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BEYOND THE RADIO-CENTRIC METROPOLIS

City-territory and network pluralities in The Great Geneva

Transit-Oriented Development for Inclusive and Sustainable Rural-Urban Regions
MSCA-ITN-H2020

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Foreword

The TOD-IS-RUR Innovative Training Network (ITN) sets up an interdisciplinary, international, and intersectoral network aiming to make significant research contributions to the scientific, societal, and ecological challenges of mobility-urbanization relations in rural-urban hybrid landscapes. Composed of lead researchers from 9 European universities, planning partner organizations, and 10 Early Stage Researchers (ESRs), it provides a cutting-edge platform to analyze contemporary rural-urban territories and develop novel, context-based planning strategies for rural-urban regions (RURs). The network aims to question the concept of Transit-Oriented Development (TOD) in RURs with a context-based approach, in which past, present, and future interactions between mobility and urbanization are studied in relation to social and environmental challenges.

The documents and contributions in this publication followed the doctoral workshop organized within the framework of the European network TOD-IS-RUR in Lausanne in September 2022. The workshop was developed on the hypothesis of the doctoral research *Sustainable transitions for rural-urban regions. Future scenarios for regional TOD*. led by Flore Guichot. This thesis more widely fits into an important and still undergoing research on the Great Geneva territory and, more broadly, on the Leman Metropolis, undertaken by the Laboratory of Urbanism and the Habitat Research Center at the EPFL, both with students' works and through design mandates.

The Lausanne workshop was a moment of collective work around the metropolis of the Great Geneva. It gave the opportunity to researchers and ESRs from different European contexts to share and reflect on their research themes and findings in application to a concrete case study. The reflection was nourished by ongoing research being led in the metropolis, technical knowledge provided by technicians, stakeholders' presentations on current planning strategies, round table discussions, and fieldwork. This research intends to draw attention to a territory, its specificities, its exemplification, and a method of gathering knowledge by understanding, experiencing, and imagining.

View from the train, Author's picture.

A Territory

The doctoral workshop was dedicated to working on and within the context of the Great Geneva metropolis. The Great Geneva territory is a specific, though not unique, case of cross-border metropolitan region. As such, it is characterized by asymmetrical socio-economic conditions on each side of the border, administrative fragmentation, and intertwined socio-spatial mechanisms. Its political construction around a joint territorial project is recent and still ongoing. This strongly attractive territory is today federated around the implementation of a radio-centric, TOD-like model to support its urban growth, connecting Geneva to French towns on the periphery. However, several paradoxical injunctions and conflicts emerge from the translation of this vision into spatial projects. The concrete and urgent problem that arises from the model's application in a stratified dispersed metropolitan territory in a complex socio-political power environment makes the Great Geneva a particularly relevant case to challenge current normative assumptions.

A Methodology

This research uses research-by-design methodologies as a tool for knowledge construction oriented toward the future. The Lausanne workshop combines both theoretical frameworks and descriptive methods to generate context-specific knowledge. It associates research methods that participate, first, in understanding the socio-spatial and political metropolitan context and, second, in imagining and projecting toward the future through hypotheses and design. The first part of the research is therefore dedicated to understanding the socio-political context of the Great Geneva and the planning ambition for the metropolis through presentations made by stakeholders and discussions with technicians from different fields. Then, fieldwork is used as an essential part of territorial reading to capture the realities from the ground. Finally, scenario definition and design are used to compile the information gathered spatially and systemically while opening some critical reflections on the current planning vision and the future of the metropolitan territory.

View of Bon-en-Chablais, Author's picture.

View from the Jura, Author's picture.

Beyond the radio-centric Metropolis. City-territory and network pluralities

Beyond the radio-centric model...

Mobility-related carbon emission and land artificialization are two of the main challenges that characterize metropolitan spaces in the scope of the ecological transition. As a response, by coordinating urban development and transport infrastructure, the Transit-Oriented-Development (TOD) model is intended to accommodate urban growth mechanisms while responding to these objectives through car dependency mitigation and land consumption limitations.

However, from an articulated model aimed at promoting the spatial distribution of mixed and lively urban communities on multiple transport axes (Calthorp, 1993), TOD applications in metropolitan contexts have evolved toward more and more centralized and univocal development strategies.

The radio-centric model is one such centralized and particularly rigid pattern of development, which envisions relation from a central place toward the peripheries through radial connections (Lynch, 1984). Compared to a grid, the radio-centric figure has the particularity of being mono-directional, supporting only one type of dominant flow. In such a model, TOD, then, is used to project ex-nihilo urban growth, necessary for the economic viability of the core city toward the periphery. Radial transport lines and urban development are punctually associated with their nodes in a restricted « well-served » perimeter, strengthening dependence and vertical center-periphery relations.

In this context, today's discourse around TOD tends to reactivate binary territorial readings: between built and unbuilt environments, between urban and rural spaces, between compact and dispersed urban forms, and between car dependency and sustainable mobility based on heavy infrastructure. This simplistic opposition, in turn, supports normative visions of growth through polarization opposing compact development, allowing sustainable mobility patterns with the rest of the pre-existing spatial capital. Thus, current TOD strategies sustain hierarchical and selective territorial visions.

Meanwhile, highlighting the inherent tension between socio-ecological transition objectives and metropolization processes, present visions foster

paradoxical center-based injunctions that lack applicability in edge territories, such as the limitation of car use. This tension enforces spatial differentiation, ecological fragmentation, and social marginalization.

Such dynamics are more visible in strongly asymmetrical and politically fragmented contexts such as cross-border metropolises. For this reason, the research is set in the Great Geneva agglomeration as a critical example of these urban dynamics. Therefore, considering an inclusive socio-ecological transition project for the Metropolis engages a critical reflection on its development processes, which have been achieved until today through limitless resource availability. Through the prism of mobility and urbanization, this research aims to take a critical step back from the current headlong rush into radio-centric growth based on heavy public transport networks and mass polarization.

Spatially inclusive transition policies and vision demand going beyond theoretical models or ready-made top-down visions, as well as beyond mono-disciplinary or silo thinking strategies. Without denying the TOD project, the hypothesis sustained by the research is that new hybrid opportunities and strategies emerge for the model's landing in more horizontal territories, which need to be acknowledged to support a socially inclusive and ecologically viable spatial transition project.

… City-territory and network plurality

The research proposes to investigate the metropolitan territory through its rural-urban edges, usually considered the metropolitan «back-stages», but where most of the current tension and paradoxes between metropolization and transition are visible. When confronted with the pre-existing and stratified context, univocal or mono-oriented responses fall short. If most visions have been thought from the center toward the periphery, what other narrative for transport-urbanization relation emerges from the territories 'in-between' (Sieversts, 2004) strong transport networks?

To answer these questions, the research draws on a body of urban literature and theory, which, rather than focusing on top-down, engineering-oriented methods, has focused, for the past decades, on the ability to understand complex and grounded multiple structures that constitute the inhabited territory. In such a disciplinary branch, the idea of the «generalized urban condition» (Choay, 1994 ; Brenner, 2014) depicts dispersed urban forms, in all their pluralities, no longer as a phenomenon to counter or as « immature » urban patterns but as hybrid urban conditions withholding their own problematics and opportunities (Vigano, 2018). Specific interactions between built and open spaces, multiple forms and levels of infrastructure, and natural networks characterize these

View from the edges, the Great Geneva peripheric system. (Drawing: Flore Guichot)

spaces. The «ville-territoire» (city-territory), more particularly, was used by André Corboz (1999) to describe, as an « étant donné » (Marot, 1995), the endogenous fine-grained dispersed settlement pattern of the Swiss plane. This urban network is «coextensive of the territory» now encompassing «forest, agricultural lands, montaines, and lakes» In this sense, Corboz encourages us to leave behind the past division between centers and peripheries and to think in systems of polarities. For him, such an approach is necessary to read the contemporary territory as well as to draw its future.

Hence, embracing the «city-territory» project in the scope of the socio-ecological transition demands questioning the a priori assumptions around the different forms of urbanity. This implies recognizing the limits inherent to the radio-centric, or hub-and-spoke, urban model as the univocal means of achieving suitability. And therefore, to be able to read and identify the relations, opportunities, and qualities rooted in suburban and rural-urban spaces beyond 'cityism' bias.

In this perspective, the rail and the plurality of mobility networks understood as the support for heterogeneous modes of living are a key resource for the contemporary spatial project. Going one step further, the term «network plurality» intends to go beyond the disciplinary blindfold to find renewed integration embedded in the diversity of relations between landscape and natural networks, mobility infrastructure, and the built environment characteristic of rural-urban regions.

Through spatial analysis, this research aims to apprehend complex social and ecological systems in their political and institutional context. The hypothesis of 'network pluralities and city-territory' intends to go beyond preconceived models to read and understand multiple territorial rationals to ground possible sustainable futures from the lance of edge metropolitan territories.

