heating season was starting. For some of Kaludjerica's inhabitants that means activating furnaces and burning whatever could be found. The smells were mixing and interchanging, starting from the typical smell of burnt wood to the more alarming smell of plastic and similar seemingly toxic fumes. The architecture varied greatly, from black warehouses to tacky unfinished villas with questionable construction choices. At first the feeling was not at all welcoming. Running away from the fumes, we entered a street at the end of which should be our first destination. The street was short and ended in an open field which you could see was used as a landfill previously, but in recent years the intensity of piling up garbage lowered. Over what were supposedly piles of leftover construction material tall grasses started growing, accompanied by fungi and different forest flowers. This landscape, together with a couple of more recent piles of trash, paints the surroundings of the stream's main spring. You could only hear the sounds of water rushing down, birds chirping and the neighborhood dogs barking at them. There was something calming about the tranquility of this place, which was only ruined by the knowledge of how much garbage there must be underneath us.

Continuing downhill towards Kaludjerica, we headed to the first row of houses on the right bank of the stream. What caught us by surprise was the amount of space left for the stream. Between the stream and the houses there is a few meters of very soft, almost wetland-feeling soil, too unstable to walk on, where a few cabbages have been growing, fol-

lowed by an elevation of a meter or two where a relatively short unpaved path marked only by a row of trees was connecting the backyards of the houses. Looking into the backyards we noticed various activities. There were chickens, turkeys, small vegetable gardens, old fridges, makeshift workshops for metal or wood...

On the other side of the stream there was an even wider plain with a line of plots left unbuilt. One of these was populated by a small playground with a DIY basketball hoop, seesaw and pull up rods, one parking space and a picnic table. What we later found out was that flooding was a common issue in this area due to the runoff from the steep streets coming down directly from Smederevo road which clarified peoples distance from the stream when choosing a plot on which to construct their houses. A closer look at the stream itself however uncovered the connection with the settlement through various sewage pipes sticking out of the steep banks, some of them actively releasing greywater into it. The same steep banks had traces of sporadic and more intense garbage throwing which didn't follow any particular trend. It seemed like passers-by treated it as a garbage can in the absence of a real one.

Our next visit was to the central area of Kaludjerica to see the conditions of its streamside. The smell in the air was still persistent, the street was wet, although there was no rain that day, probably from the usual burst of a pipe under the asphalt streets. We headed towards the bridge in the main street passing by a huge apartment building which was still under construction during our first visit in September. There was already a sign for apartments for sale with some already having been sold. The apartment building had its own parking space next to it with a high metallic fence covered with fake green leaves, probably trying to imitate a hedge. As we walked past this parking lot

we started hearing the sound of the stream flowing behind it. The small bridge crossing the stream was full of water which the speeding cars would spray onto the pedestrians from time to time. From the bridge there was a clear view of their relationship in the center. The right bank was completely degraded from the construction of this apartment complex and hidden from the view of the buyers which left us thinking if the cheap metal fence is there to stay to obstruct the view of the dirty stream or would there be a new upgrade the next time we would visit Kaludjerica?

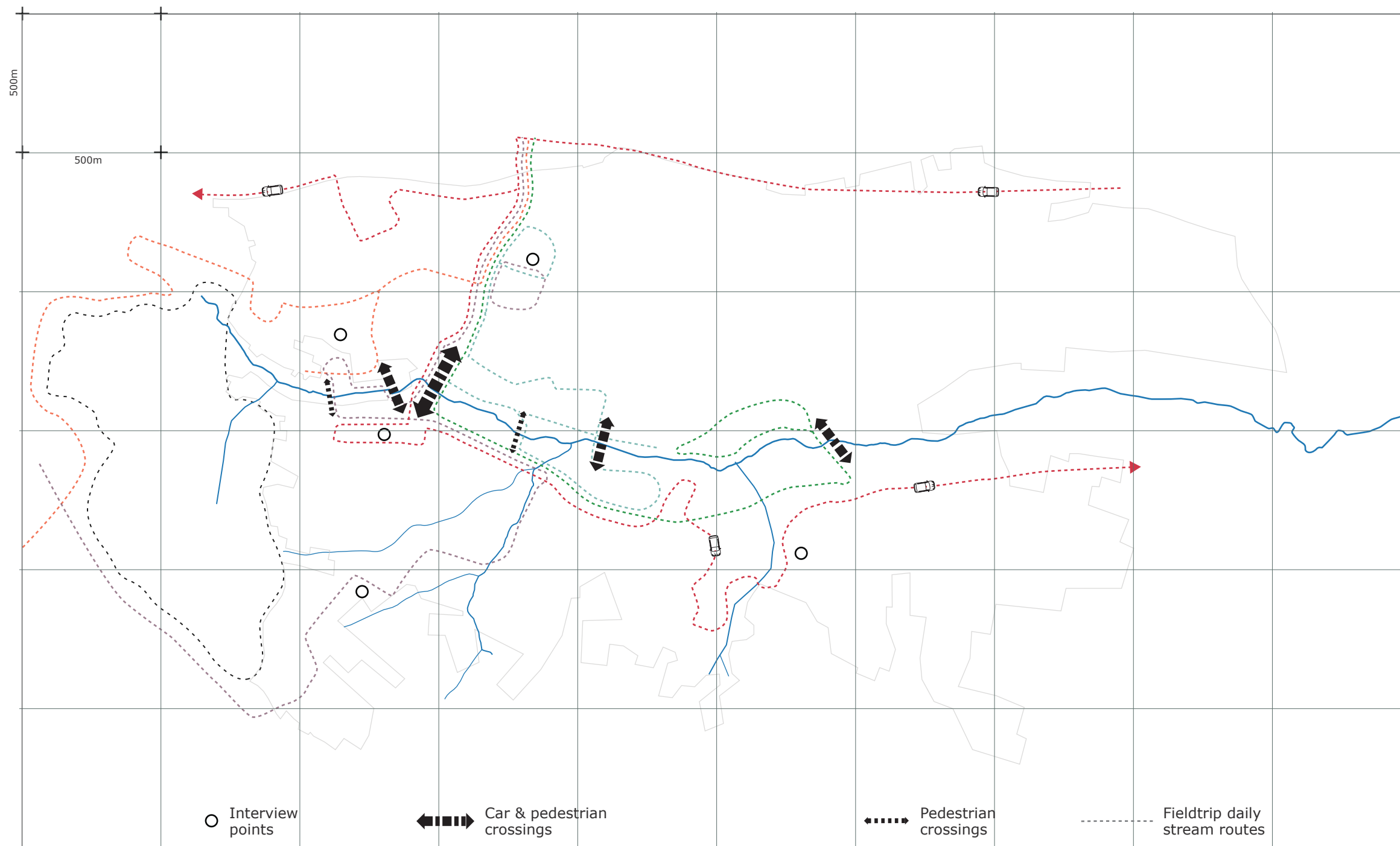
Moving on to the other side of the bridge we stopped to observe the modern car wash where a man was cleaning his van with a pressure washer. He didn't seem to mind us walking around so we took our time to go around the plot and take a closer look. Soon after we noticed that the irrigation of the place was solved in the simplest way- letting the runoff flow from the asphalt into the stream, which made us shiver with the thought. We moved on to our next stop which was another nearby crossing point. Between a very interesting suburban villa and a relatively new shopping center was a small pedestrian bridge. The large shopping center almost swam into the stream with its concrete walls, leaving trash all around. The smell changed from the usual heavy smog to a combination of sewage and soap, the first coming from the settlement's sewage piping, while the latter coming from the shopping center's garage, which doubles as another car wash. We went around the mall and into it, hoping to gain a better view which wasn't successful, only to come back to the main street and continue our small journey. It took us a couple of minutes to get to a secondary stream which flows into the main which anyone would have missed to notice. It is completely covered by the streets and houses with just a small bridge at the point where it is finally released into the Kaludjerica stream.

Our third venture focused on the area of Kaludjerica's second elementary school and the final bus stop of the 309 line. In this area of Kaludjerica, the topography shifts from a steep valley to a more moderate one, and the density of the settlement dissipates. Agricultural fields and meadows take over the riparian zone, leaving a breathing space for the stream. On a sunny and warm day, the settlement also reveals a new face, the atmosphere shifts to one of a peaceful village. People going about their daily activities with no rush, kids going to school unaccompanied, elders carrying groceries and stopping for a chat with their neighbors by the fence...

In our search for a way into the fields and essentially the riparian zone, we saw a small dirt road leading down next to a house where a man was cutting wood for the upcoming winter. We cautiously stopped to ask him if it was okay for us to take this road to the stream to which he gave us the green light and pointed out that the only problem in our plan would be that the ground was muddy due to the rain of the previous days and to be careful not to fall. Coming down into the meadows felt like being at a different streamside altogether. You could see rows of fruit trees and vegetables growing on the ground, some burnt trees which someone probably wanted to discard in the next season. When we finally approached the end of the meadows and beginning of the lush and wild riparian zone, we started noticing traces of discarding waste, different types of waste leftovers and of course the faint smell of sewage in the air. In our experience this was somehow the theme which followed this stream through its whole course in the settlement.

To sum up the relationship of Kaludjerica and its stream in a simple manner is no easy task. Through our walks and interviews we have uncovered a series of layers of sociological, historical, political and urban nature which overlap and form the current condition. From our interviews we realized that the inhabitants' perception of the natural aspect of the stream as a water body with its own ecosystem (whatever is left of it anyway), and their intentions towards it vary significantly from household to household. The urban and environmental conditions uncovered by the walk gave another perspective about the settlement's state. The issues are spread throughout the settlement, guided by mainly anthropological factors such as insufficient surface porosity and intense use of asphalt and concrete, lack of sensible planning and construction practices, administrative gaps in efficient waste and water management and wild garbage disposal sites coupled with faulty self-made sewage as answers to that - to name the most evident.

Building walls and fences to widen the gap between them and the stream when they are already invading its natural space shows that the stream is not considered as a defining part of this settlement by some of the people who live around it. In fact it is viewed as an inconvenience which the easiest way to solve would be to put it in underground pipes and for it to follow the same destiny as most of Belgrade's urban streams do. On the other hand, traces of care and streamside activity can still be found in zones left unbuilt because of flooding, landslides or agricultural activity that still hasn't had the time to be converted into housing. Visibilising the acts of care and collaboration previously researched through interviews and exposing the environmental urgency of the stream's state, which could potentially harm the residents of Kaludjerica, would make solid grounds for a fight in favor of the rights of the stream.