By identifying the limits, paradoxes, and conflicts that emerge from the current radio-centric TOD vision within rural-urban metropolitan edges, this research brings forward the necessity for more hybrid and context-specific spatial naratives able to capitalize on existing spatial structure, both infrastructural and urban, to support the socio-ecological transition

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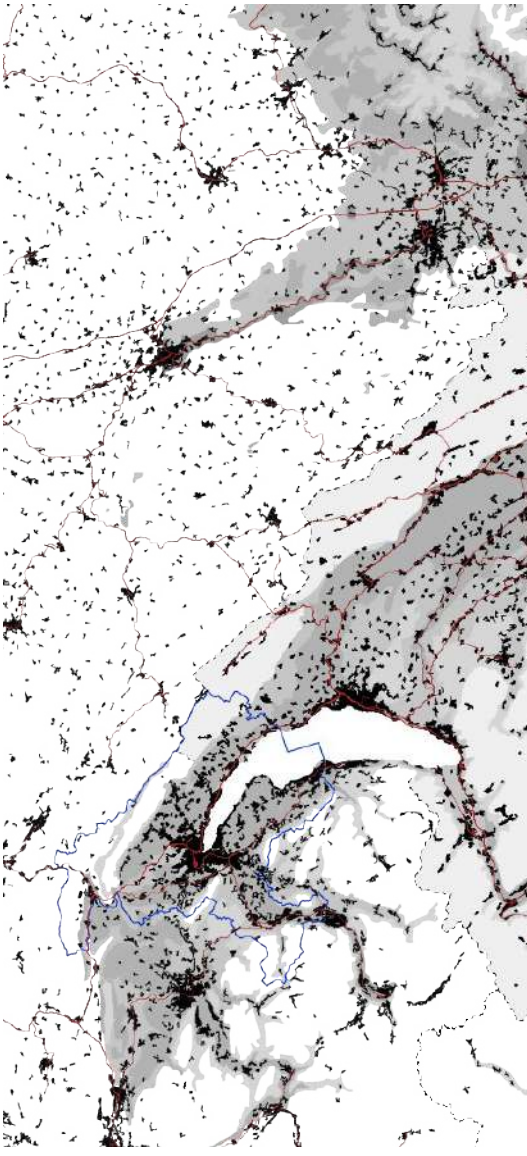
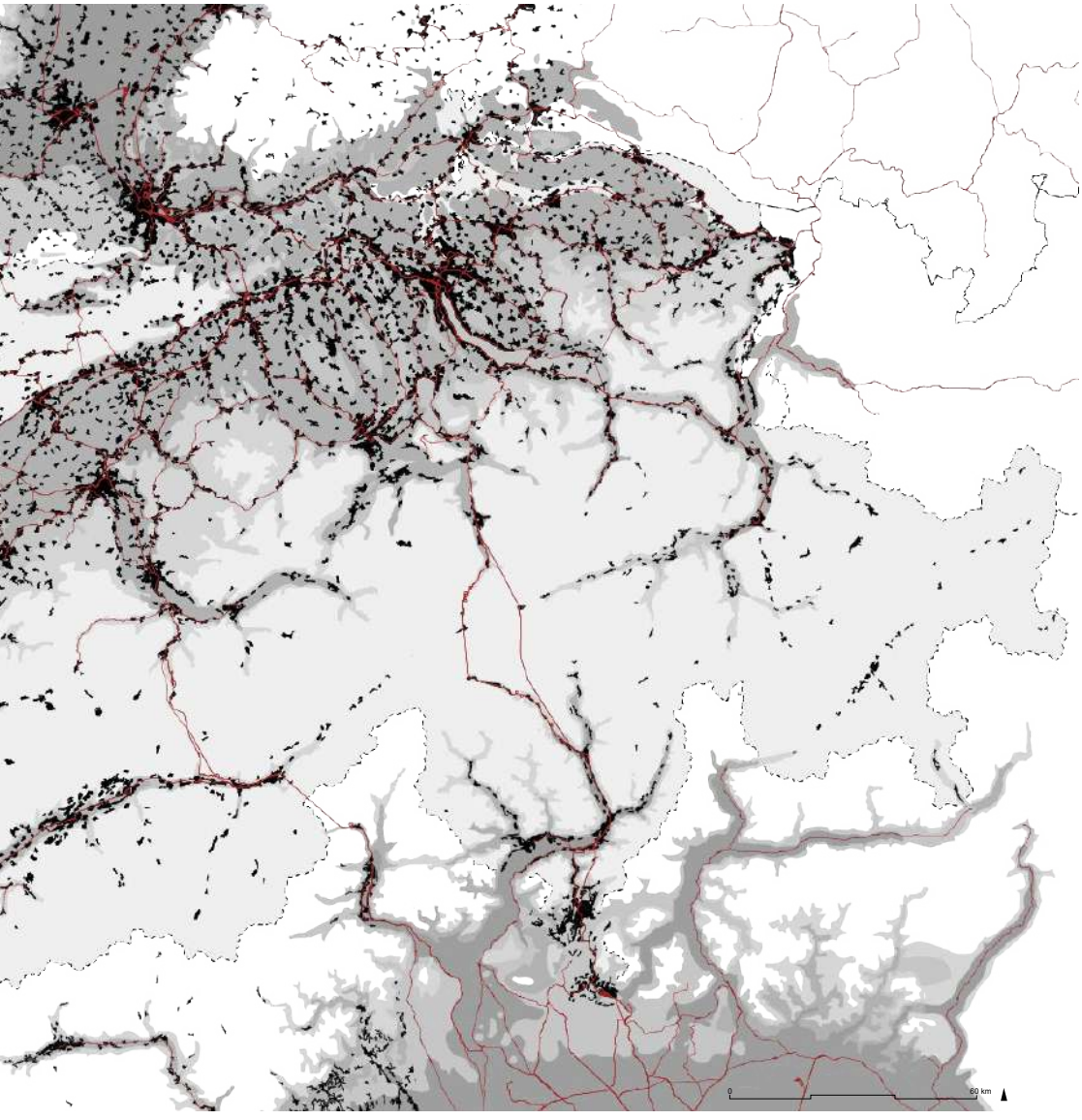
ON THE TERRITORY



The Great Geneva within the frame of the Swiss plateau as the «city-territory», Decentralized concentration. Author, 2022.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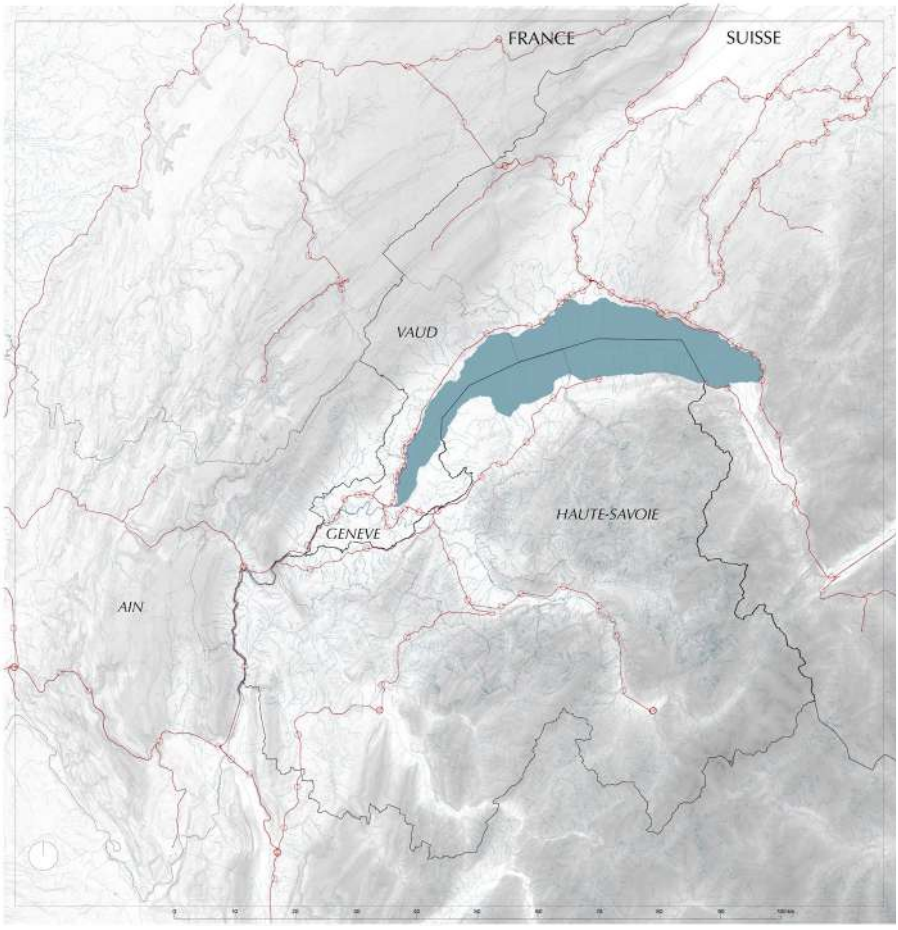

The Great Geneva, natural territory and political boundaries. Author, 2022.

A natural Metropolitan development

A 'Natural' Metropolis

The Great Geneva Metropolis is geo-morphologically located in the watershed of the Rhone River. The region is a living basin home to over a million inhabitants, spreading over the Franco-Swiss border on the edge of both national territories. Its boundary coincides with this natural formation, from the Jura, Voiron, and pre-alpine massif, connected through agricultural valleys and plains, leading to the Leman Lake. The administrative rupture of the landscape formation resulted from a long historical process that drew and redrew the border until the end of the 19th century. This division results in the state that we can observe today of a nationally divided natural living basin (Barbier et Schwarz, 2016). The Canton de Genève is a 'city-state without lands' enclaved in French regions, and the French part of the metropolis is an edge region «cut out» from its national territory by natural formation.

Despite the frontier and cultural and religious differences, the naturally constrained region of the Great Geneva has a long history of exchange and interdependence between the French and Swiss territories. This relation materialized in the early stages through the necessity of Geneva to palliate its restricted land availability. Agricultural production of the French bordering areas was necessary to supply the food demand of the Geneva population. To facilitate these exchanges, geographical and customs agreements between the two States created a 'zone franche' that guaranteed tax-free movement of goods across the border. Hence, agriculture production and food supply constituted an early land-based interdependency between Geneva and its hinterland. The transport network also embodies this early interdependence for both people and goods. Geneva, located on the lake's shore and the Swiss territory's far end, is in a specific cul-de-sac position. This spatial condition is why most rail network construction had avoided the town, passing through the surrounding French parts. Geneva was imperfectly linked to its natural territory, which pushed for the early development of an extensive and cross-border tramway network. This network was at its peak in the 1920s, constructing one of the densest tramway systems in Europe, radio-centrically disposed around Geneva and going across the national border (Barbier, Schwarz 2019). However, with the Second World War reactivating the frontier, and later on, the lack of competitiveness of the tramway with the bus and individual cars, the network was almost entirely dismantled by the end of the 60s, enacting the era of the «all-car-oriented-development» dominating Geneva's planning (Gallez et al., 2008). It is still this condition that current tramway and train projects are trying to remedy until today. The transport systems had a leading role in the urban development and exchanges in the region. These two examples show that the unity and bounded

landscape formation are at the origin of early cross-border relations. Hence, the region constructed itself as a 'natural' Metropolis, which took a long time to become a political reality.

A Metropolis within a Metropolis

The complex multipolar region in which the Metropolis is set can explain the delay in constructing a political, institutional organization between the Canton of Geneva and its hinterland. Regarding spatial continuity and functional integration, the region holds a very particular position, showing unclear boundaries of the metropolitan phenomena. As André Corboz (1999) described, the Swiss plateau from Geneva to St Gallen is a particular type of 'city-territory' defining a continuous pattern of dispersed urban nodes on a dense transport mesh. The Great Geneva corresponds to the end of this «city-territory» figure joining the French and Swiss national systems. Within this plateau, around the figure of the Leman Lake and bounded by the Alpine and Jura Massif, the Greater Geneva is part of a larger metropolitan region: la Metropole Lémanique.

The works of the urban sociologist Michel Bassand in the 90s already recognize this spatial figure where the mobility dynamics are supporting the profound transformation of the social and spatial context leading to the metropolization phenomenon (Leresche et Michel Bassand, 1991). This imbrication sets the Geneva Metropolis as a hinge both geographically, in terms of identity, and functionally, in a complex polycentric and highly dynamic region (Bassand, 2004). This imbrication can be illustrated from a functional point of view [fig.1]. On the one hand, we can define the radius of attraction around Geneva by looking at the ratio between the active population residing and the active population working in the Canton de Geneva in the surrounding communes. Though expanding through time, the area defined this way sets a concentric region around the Geneva Canton. On the other hand, if we look at work-related movement, the emerging areas of influence are much broader and multipolar. Therefore, the Metropolis is pooled simultaneously by its surrounding metropolitan area and the wider multipolar Leman Shore region. However, despite multiple attempts, the ambition of the Métropole Lémanique to become a political entity never succeeded. Therefore, both Geneva and Lausanne have withdrawn into their own metropolitan surroundings. For Geneva, this meant strengthening its ties with the neighboring French Department and Communes rather than the rest of the Leman region.

A specific model of urbanization

The Great Geneva's imbrication into this wider Metropolitan region and a binational system challenges the classical center-periphery reading of the

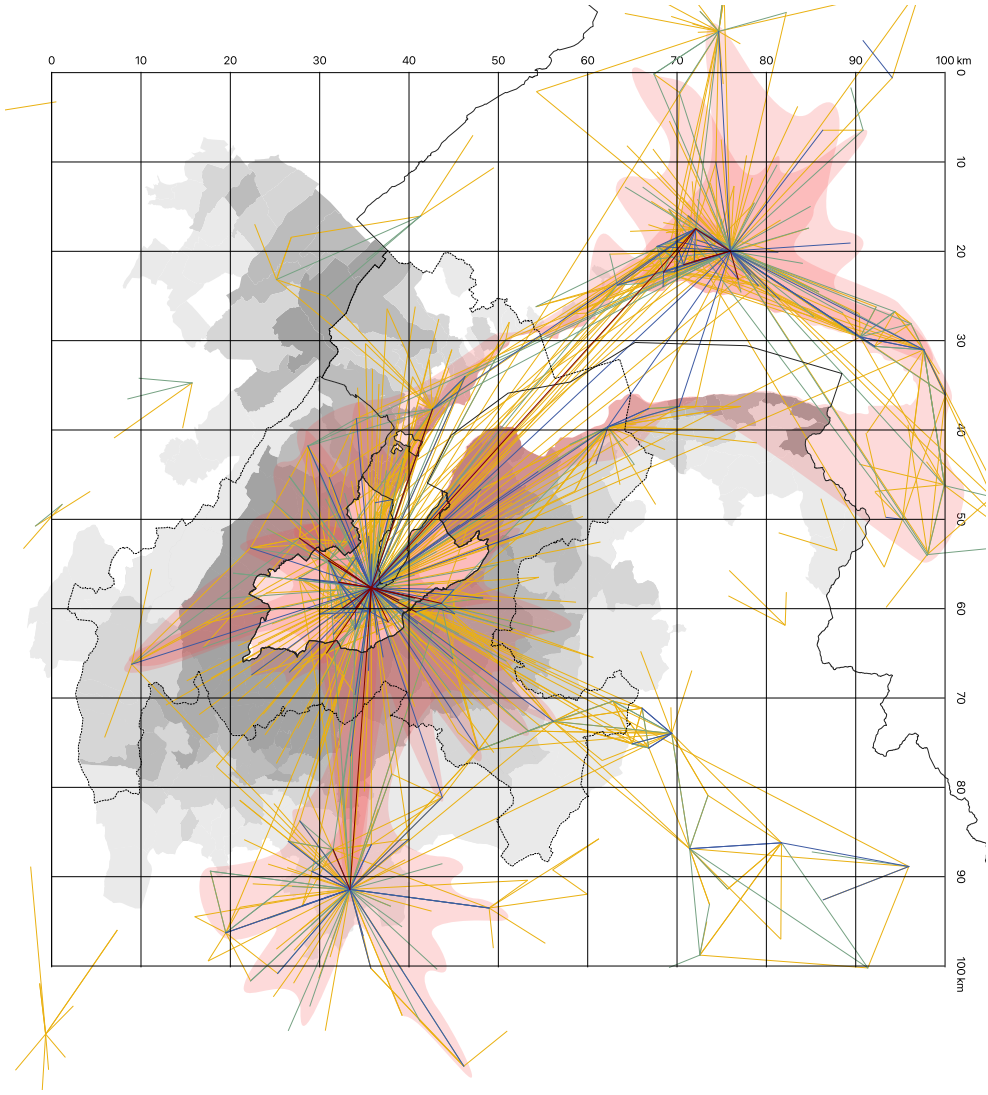

Fig 1. Metropolitan area evolution and cross-border mouvements, Author, 2023. Sources: OST, INSEE.

metropolis. Most specifically, it puts the periurban and rural spaces as hinge territories. As part of the 'city-territory', the Great Geneva region is a complex intertwinement of urban, rural, and natural conditions structured by socio-economical rationals and historical and morphological ones. The development at play in the area is to be understood from a metropolitan perspective, and the more traditional and endogenous development related to the dispersed development patterns based on infrastructural support (Vigano et al., 2017). On the one hand, the region's development followed a traditional «rurbanization» process (Bauer et Roux, 1976) with the continuous growth of the core city and polarized concentrated development. On the other hand, the preexistence of a dense village network, land protection policies, a willful car-oriented development, and particular cross-border dynamics have given a specific form of rural-urban development [fig.2].

Going back to the early 20th century, we can see a kind of isotropic development of small villages and hamlets placed on water and road networks. In this stage, only Geneva stands out as a city. By the 1940s, Geneva structured its core, while secondary polarities build up around village aggregation connected by rail nodes. Some villages connected by the tramway slightly grow as well. However, the development of the Arve Valley related to industrial production is more dispersed. The early politics of preservation of Geneva's rural periphery, also known as the 'Green Belt', marks a clear-cut differentiation of the development across the frontier. These preservation laws drastically affected the French side of the Agglomeration, generating an early and rapid spill-over mechanism. Furthermore, these politics set a clear physical rural boundary between Geneva and the French development or what has long been called the 'other Geneva' (Diener et al., 2005). By the 1960s, we see an important dispersion around Geneva, both transversally, reaching Annemasse and on the lake shore. However, this expansion of the core city starts to be limited. Therefore, boosted by Geneva's anti-urbanization policies and attraction, much less hierarchical urbanization began to take shape, supported by the strong car-oriented infrastructural development. This development on the French side is achieved by aggregation around the pre-existing village structure on first but also secondary roads and according to the topo-morphological logics, while the radial continuous urbanization of Geneva came to join the Canton's borders. Meanwhile, the secondary poles generate a more dispersed periphery around them. By 1980, a new boom in urbanization structures itself on the transversal axes from Geneva on the French side of the border. The figure of corridors and pearls-neckless around Geneva appears. Meanwhile, the densification of villages continues on the foot of the Jura and in the Chablis plain. Since 2000 and until today, these concomitant developments continue to strengthen the radial urban axes from Geneva, the main secondary poles with their core and periphery development, and the more spread bur condensed aggregation