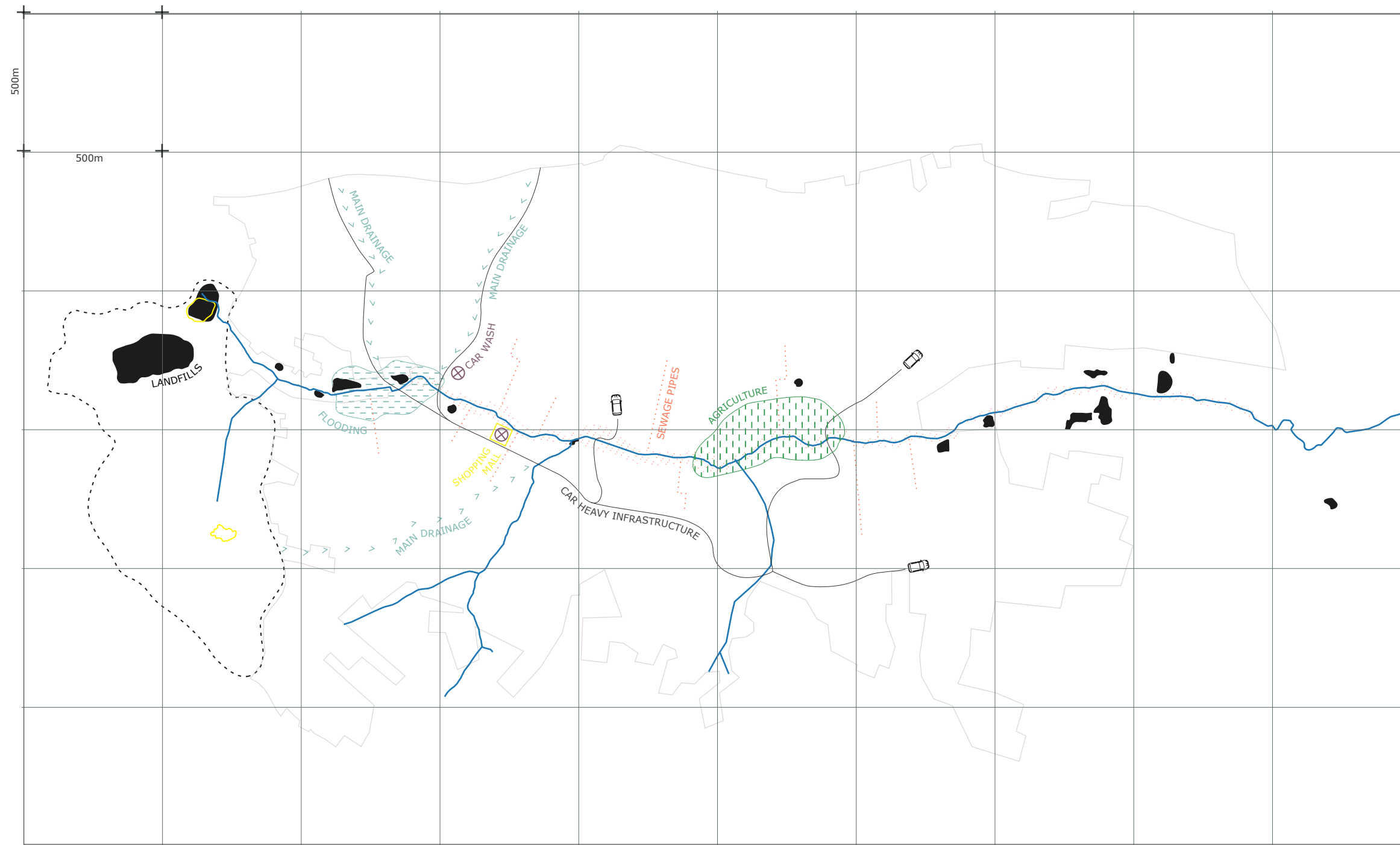
× Fig. C.20: Fieldtrip map

Anthropogenic factor

The stream

Anthropogenic factor

The stream



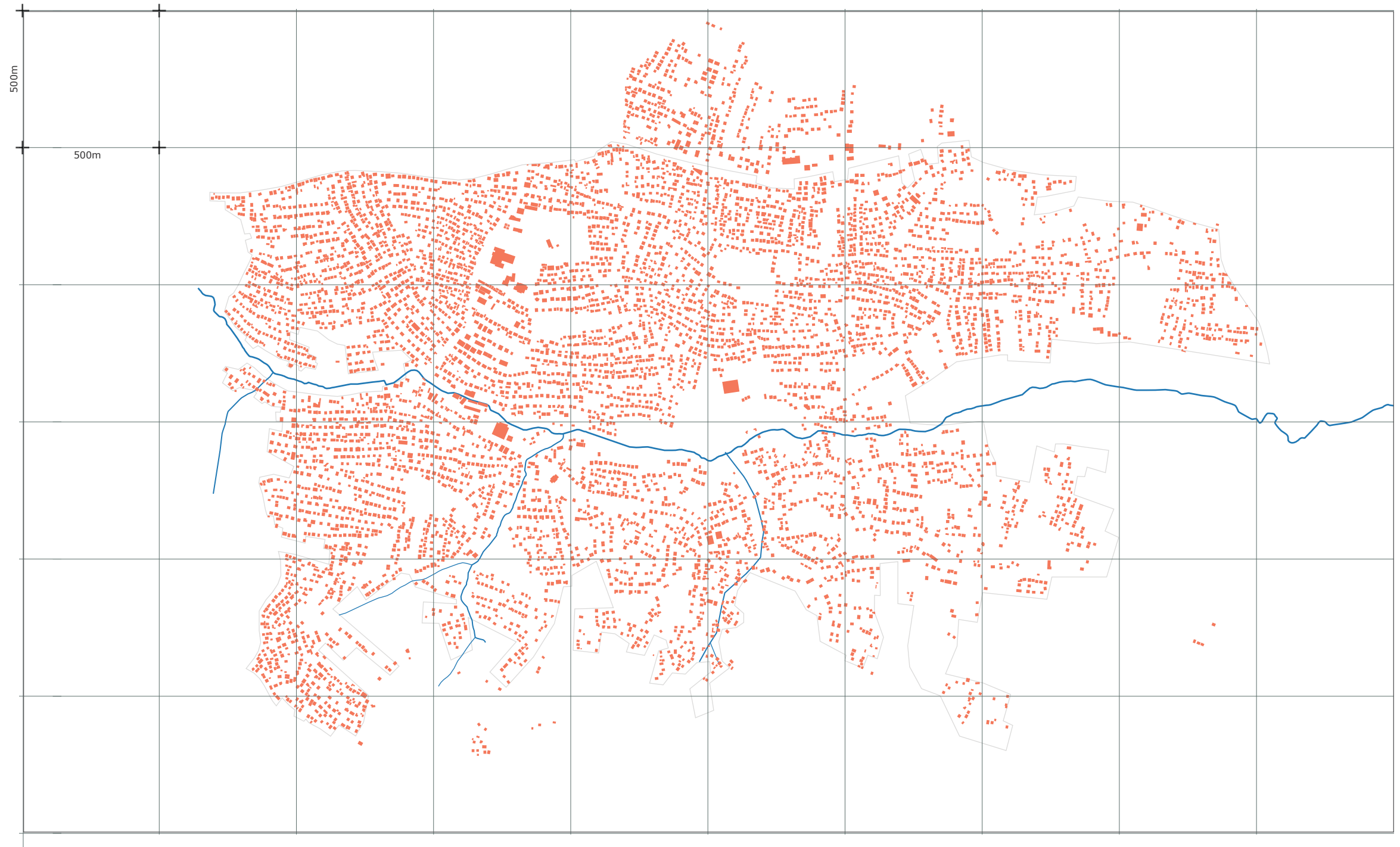
× Fig. C21 Pressures on the stream - Human activity

Anthropogenic factor

The stream

Anthropogenic factor

The stream



× Fig. C.22 Pressures on the stream - Built environment

Anthropogenic factor

The stream

Anthropogenic factor

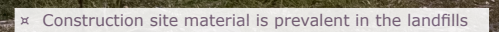
The stream







✕ The spring of the Kaludjerica stream surrounded by landfill waste





✕ Another closeby illegal landfill, Kaludjerica can be seen in the background





- × (up) Terrain around the spring
- × (right) A view towards Kaludjerica through the dense foliage



210



211



- ✕ (left) Pipe leading directly into the stream
- ✕ (up) The inaccessible side of the stream



Wide open and accessible streamside



✕ Serves also as a place for throwing trash





220



221



- ✕ (up) Active sewage disposal
- ✕ (right) Concrete pipes used for the stream in the areas of crossing



- ✕ (left) Another view of the pipe
- ✕ (up) The stream's right bank completely destroyed due to a construction site right next to it



- ✕ (up) A vast collection of pipes of different shapes, sizes and materials
- ✕ (right) Hiding the impact by using more elaborate systems





☒ Huge concrete walls protecting it from the stream





AKTIVNA
PENNA

SELF SERVICE
CAR WASH
00-24

AKTIVNA
PENNA

SELF SERVICE
CAR WASH
00-24

00-24



✕ Kaludjerica lost in the smoke coming from the houses' heating systems





✕ The stream finally having space to 'breathe' where the settlement starts dissipating