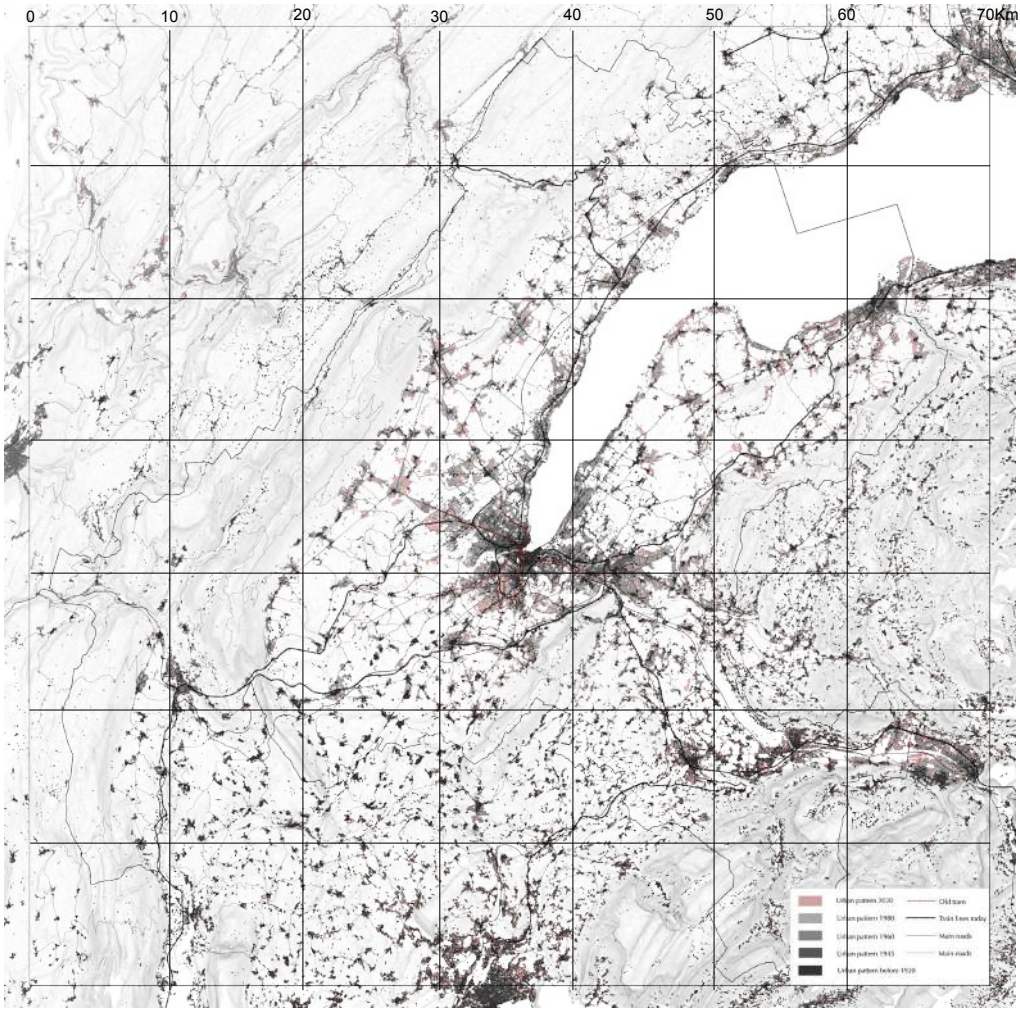

Fig 2. Urban development between 1920 and 2020, Author, 2023. Sources: Data.gouv, SITG.

	Growth in the Great Geneva, Villages, Local center and periphery	Growth in the French side of the Agglomeration	Growth in the French side of the Agglomeration, Villages, Local center and periphery
Growth 1968-2018	62,3	63,7	63,7
Growth 1999-2018	42,6	66,7	66,7
Growth 1982-1999	79,1	72,8	72,8
Growth 1975-1982	77,2	71,2	71,2
Growth 1968-1975	50,4	44	44
Growth 1954-1968	15,6	33,8	33,8

Tab 1. Growth repartition between 1968 and 2018 between the different part of the Agglomeraiton, Author, 2023. Sources: OST

around ex-villages. Between the 1960s and today, 60% of population growth has been accommodated on the French side of the Agglomeration, mainly around village areas and small local centers [tab.1]. This combination of polarization, dispersion, protection, and laissez-faire explains the leopard stain rather than the oil stain development of the Agglomeration we witness today. It defines a spread but concentrated development based on village structure in the central plain, developing a multipolar urban system with little hierarchization and many small poles. These diverse patterns of urbanization are inserted into a natural and rural landscape, which makes for the Metropolis's identity and recognized life quality.

A functionally integrated specialized metropolis

Functional integration

Intensive cross-border commuting, related to the Geneva-centered labor market, is a significant characteristic of the region. The nearly 115 300 daily cross-border commuters toward Geneva generate a critical interdependence between the French and Swiss sides of the Metropolis[1]. 78% of the jobs in the Geneva Canton are held by people living outside the Canton[2], 60% of which come from neighboring french Communauté de Commune[3]. The prevalence of this work-related flow and the interdependence they generate was demonstrated again during the Covid crisis, with the inability of Geneva to close its border without suffocating its economy. Scholars have described how this interdependency makes Great Geneva a strongly integrated cross-border region (Sohn at al., 2009). Despite being outside the EU, bilateral cross-border agreements promote a debordering process enabling economic and political cross-border integration, a significant resource for metropolitan and economic growth (Herzog et Sohn, 2014).

Geneva's economic growth boomed in the 60s, led by high-end production and the banking sectors. The combination of the job availability in high-end positions in industry and service and the differential salary based on Swiss standards lead to a competitive workforce in most economic sectors. From then on, the region started to drain workforces internationally and from the neighboring French areas. Cross-border workers remained relatively low until 2000, then exponentially creased, doubling by 2008 and tripling by 2015 to reach the current state [fig.3]. Today, nearly a third of the populaiton of the French part of the agglomeration work in Geneva Canton[4]. Hence, this functional integration is drastically asymmetrical in the Metropolis, defining 'one-way movements' from the French periphery to the center of Geneva. However, it is important to note the recent de-centering of work-related flows. If we look at the flows going to the central city between 2012 and 2018, they

have diminished by 44% in this period [tab.2]. Moreover, this differential is most decisive for small distances (minus 5 kilometers) and long distances (over 30 kilometers). The Canton de Geneve is becoming more polycentric with no reduction in the overall flows. This is confirmed by the raise of the ration job/population in nearly every commune of the Canton [fig.4]. Hence, the functional integration between France and Swiss is strengthening as the metropolis is becoming more polycentric and ever wider.

The ever-increasing cross-border functional integration process is inseparable from the socio-economic and spatial development on each side of the border. If spatially speaking, the French part of the Metropolis is the periphery of Geneva, the relationship between the two parts of the Agglomeration goes beyond traditional center-periphery relations because of its bi-national nature. Cross-border metropolises are specific cases where conditions directly impact mobilities across the border, creating an interplay between unbalanced socio-economic conditions and spatial interdependency (Decoville et al., 2013; Gallez et al., 2013). In the case of Geneva, asymmetrical socio-economic factors are at the root of its functional integration.

Asymmetrical socio-economical conditions

The Great Geneva is characterized by one of Europe's most significant cross-border socio-economical differential. To understand this differential, it is necessary first to remember that Switzerland does not belong to the Euro Zone and has its own currency. The Swiss franc is a refuge and strong currency compared to other international currencies, including the Euro. In addition, if the confederation levies a fixed tax on company income in Switzerland, the Swiss Canton and commune are sovereign in their taxation rate. Therefore, the tax rate on enterprises remains low in the Canton of Geneva compared to the French national tax system. Thus, the Canton is very attractive for enterprises' implantation. However, the labor force's price is very high due to Switzerland's high living costs. However, low indirect wage and social insurance costs make the Swiss labor force competitive internationally.
From an individual point of view, Swiss-based salaries are much higher than french ones for the same position. This is theoretically balanced by France's welfare system. Health insurance, for example, managed semi-privately in Switzerland, depends on individual contributions, and needs to be subtracted from net personal incomes. In contrast in France, it is fully taken care of by the state and preempted in labor contribution from both the employee and the employer. Nevertheless, specific agreements between Swiss and France make living in France adn working in Switzerland extremly attractive.
Land value and housing prices also vary significantly across the border. With the general Swiss living standards, rent and housing prices are high. Geneva

has one of the most expensive housing markets in Switzerland. Despite a recent rebound in housing construction, buildable land scarcity due to cantonal and federal protection laws and the accumulation of delays in housing provision caused the market to surge. This combination leads to a profound housing crisis in the Canton. With the continued increase of workforce migration toward Geneva and its unbalanced development system (jobs rather than housing), The Canton had to export its housing problem beyond its border to the Vaud and the French communes (Lambert et al., 2019). On the French side of the Agglomeration, the entire Haute-Savoie département and the Pays de Gex have some of France's most expensive housing prices. Nevertheless, the rupture at the border in term of housing cost is clearly readable. The French neighboring region remains significantly more affordable in terms of housing than the Swiss part of the Agglomeration. Therefore, the combination of asymmetrical conditions in taxation, land value, housing market, salary, and living cost creates strongly asymmetrical socio-economical conditions across the border.

Spatial specialization and uneven development

The previously described, economically driven individual and enterprise choice implies a form of spatial specialization that, despite its early realization (1990s), has been increasing for 30 years. Indeed, despite the ambition that rose in the early 1990s to rebalance the metropolitan territory to limit cross-border flows, which overloaded the networks, actual policies have yet to be carried out in this direction. While the Canton de Geneve keeps attracting new job positions, with 89% of job creation in the past ten years located in the Canton, the French side of the Agglomeration hosted 75% of the population increase[5]. Therefore, over the past ten years, the ratio between jobs and population diminished in every French part of the Agglomeration while this ratio augmented significantly in the Geneva Canton. Thus, despite the increase in housing construction in the Canton of Geneva, the French side of the Agglomeration accommodates the vast majority of the population, to the detriment of agricultural and natural territory. At the same time, the Canton benefits from a substantial increase in terms of workspace while preserving its natural heritage. This unbalanced development generates a growing discontent among the Swiss and French population.

However, the job/housing divide is not the only spatial differentiation given by the unbalanced socio-economical cross-border relation. Population growth in France went with a clear lack of investment in service to the population, amenities, roads, and transport. In the Pays de Gex, for example, the population doubled in the past 20 years with nearly no investment in infrastructure. Due to the Franco-Swiss bilateral agreement on tax retrocession, cross-border workers pay their taxes in the Canton de Genève. The Canton de Genève then retrocedes 3.5% of this tax income to the French communes proportionally

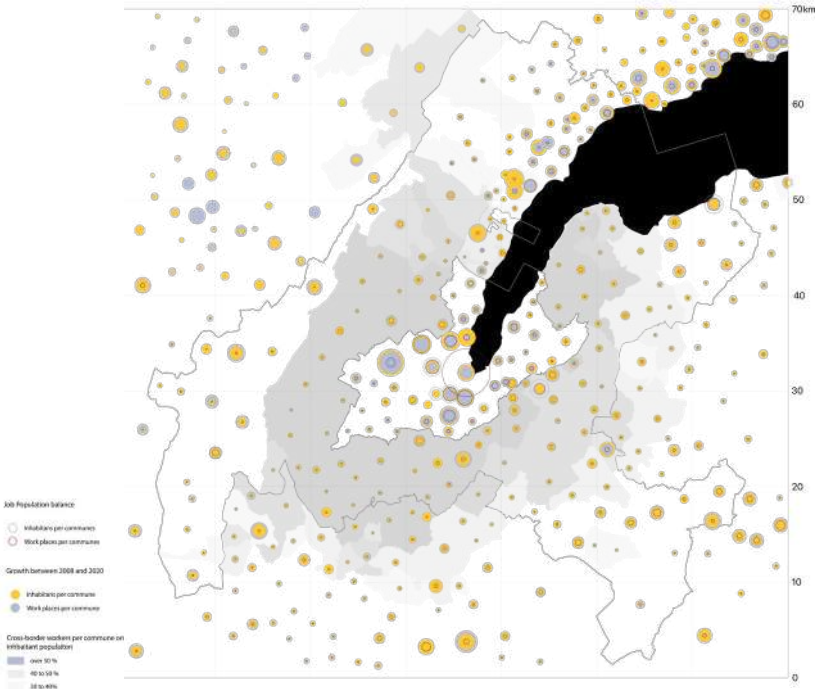

fig 3. Cross-border population employement ratio and evolution, Author, 2023. Sources: INSEE, OST.

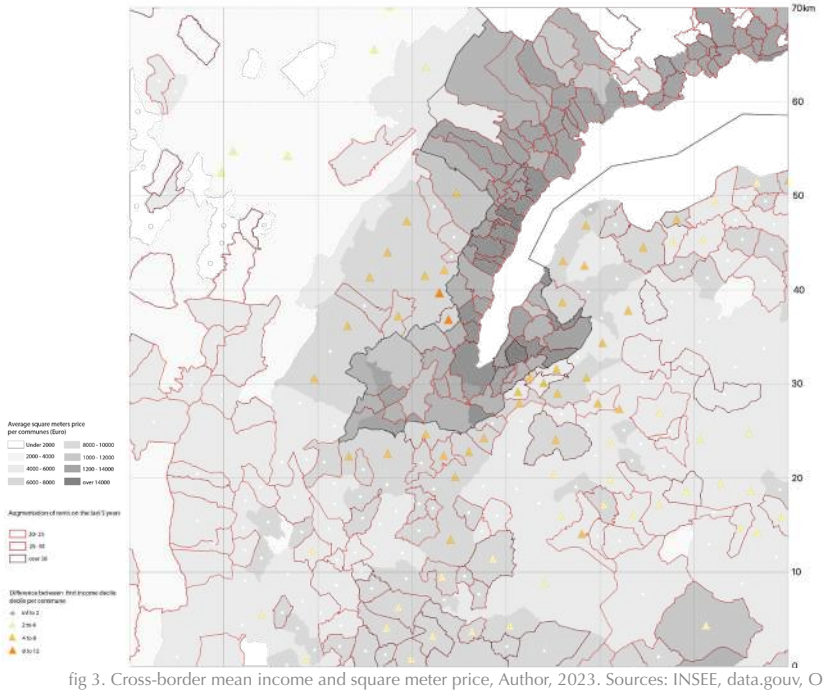

fig 3. Cross-border mean income and square meter price, Author, 2023. Sources: INSEE, data.gouv, OFS.

to the number of cross-border workers they host. Even if this percentage is low, the French commune perceived it as a tax windfall for small communes which, in the French centralized tax redistribution scheme, would have earned much less. However, this agreement, which has not been updated since 1983, is now starting to show its deficiencies. It did not enable the commune to remedy service and amenity provision because of both the ever-increasing land value and the rapid population growth. Meanwhile, promoters target the French part of the Agglomeration to settle land-consuming activities directed toward the Swiss population, such as extensive leisure amenities and malls. This territory development participates in widening the spatial specialization and the specialization of the flows crossing the region.

Besides the spatial split of services and amenities, other less tangible relations contribute to the uneven quality of living in the Metropolis. The salary differential implies that on the French side, it is increasingly difficult to fill job positions much better paid in Switzerland. This is particularly true in the civil service, administration, health, and low-skilled jobs. This inability to keep its working population reinforces an impoverishment in the French communes' services and ultimately reduces the quality of life of its inhabitants. Recent research has also demonstrated that despite the intense job-dweller entanglement in the Geneva Metropolis, the border is not crossed by other types of activities, movements, and social groups (Gumy, 2020). The population's financial, national, social, and cultural capacity can explain this impermeability. Besides, the bi-national system implies, for example, that due to health insurance policies, Swiss amenities are not accessible to French citizens and vice versa, except for cross-border workers who can choose their healthcare system. Therefore, non-work-related flows in the Agglomeration are also very monodirectional. If the Swiss population crosses the border for consumption purposes, it is a privilege for the higher social class in France to do so.

The one-sided exchanges between the French and Swiss sides of the Agglomeration generate spatial specialization across the border of space and flow. As a result, French communes are turning to dormitory cities, while local mayors need more tools to capitalize on and challenge promoters-driven development. At the same time, the inability of these communes to provide the necessary amenities, transport, and service to their growing population and the implantation of monofunctional activities turned toward the Swiss population, leads to a general degradation of living standards. Therefore, the Great Geneva Metropolis follows a model of integration by specialization (Decoville et al., 2013), which feeds and is fed by the socio-economic asymmetries that tend to increase across the border.

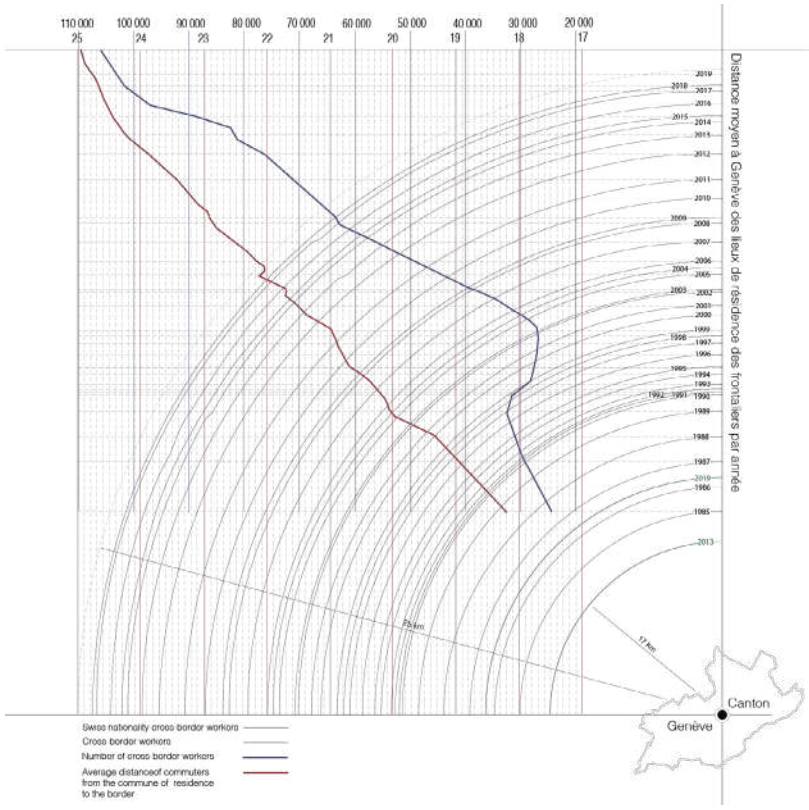

fig 3. Cross-border workers according to average distant to the boder, Author, 2023. Sources: INSEE

	Commuters in the Metropolis in %	Moins de 5 km	5 - 15 km	15 - 30 km	Overs 30 km
Differencial between 2012 -2018	Total	20	20	-5	5
	Cross-border	1	-1	7	-7
	Swiss to Swiss	60	46	1	14
	France to France	-30	36	-7	-0

	Commuters toward the city of Genève	Moins de 5 km	5 - 15 km	15 - 30 km	30 km et Plus	TOTAL
	2012	44429	58099	29638	13546	145722
	2018	127865	29638	33307	19121	209931
	% d'augmentation	-188	48	-12	-41	44

Tab 2. Cross-border and commuter percentage according to average distant between residence and work commune in 2012 and 2018, Author, 2023. Sources: INSEE, OST.