PART D TACTICS

CONTENTS

A Model for a self-sustained
neighbourhood

Inform

Interact

Rectify

Consolidate

A MODEL FOR A SELF-SUSTAINED NEIGHBORHOOD

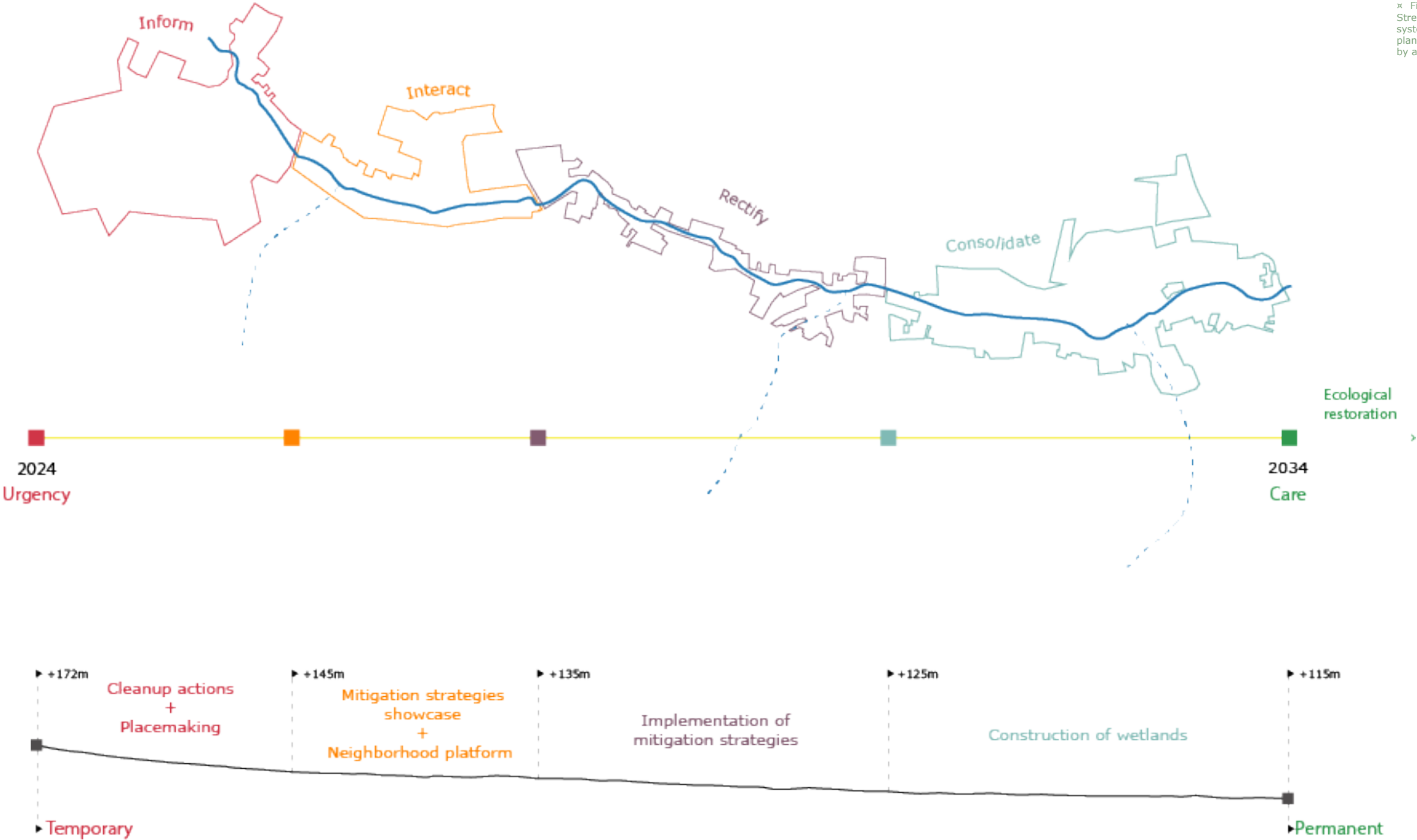
The analysis of our fieldwork and research gave us the insight to imagine a plausible future for Kaludjerica. A future where the stream has managed to stay out of concrete piping, with clean water, its riparian zone alive and vibrant, hosting all kinds of life while being a vital agent of health for all of Kaludjerica. But, this decision lies on none other than the residents of Kaludjerica.

In order to not impose any kind of vision through a specific project, we choose to report our findings and propose a set of strategies that could make possible a desired outcome. So our proposal to bring the settlement from its state of urgency to the state of care, takes the form of tactics in a step by step fashion.

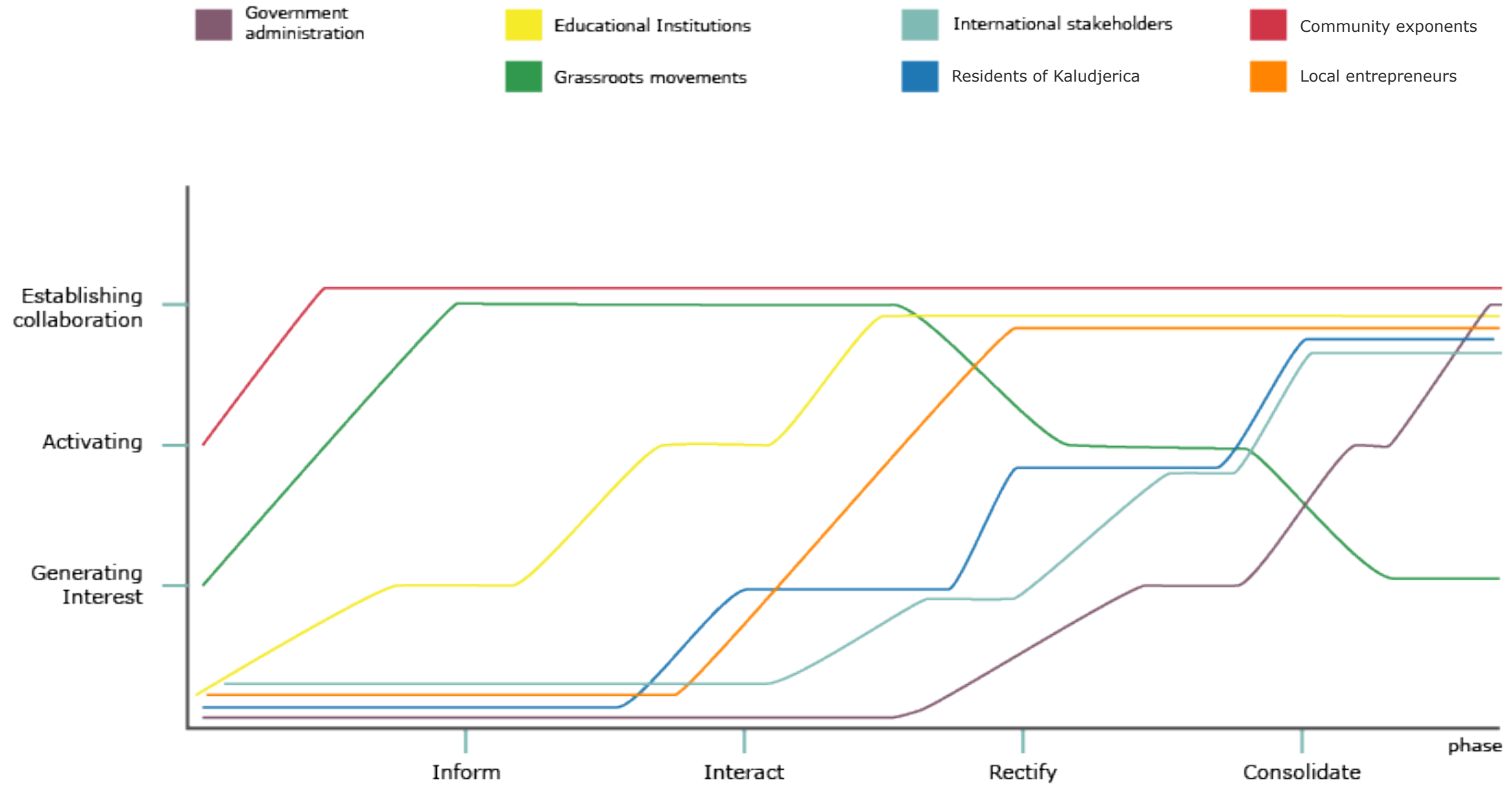
The people of Kaludjerica are aware of the stream's problematic condition but they don't have enough information neither about the causes and effects of it nor about the solutions and benefits that nature-based interventions can offer. They have lost faith in the government's promises to fix this issue, which have been going on for more than a decade without any progress.

However, they have the ability and willingness to organize and contribute to solving urgent matters that affect them and their neighbourhood, as shown by existing collective efforts and collaborations in the settlement. The process of informing and gathering potential collective effort needs a spatial expression and a coherent plan for participation and multi-stakeholder engagement.

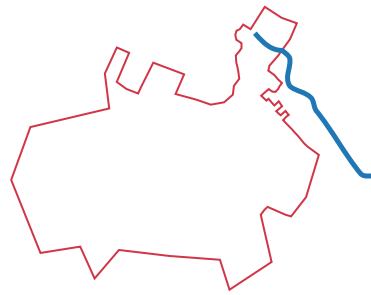
Our effort to combine these ideas resulted in four main steps: Informing, Interacting, Rectifying and Consolidating. The steps follow spatially the stream's natural flow, from the springs and landfills, to the open fields and polluted waters. We imagine our path starting from small clean-up actions and placemaking and ending 10 years later with securing a constructed wetland system with the government's involvement, which can provide a solid ground and space for the streamside to recover from the pressure it has faced over the years.



× Fig. D.1:
Streamside eco-
system recovery
plan. Drawing
by authors.



× Fig. D.2:
Stakeholder
participation di-
agram. Drawing
by authors.



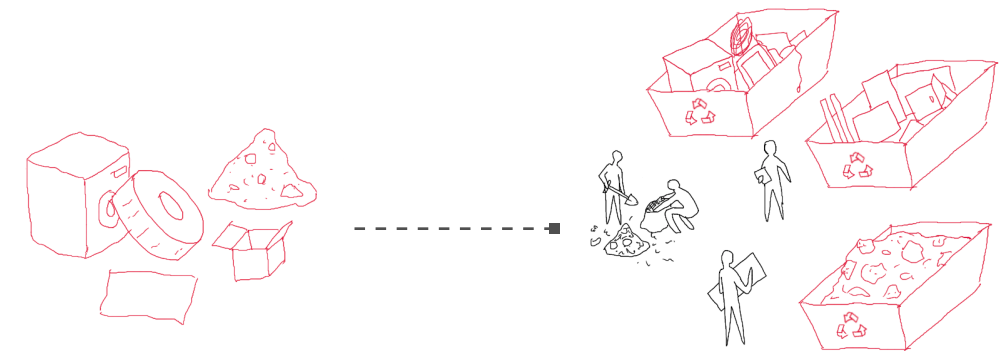
INFORMING

The first step involves mobilizing a small group of motivated individuals from Kaludjerica who are passionate about addressing the ecological severity and identifying key representatives that have experience with activist action in the area.