Metropolitan expansion

The spatial specialization of poles and flows is not static. Price rationales and housing scarcity in the Canton de Genève led people working in Geneva, whether French or Swiss, to seek housing on the French side of the Agglomeration. Under increasing demand, the French housing market in the region underwent a significant uplift in the past year, specifically in direct neighboring and well-connected communes. This process has a drastic impact on metropolitan dynamics. This unbalanced socio-economical condition has two repercussions. First, while the amount of cross-border workers is going up yearly, the average distance traveled by cross-border workers to the border is also growing each year [fig.3]. Switzerland-to-Switzerland pendular flow also increased significantly in distance over this period. Hence, individuals are always willing to go further to find better life conditions. However, among cross-border workers, we witness a differential between the Swiss and French populations. Swiss nationals who work in Switzerland and reside in France also tend to travel longer distances per capita but remain significantly closer to the border. Second, France-to-France pendular workflows in the Agglomeration increased significantly in kilometers per person between 2012 and 2018. In 2013, 36% of France-to-France work-related commutes were under 15km, and 52% were between 5 to 15 km; in 2019, only 6% of these movements were under 5km, and 89% were between 5 and 15km. In comparison, the average distance to the border went from 24.2 km to 25.7 km per person [tab.2]. This means that individuals perceiving French salaries are pushed further and further away from the communes they work in due to Swiss-based wages increasing living costs in the French regions. These numbers show how the relation between the differential of salaries across the border, the impact of the spill-over mechanism, and housing market demand across the border leads to the constant expansion of the Metropolis. Furthermore, this expression is done by spatial differentiation based not only on the border but on the differential between Swiss-based and French-based incomes, augmenting the cross-border flow and generating pendular nationally bounded flows. The growing territorial asymmetry constantly increases the French regions' dependence on Geneva and the Metropolitan expansions through concentric social differentiation.

Socio-spatial differentiation

Durand et al. showcase that the integration process of cross-border areas is as much a source of opportunity as a source of vulnerability (Durand et al., 2017). In this regard, the physical connection to Geneva's working bassin allowed the Haute Savoie and Ain region to have an increasing employment rate between 2009 and 2020, despite the relative stability and even the reduction in the number of jobs in the area during the same period. Indeed, the dynamic of

employment growth related to Geneva's central areas has compensated for employment shrinkage in primary and secondary fields, specifically in Haute Savoie. Hence, the French part of the Agglomeration is a dynamic region in terms of employment. However, during the same period, the unemployment rate increased in all the French Communauté de Commune belonging to the Great Geneva Agglomeration, except in the Commune de Faucigny-Glières, which also happens to be the furthest away from Geneva. Meanwhile, the unemployment rate in Geneva is diminishing in the same period. Therefore, the dependence of the neighboring French region toward Geneva is augmenting. While the French territories benefit from the socio-economical development of Geneva, it also increases the social precariousness in these regions [tab.3].

Looking closer at the social spread in the aggregation, we see that despite the high number of cross-border workers in the neighboring commune, the border is still clearly visible. This is because even if the French part of the Agglomeration constitutes one of the wealthiest regions of France, it is also the region with the highest Gini index, the differential of income between the wealthiest decile and the poorest decile of the population. Hence, the French surrounding communes are among the most socially differentiated in the county. The French communes of the Agglomeration face two standard populations: those living in the area with Swiss salaries and those living in the area with French-based wages. With the French social welfare system, paradoxically, it is not only the poorest of the population, which has access to social housing and social help, who is affected, but also the low middle class. That is, the population just above social help standards is most vulnerable to the ever-increasing cost of living. On the French side, the disparities are not only between the communes but within the communes. By looking at the disposable income per consumption unit, we see a clear distinction between the population living in the core primary and secondary poles of the Agglomerations, most of which correspond to well-served public transport areas except on the dot of the Jura and the lake shore, and lower living standards is the communes periphery and more dispersed areas [fig.4]. In addition to the concentric social disparities, the attraction to Geneva enforces the social-spatial differences through polarization on main transport axes.

The Great Geneva metropolis follows a model of integration by specialization (Decoville et al., 2013), which feeds and is fed by the socio-economic asymmetries across the border and within the French territory. In the Great Geneva, the social polarization is done through the combination of the 'border' effect and the 'metropolization' effect, increasing socio-spatial inequalities across the border and between the well-served poles and the rest of the territory.
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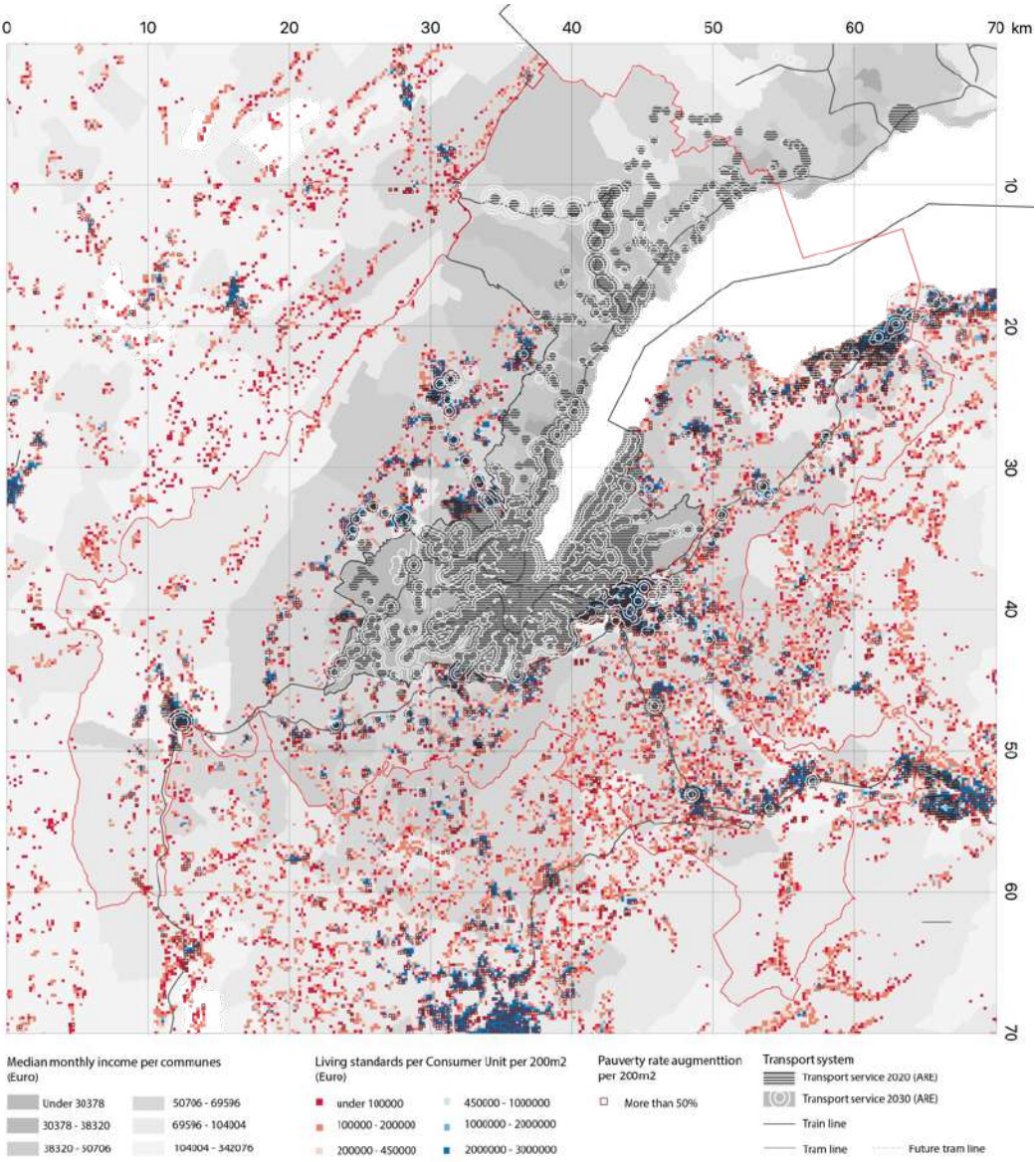

Fig 4. Living standards across the Great Geneva Agglomeration, Author, 2023. Sources: INSEE, OST.

	Job / population ratio 2009	Job / population ratio 2020	Employment 2009	Employment 2020	Unemployment 2009	Unemployment 2020
Canton de Geneve	1,45	1,67	75,3	73,5	9,5	7,7
C.A Pays de Gex	0,23	0,20	77,8	81,6	5,6	8,2
C.C Pays Bellegardien	0,34	0,32	66,4	67,7	9,9	10,7
C.C du Genevois	0,29	0,23	72,9	73,9	6,1	8,2
C.A Thonon Agglomeration	0,30	0,26	72,2	73,5	5,6	8,2
C.A Annemasse Agglo	0,36	0,31	77,4	78,9	9,7	11,9
C.C Arve et Salève	0,21	0,18	73,5	76	5,2	6,1
C.C Pays Rochois	0,37	0,33	74,5	75	4,3	6,4
C.C Faucigny - Glières	0,47	0,49	69	72,8	8,2	7,5

Fig 3. Job/population ration, employement and unemployement between 2009 and 2020, Author, 2023. Sources: INSEE, OCSTAT