With the help of other inhabitants, as well as an initiative of a public clean-up call from Belgrade's grass-roots movements the goal is to clear the landfill at the stream's spring and construct water barriers or public furniture out of suitable waste, while informing on the total action plan and the process of waste collection, sorting and hazards.

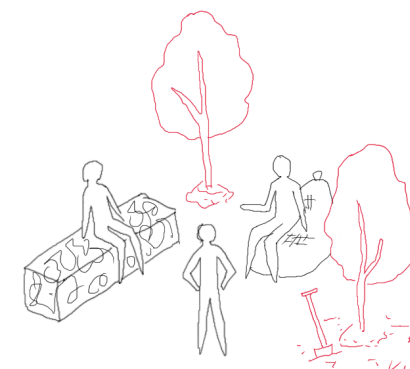
✕ fig. D.3
(right): Diagram
of interventions.
Drawing by
authors.

Stakeholders

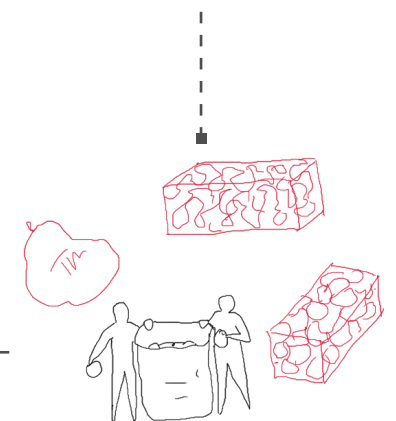


collecting waste

sorting

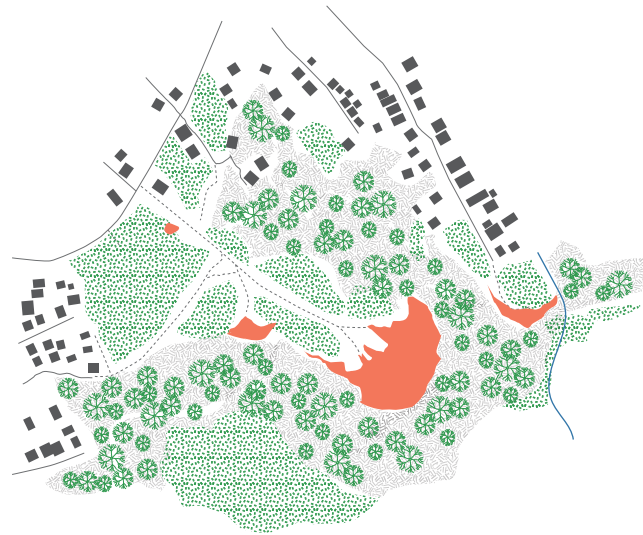


reforestation &
education

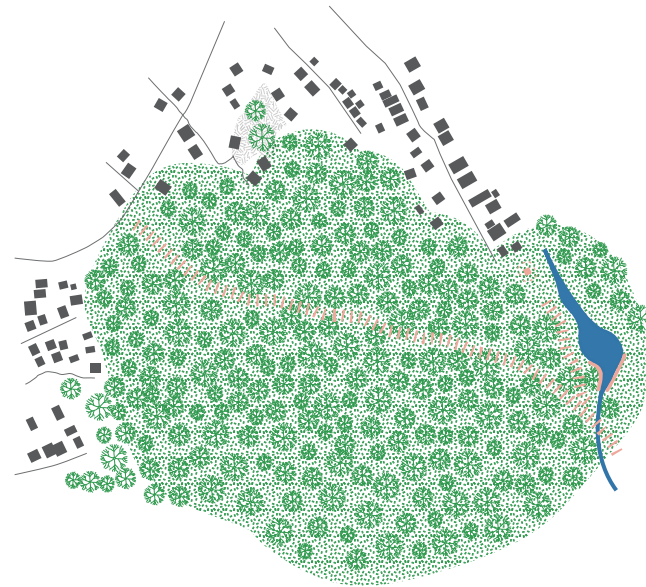


urban furniture
making

1. Urban furniture and educational platform.
2. Widening of the stream basin to prevent torrents further down-stream.
3. Planting vegetation on the brownfield soil of the landfills.



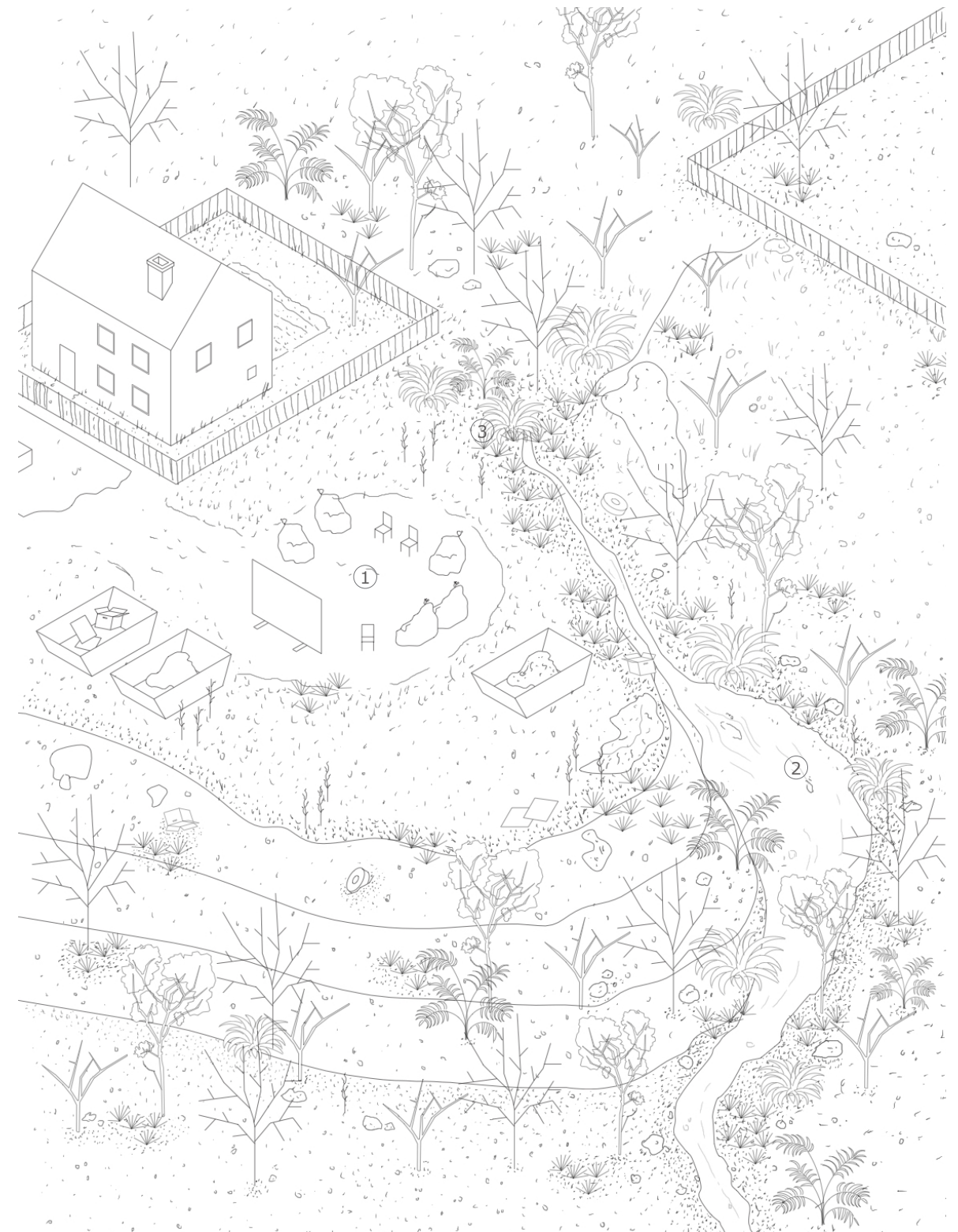
state of the springs
surroundings in 2023



spring area after clean-
ing, reforestation and
basin expansion

× fig. D.4 (left):
Large scale
interventions
in the landfills.
Drawing by
authors.

× fig. D.5
(right): Axono-
metric view of
the interven-
tions surround-
ing the streams
spring. Drawing
by authors.





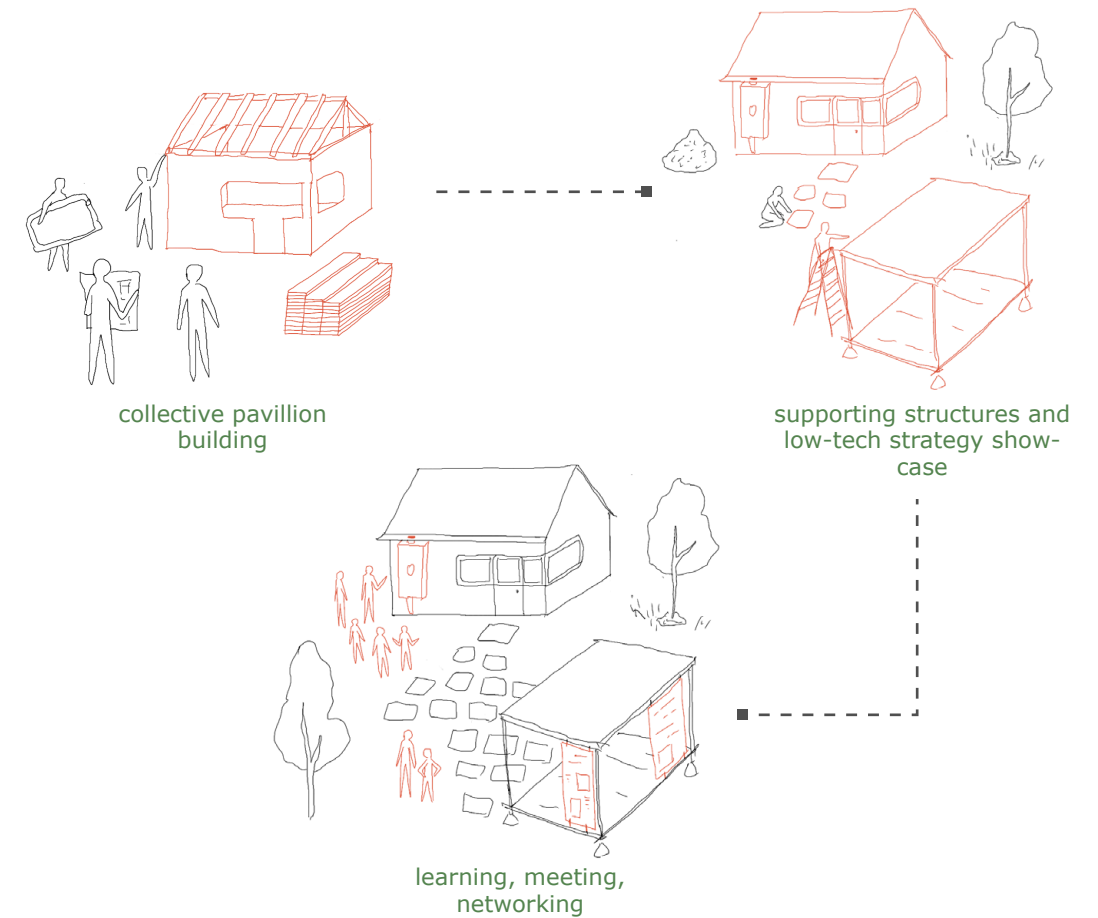
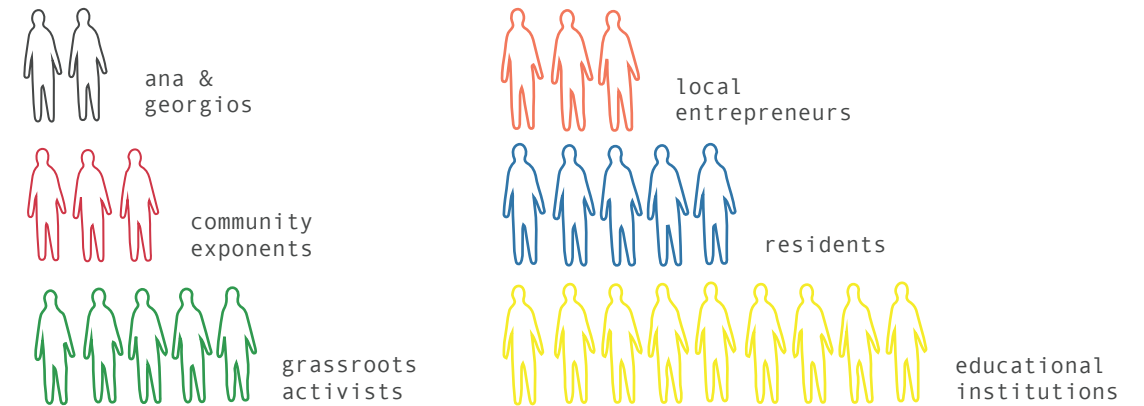
INTERACTING

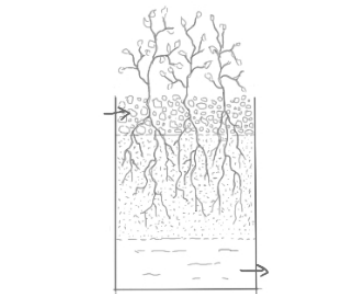
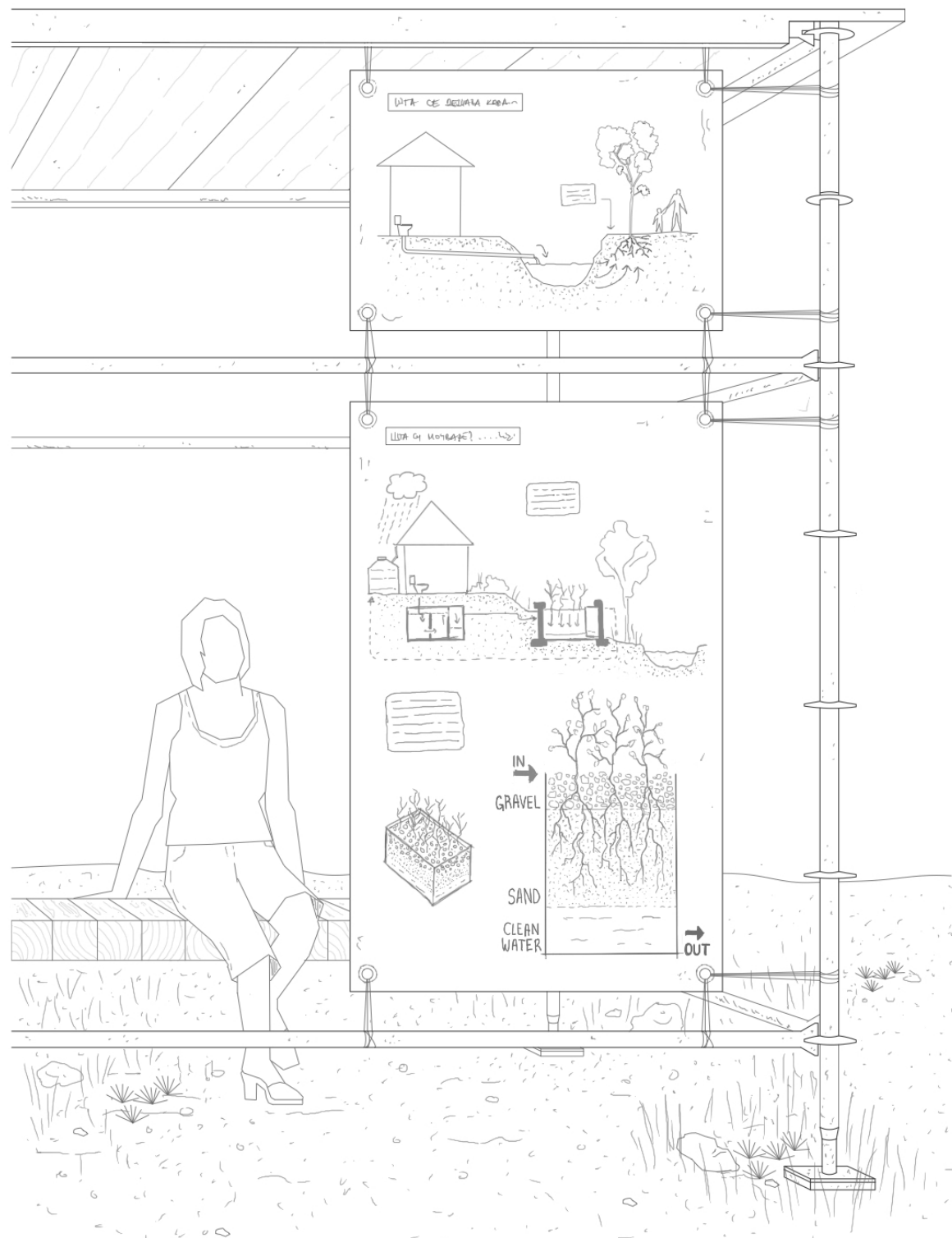
The second step focuses on Information dissemination and strategy proposals. By creating pavilions and lightweight structures near the stream where residents can access information about the state of the stream and try out hands-on the proposed strategies for mitigating its effects. These strategies will encompass actions that individuals can take within their homes, gardens, and common spaces.

City and neighbourhood level stakeholders, such as environmental organizations, schools, universities and community leaders, will play a vital role in disseminating this knowledge and facilitating dialogue with the community. Other local actors who find that their tools and businesses can help in the process can also find here a platform to promote their work and start new collaborations.

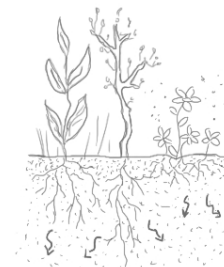
✕ fig. D.6
(right): Diagram
of interventions.
Drawing by
authors.

Stakeholders



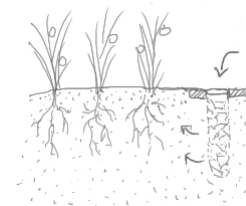
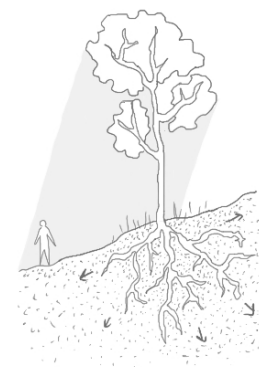


1. Constructed wetland system



2. Diversifying species

3. Phytoremediation

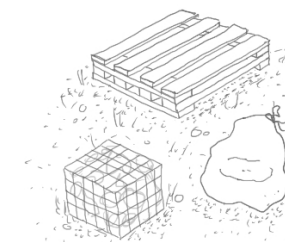
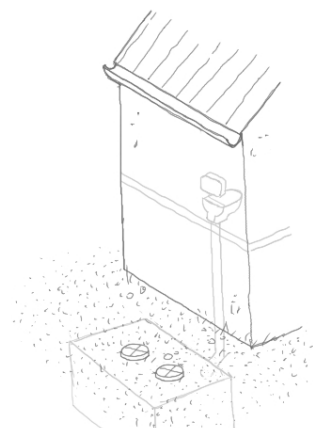
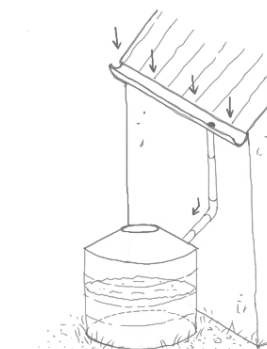
4. Organic waste
fertilizing

5. Landslide retention

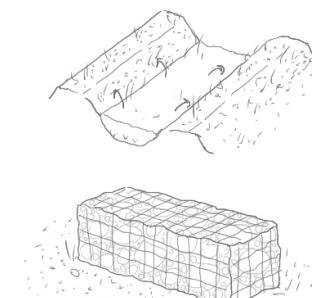
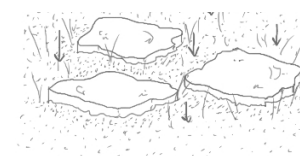
6. Shading