A recent, fragmented and asymmetric metropolitan governance

A recent politico-institutional territorial organization

The Great Geneva is a cross-border metropolis which connects two countries with two different political and administrative systems, financial possibilities, cultural and historical constructions. Therefore, the emergence of the Metropolis as a territory of joint political action is not self-evident.
Despite the early interaction between Geneva and its French surroundings, until the 80s, the region was ruled by a laissez-faire strategy under economic impetus. The first intergovernmental relation between the Canton de Genève and the French département dates back to 1974 with the Comité Régional Franco-Genevois (CRFG). However, apart from taxation and health care agreements intended to clarify and facilitate cross-border functional integration, little to no action is taken jointly. Cross-border spatial interactions involve managing risks linked to the flow crossing the territory. Thus, the management of watercourses was the first reason for cross-border cooperation. Afterward, when road traffic related to cross-border flows began to lead to discontent among the Genevian population due to nuisance and pollution, public transport planning became Geneva's planning agenda (Gallez et al., 2013).Then, the first attempt at a cross-border spatial planning emerged in 1997 with the 'Livre blanc franco-genevois de l'aménagement du territoire', latter back-up by the 'Charte d'aménagement de l'agglomération transfrontalière franco-valdo-genevoise'. These two documents constitute the premises of the cross-border collaboration regarding spatial development. These agreements mainly intend to facilitate the cross-border infrastructural developments, highly specialized international poles, and natural preservation strategies of landscape landmarks. Despite the lack of implementation, this document already clearly defines the radio-centric infrastructure-based model of the Agglomeration around Geneva. The cross-border development of the Agglomeration then took a new dynamic in 2004 with the emergence of a new Swiss tool: The projet d'Agglomération. The Franco-Valdo-Geneva metropolis, subsequently renamed the Greater Geneva, was thus born as a project of metropolitan governance based on flexible, and voluntary intergouvernementale partnership (Walter et Roy-Baillargeon, 2015). It was only in 2012 that the Greater Geneva metropolis was constituted into a Groupement Local de Coopération Transfrontalière (GLCT). The GLCT is a Swiss public law governance structure with legal capacity and budgetary autonomy. This structure is responsible for developing the cross-border project d' agglomération, revised every four years. Therefore, the ambition of metropolitan governance today is to go beyond individual projects and to foster coherent development across the border.

The Great Geneva Agglomeration, as defined by the territorial entities who

willingly joined the GLCT, is an administratively fragmented territory. It binds not only two different national systems but also different sets of territorial actors with varying capacities in terms of planning. Constructed around the Geneva Canton, the Agglomeration encompasses the District of Nyon on the Swiss side and eight Communautées de Communes belonging to the Ain and the Haute-Savoie Département on the French side. Strong communal autonomy in land use planning characterizes the Swiss federal system. The Geneva Canton is an exception to this system. Due to its limited territory, the Canton acquired very early the competencies in spatial development and, hence, has a steady and long history of spatial planning. Therefore, the Geneva Canton has a fairly centralized system with weak communal autonomy. This is not the case for the District de Nyon. The District, belonging to the Canton de Vaud, is an institution joining 47 communes, constituting an intercommunity whose aim is to mutualize and coordinate intercommunal development projects. However, within this institution, the communes have substantial autonomy and remain competent in planning. Beyond these cantonal differences between the two Swiss parts of the Agglomeration, the Swiss direct democracy system impacts spatial planning. Cantonal and Communal referendums can refuse plans for individual urban and infrastructural developments in every Canton. That is to say, to the agreement or disagreement of the population at the different administrative scales. On the French side, despite a centralized institutional system, intercommunal structures (EPCI) have been promoted thanks to taxation and financal incentives. However, these structures do not cancel prior sub-division. Intercommunal administrative structures do not have a single regime of existence. They exercise the powers delegated to them by the municipalities. In other words, it is an «à la carte» intercommunity system. The Greater Geneva comprises two types of EPCI, les Communautées de Commune (CC) and the Communautées d'Agglomération (CA). In the Communauté d'Agglomeration, the EPCI takes responsibility for territorial planning, including local urban plans, which is not mandatory for the Communauté de Commune. In addition, the Pôle métropolitain du Genevois Français, created in 2017, is the group of eight Communautées de Commune which is in charge of cross-border cooperation. The Pôle coordinates mobility, territorial development, economic development, and energetical transition initiatives.

This fragmented spatial and political context involves complex and asymmetrical power relations in the planning process between entities with very diverse political opinions and material, financial, knowledge, experience, and human capital. As the recent change of the aggregation's name asserts, the Grand Geneve Agglomeration project is a fairly vertical structure where the canton de Genève has the leading role.

The Grand Geneva Plan d'Agglomération

The Great Geneva's cross-border cooperation is structured around the Swiss federal planning tool of the Projet d'Agglomération. The Agglomeration project is the realization of a paradigmatic shift in Swiss planning at the turn of the century. They support a new territorial vision that asserts the turn toward metropolitan concentration of urban development. This vision is a breakthrough from the previously supported nationwide distribution of urban development called Decentralized Concentration (fig.6). Walter et Roy-Baillargeon (2015) describe the Projet d'Agglomération as part of a New Regionalist paradigm in planning, fostering flexible collaborations and unofficial processes to mitigate the externalities generated by territorial imbalance. The Projet d'Agglomération inaugurates a new kind of metropolitan governance to develop a «vertical, horizontal and multisectoral» (Union des Villes Suisses, 2016) cooperation between the different national and international territorial scales. This cooperation tool aims at the «efficient coordination of transport and urbanization» (Union des Villes Suisse, 2016) to promote territorial coherence. Federal funding supports the agglomeration project implementation. These funds enable the confederation to co-finance agglomeration measures, up to 45%, if, and only if they are associated with mobility infrastructures. In addition, the allocation of these funds is subject to the organization of urban development around public transport infrastructure following the objectives set by the Loi fédérale pour l'Aménagement du Territoire (LAT). The revision of this law in 2014 directly aims at stemming sprawl and requires the coordination of urbanization and transport with the explicit ambition to develop «compact built environments» (LAT, 1979). Therefore, new developments are set in existing polarities to reach « efficiency criteria» and justify infrastructural investments, firmly cutting with the fine grain and highly subsidized multimodal transport system that characterizes the Swiss context. Through federal financial support and normative measures, the Agglomeration Projects promote a Swiss type of Transit-Oriented Development (TOD) model for metropolitan areas.

Therefore, the Great Geneva Agglomeration Project is based mainly on a Swiss tool and depends on Swiss federal funding. Following the guidelines, and since 2004, the four last editions of the Projet d'Agglomération of the Great Geneva promote a radio-centric TOD model. Since the first occurrence of the plan, it has rooted the cross-border coordination in a vision based on infrastructural corridor development around the tramway network and punctual development based on the train network. This structure aims to connect the city of Geneva to the existing French polarities and to structure new poles of urban development in rural communes where access to Geneva would be enforced. Therefore, the plan's logic is to integrate urban development and densification into transport infrastructure development, opposing the «sprawled» development of the

Agglomeration in the past 50 years. Meanwhile, this model is used to construct a discourse promoting natural landscape continuity and its value on both sides of the border. Since the last version of the Agglomeration Plan (PA4), the radio-centric Transit-Oriented Development model supports the vision of a «green, multipolar, compact, and proximity-based, cross-border metropolis» (PA4, 2021, 24) with new public transport axes as its backbone. The TOD model aims at bringing « coherence » to the cross-border Agglomeration. This development model is also at the heart of the Agglomeration's recent commitment toward the socio-ecological transition, which includes carbon neutrality and zero net artificialization by 2050 (Charte Grand Genève en transition, 2022).

TOD in an asymmetric metropolitan context

The TOD model leading Great Geneva's development is set in the asymmetric cross-border context. The radio-centric reading of the Agglomeration, asserted by the first set of PACA studies (Perimeter d'Aménagement Concerté d'Agglomération), was intended as a mean to go beyond the typical center-periphery or French-Swiss split of the Agglomeration (Quincerot, 2009). Nevertheless, the undifferentiated vision established another form of duality where the spaces «outside the networks» are gradually being disregarded without annulling the cross-border asymmetry.

First, the plans are based on a unique tool created within the Swiss context and then applied to the cross-border situation. However, different tools, regulations, and policies in both planning systems across the border affect the coordination of transport and urbanization. This lack of harmonization further asserts asymmetry between both sides of the Agglomeration. For example, regarding land use, the Swiss Canton has been developing early protection mechanisms for natural and agricultural lands. The "surface d'assolement" (crop rotation aera) is the census of the protected agricultural land per Canton. The Canton has to safeguard these agricultural surfaces at the risk of losing planning competencies. In Geneva, the remaining agricultural land is reaching the limits of the mandatory "surface d'assolement". This led to the recent cancelation of specific projects. In France, so far, a similar policy has yet to be applied. Hence, new urbanization on bear land is 'naturally' set on the French side.
Another example is the tools tithing together urbanization and transport. In Switzerland, due to the direct democracy system, no planning tool can condition infrastructure development to urban development. Indeed, the communes and Cantons' population can block the development of either urban or infrastructure projects. On the other side of the frontier, planning, and transport actors have used the tool of the" Contrat d'axe" to implement cross-border tramways. This is a contract between planning and transport actors which allos to combine density-diven development projects to a public infrastructure