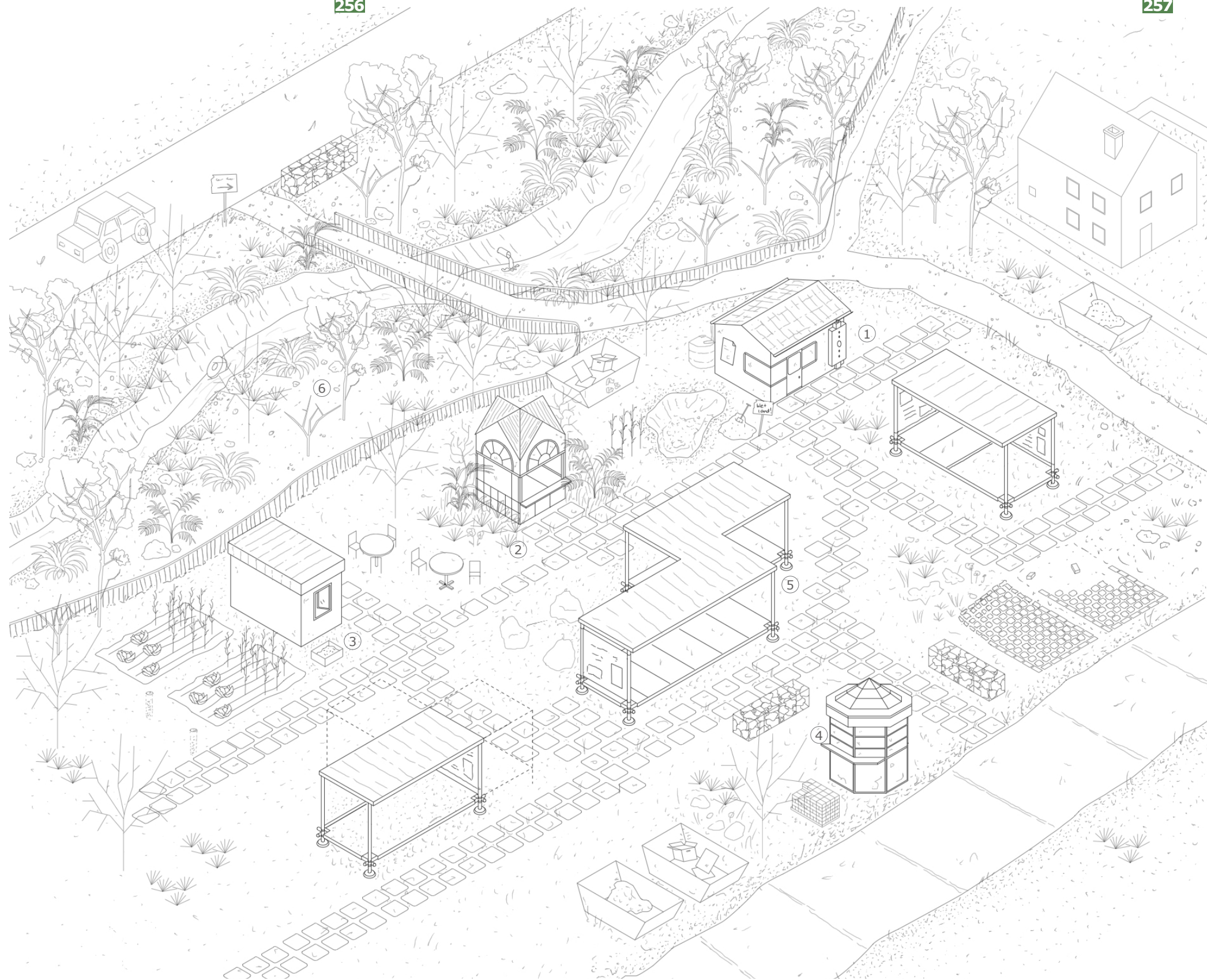
7. Permeable fencing

8. Upcycled urban
furniture9. Proper septic tank
construction

10. Water collection

11. Flood retention
strategies

12. Permeable paving

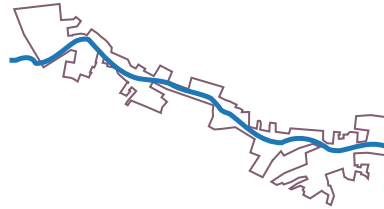


1. Waste & Water pavillion
2. Garden pavillion
3. Agriculture pavillion
4. Material upcycling and mitigation pavillion
5. Urgency & strategy pavillion
6. Space for the stream

✕ Fig. D.8 (left): Axonometric view of the strategy pavilions inspired by versions of the famous Yugoslav 'kiosk' structures which were found abandoned across Kaludjerica. Drawings by authors.



✕ Fig. D.9,D.10 & D.11 (right): Sightings of kiosk structures in Kaludjerica which inspired the pavilion design



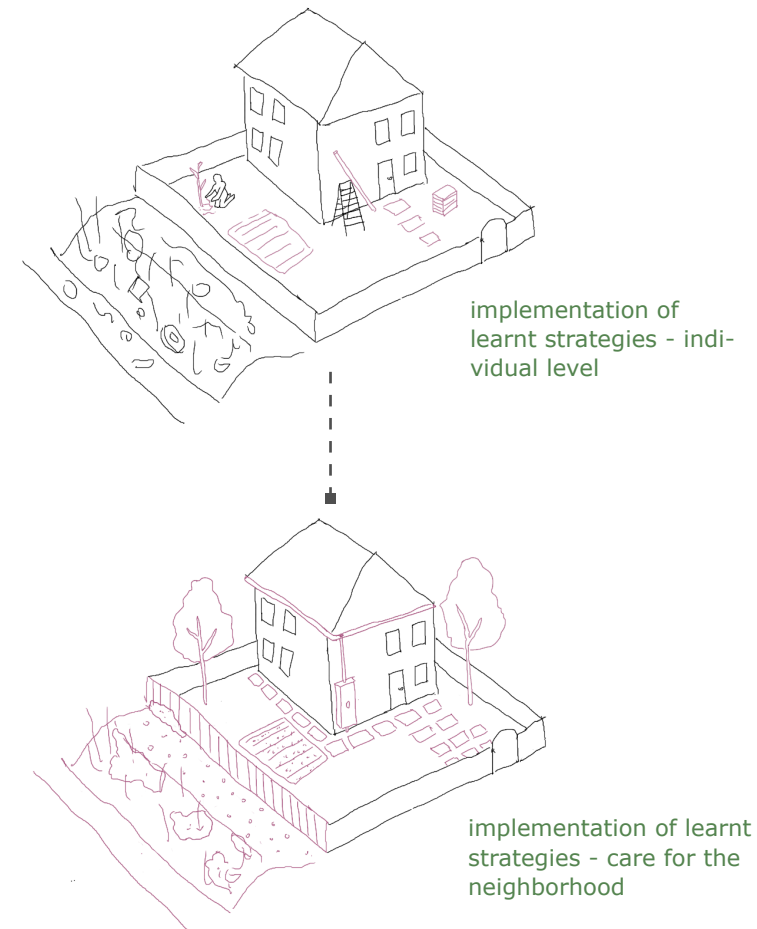
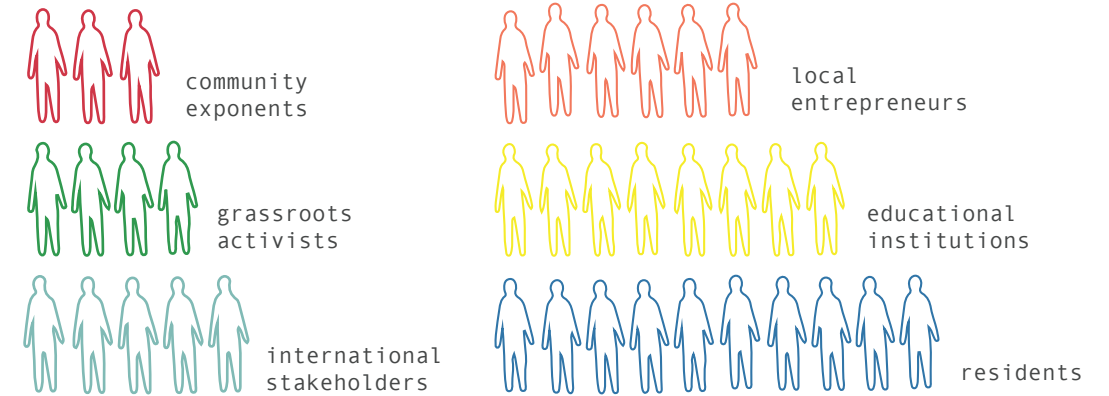
RECTIFYING

In this step, the proposed strategies are put into action. Residents are encouraged to implement the suggested measures, ranging from sustainable practices in their personal spaces to collective efforts within the neighbourhood.

This step aims to showcase tangible results and demonstrate the positive impact of the action. As implementation progresses, the initiative can be brought to the attention and support of national and international stakeholders interested in contributing to the cause, giving the residents an advantage in their political position to initiate negotiations with formal state institutions for further action.

✕ fig. D.12
(right): Diagram
of interventions.
Drawing by
authors.

Stakeholders



1. Water tanks for rainwater retention

2. Fruit and vegetable gardens which can be irrigated from the gathered water and fertilized by organic house waste

3. Planting trees to provide natural shading, shelter for non-humans and a decrease risk of landslides

4. Using more permeable options for paving to decrease water retention during heavy rainfall

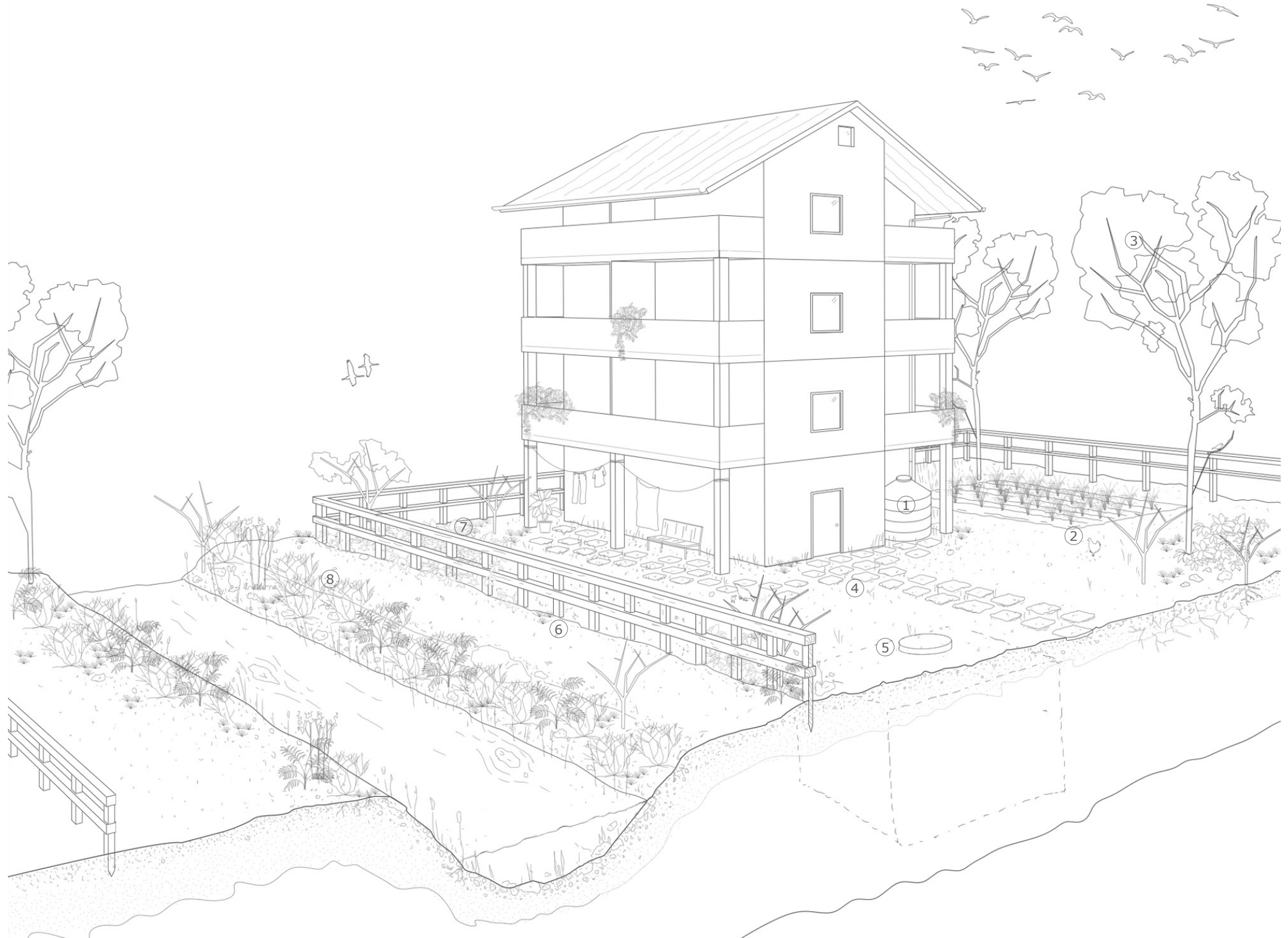
5. Construction of proper septic tanks to lower the impact on the stream

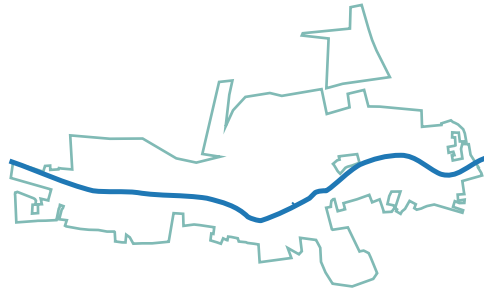
6. Permeable fencing to allow wildlife passage and easier access to the stream

7. Phytoremediating the soil by a conscious choice of plants for the garden

8. Care stretching over the fence - the garden becomes part of the riparian zone

✕ fig. D.13: Perspective view of individual practices which can be implemented for a more resilient and inclusive household. Drawings by authors.





CONSOLIDATING

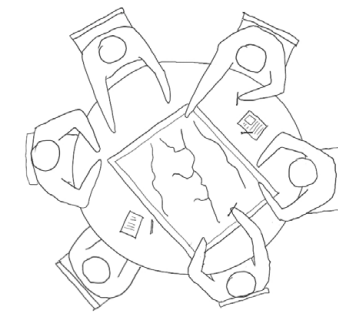
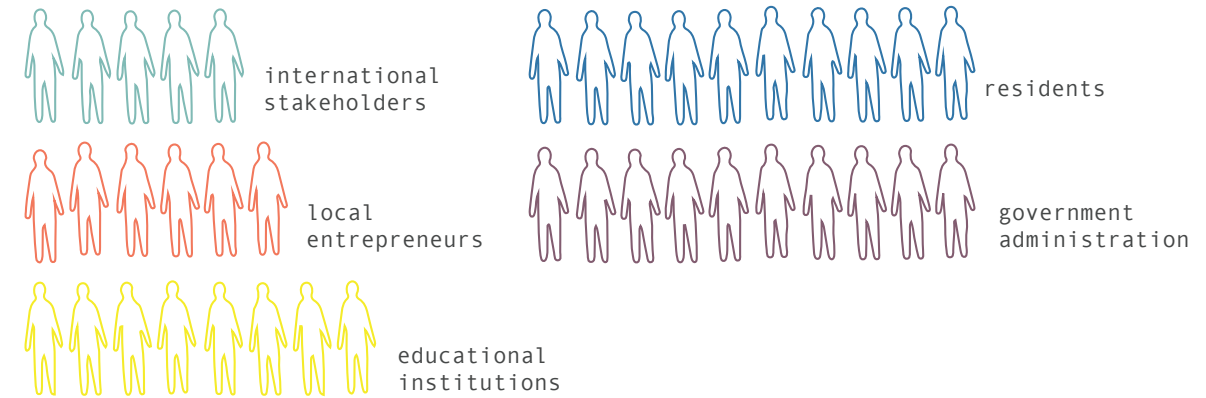
With increased resilience and community engagement, the neighbourhood gains political power to concretely negotiate a collaboration with the state administration.

At this stage, the focus shifts towards advocating for the construction of a wetland as a low-tech, nature-based water purification system to solve the issue of sewage at hand.

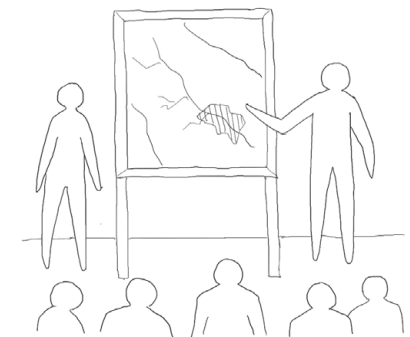
The restored stream ecosystem becomes a shared responsibility, showcasing the neighbourhood's commitment to care for both the environment and its inhabitants. Collaborative efforts between the community and the state administration are essential for achieving this long-term sustainability.

× fig. D.14
(right): Diagram
of interventions.
Drawing by
authors.

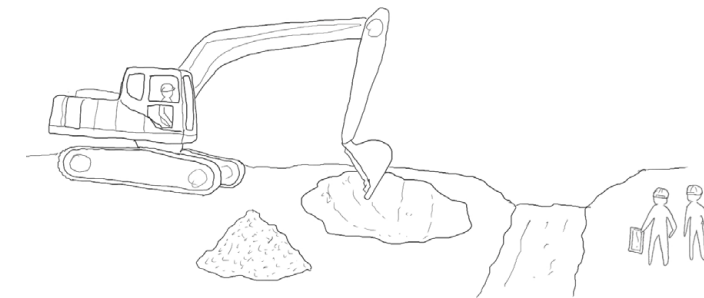
Stakeholders



Roundtable discussions
with different stakeholders

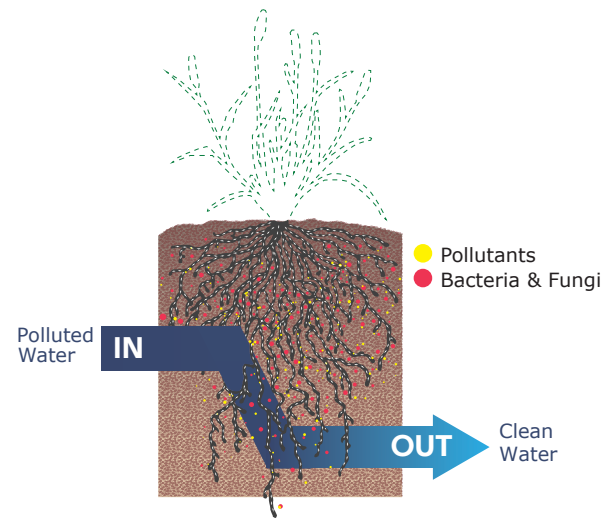


Project presentation and
public discourse

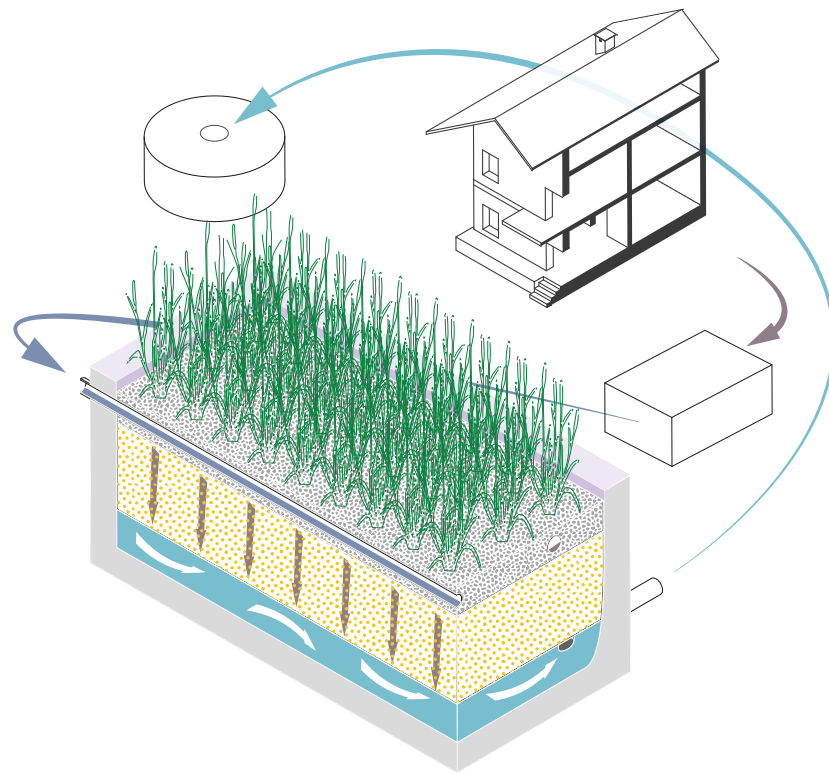


Beginning of construction

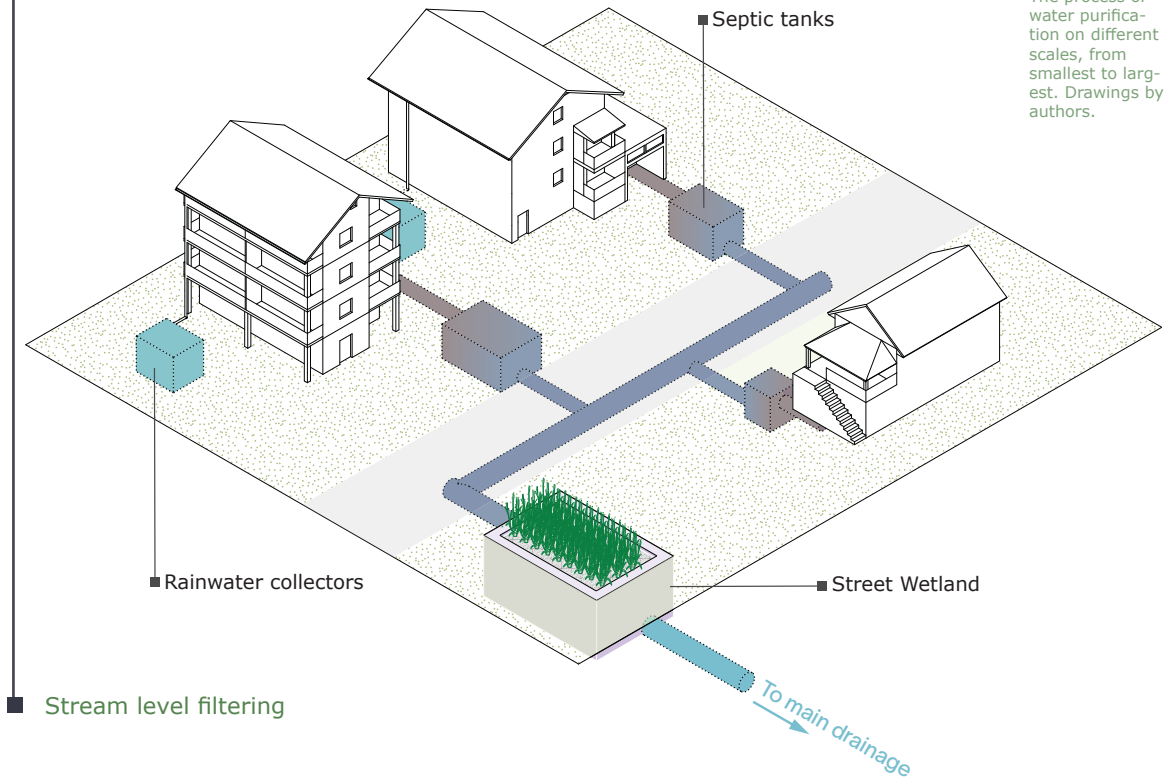
The microorganisms living in the plant's roots



Water filtering on an individual level

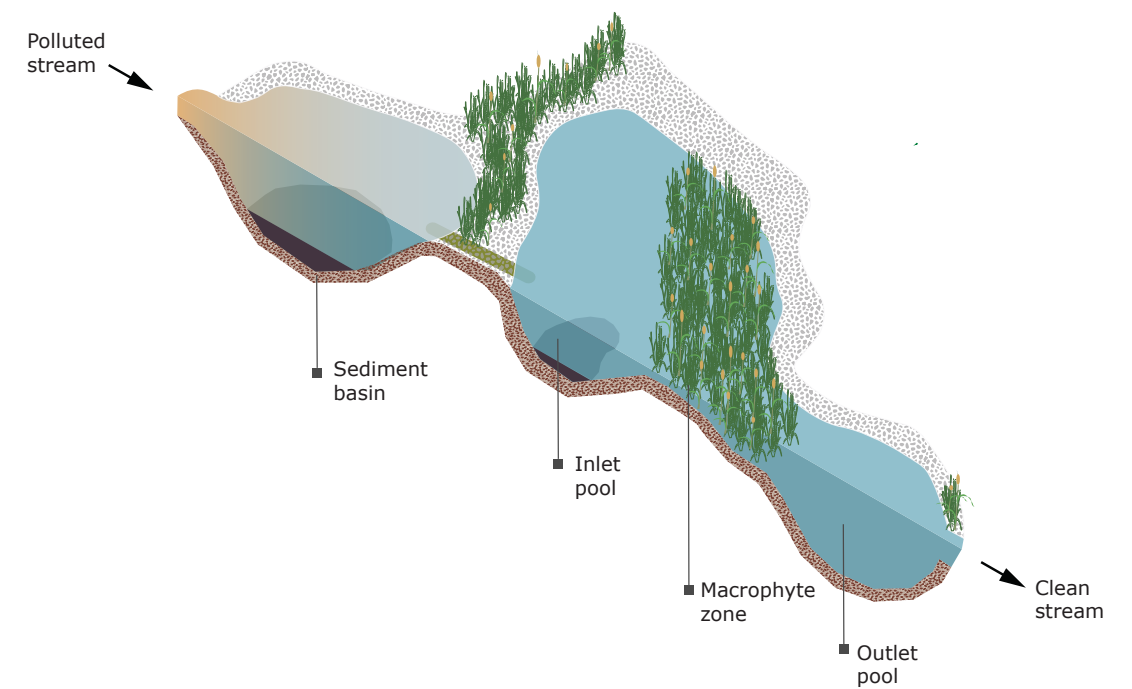


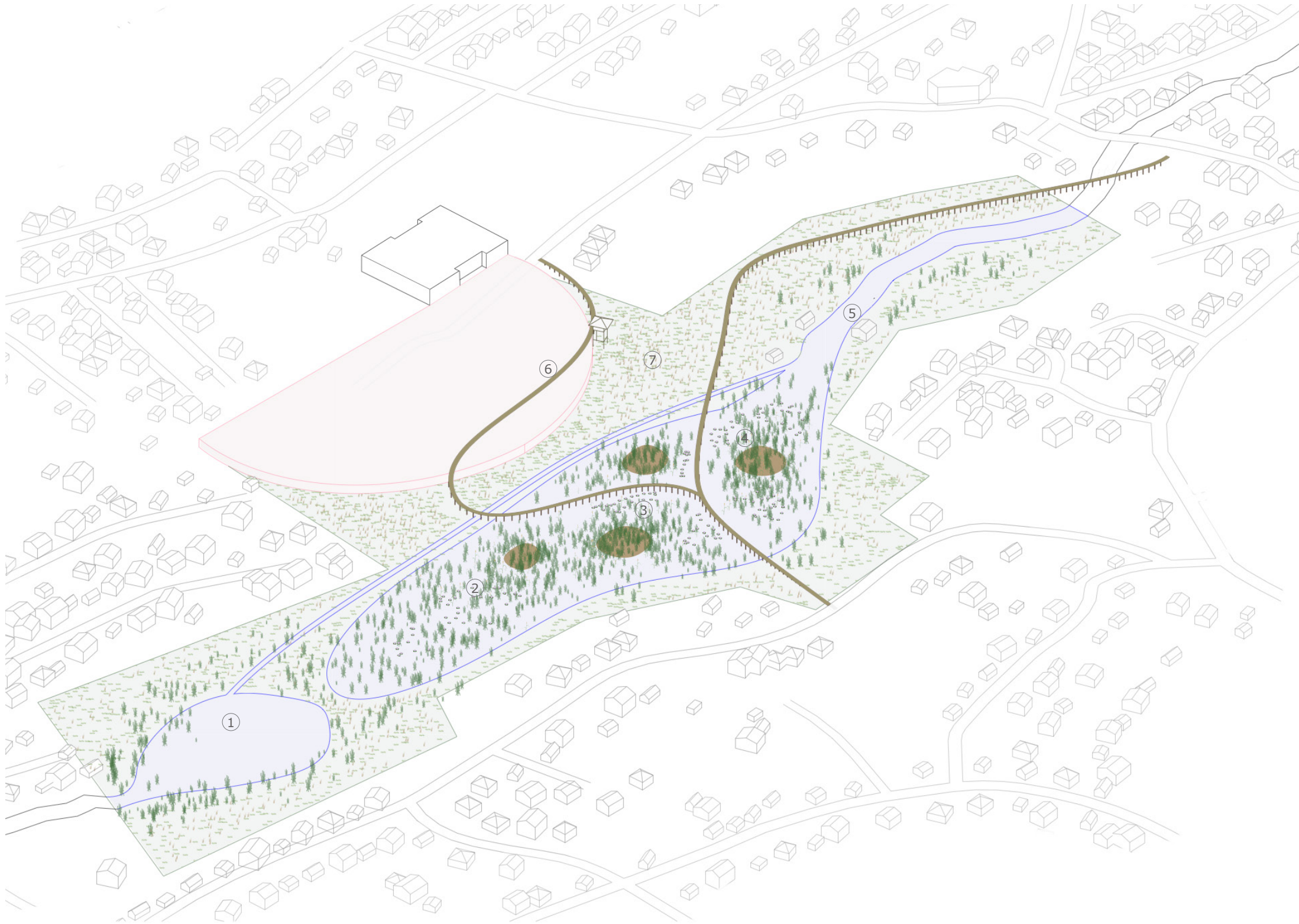
Street level filtering



✕ Fig. D.15:
The process of water purification on different scales, from smallest to largest. Drawings by authors.

Stream level filtering





- 1. Sediment basin
- 2. Inlet pool
- 3. Macrophyte zone
- 4. Outlet pool
- 5. Clean stream
- 6. Pedestrian bridge
- 7. Non-human zone

✕ Fig. D.16:
Vision of the
streams wetland
system

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FIGURES

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[fig B.11] Kaludjerica from Šklj to Abc (Neelen & Dzokic, 2012)