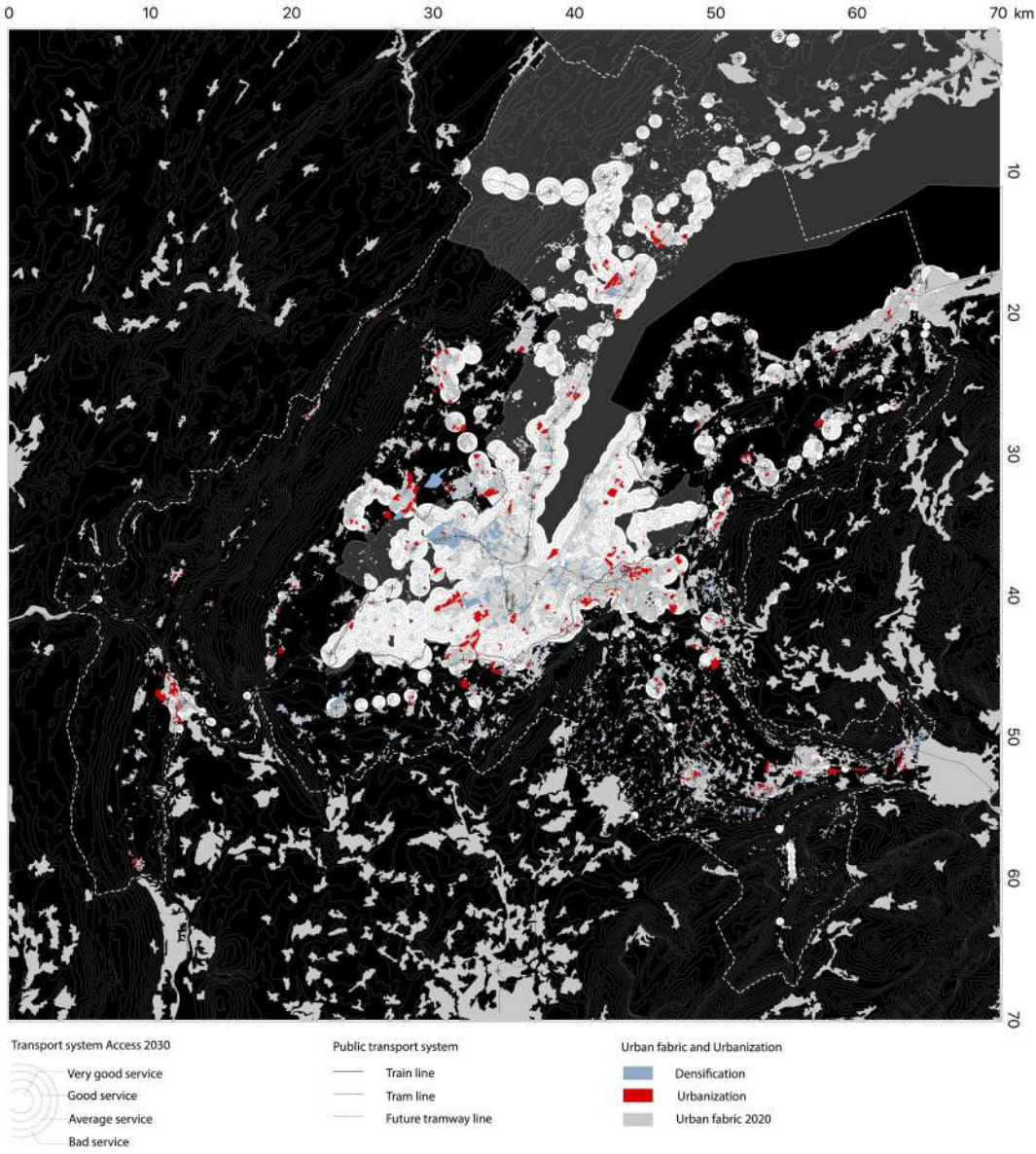

fig 5.Urban form , denstiy and mobility project, Author, 2021. Sources: SITG.

project. Therefore, here again, and across the same infrastructure, only one side of the Agglomeration is bound to participate in the urban development of the metropolis.
Second of all, nearly all the urban structures outside the radio-centric model are defined as 'villages' in the first agglomeration plan, whether qualifying actual Swiss villages or secondary or small French centers [fig.5]. In the fourth Agglomeration Plan, the urban fabric outside the main network axes is erased in the transport plans and vision of Greater Geneva 2040 [fig.6]. Thus, the TOD vision proposed by the Agglomeration Plans increasingly ignores the question of spaces 'in-between', the principal axes and poles. Embodying the strongly selective and normative bias of the TOD logic, it opposes good compact urban forms well-served by public transport and bad urbanization condemned to car-dependent or relegated to aesthetic and ruralist values. Nevertheless, this normative stategy does not impact the Agglomeration equally due to the difference in development patterns and existing infrastructural capital on both side of the border. On the French side of the Agglomeration, more than 80% of the current population lives in these 'in-between' spaces[6]. Therefore, the dominant vision for Great Geneva neglects the pre-existing urban context in favor of a hyper-selective and hierarchic growth-oriented model aimed at hosting Geneva's workforce rather than integrating the French edge regions.

Hence, the radio-centric TOD model, as Greater Geneva's leading development figure, embodies the aggregation's asymmetrical development. Even more so, it continues to externalize Geneva's metropolitan problem toward the French side of the Agglomeration. By doing so, it takes the risk of enforcing the current state of spatial differentiation and social unbalance on the edge of the Metropolis. With the transition objective and the territorial coherence it demands, it is critical to question the theoretical TOD model roles in the asymmetrical metropolization dynamics.

Notes

1 Cross-border workers residing in France in 2019, OCSTAT.
2 Employment numbers in the Canton de Genève between 2009 and 2020, OFT.
3 Dossier complet des Intercommunalité between 2009 and 2020, INSEE, 2023.
4 Calculated on the base of poupulation and work ratio, OST, 2020.
5 Population and employement increase between 2009 and 2020, OST, 2020
6 Calculated through GIS combinaing the Desserte 2030 and urban localized density 2020 SITG

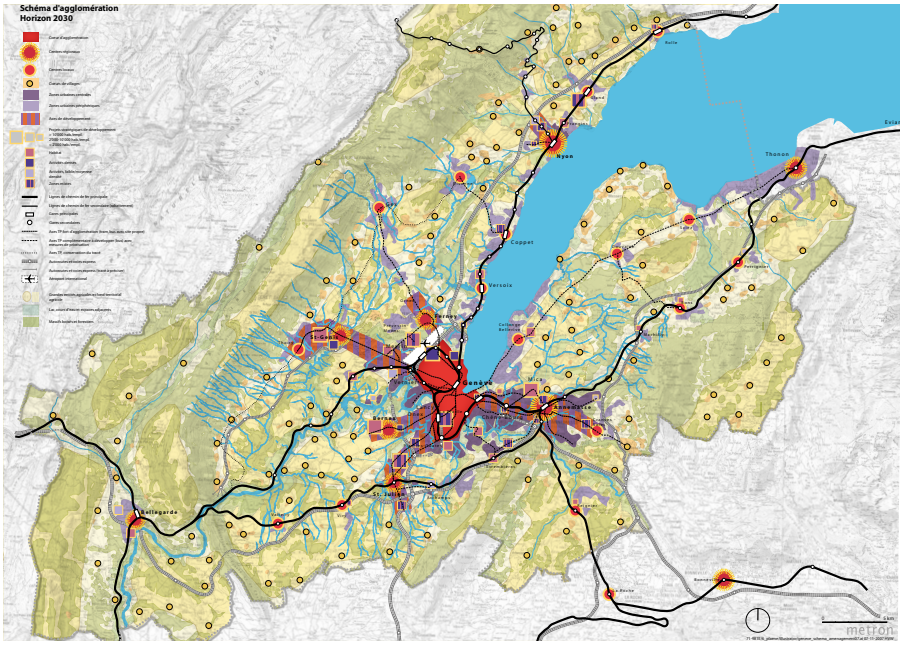

Fig 6. Schéma d'Agglomération Horizon 2030, Premier Projet d'Agglomeration (PA1), 2007. Sources: Grand-genève.org

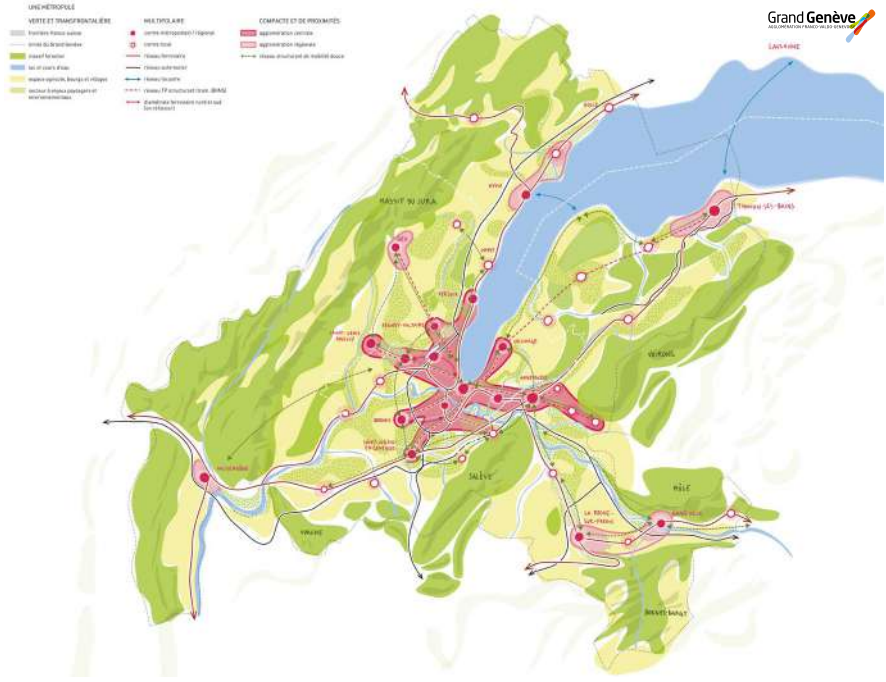

Fig 7. Vision d'ensemble du Grand Genève 2040, Quatrième Projet d'Agglomeration (PA4), 2021. Sources: Grand-genève.org

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TRANSIT ORIENTED DEVELOPMENT (TOD) FOR RURAL-URBAN REGION
Lessons from Practice

Mobility is a potent vector for development. In the Geneva cross-border context, the wage differential on either side of the border is a second determining factor. Theoretically, transport infrastructure development should be done according to existing or potential demand, that is to say, according to the importance of flows and the origins-destinations of trips. However, today's society has reached such opulence that the reverse is just as valid. Thus, we observe that establishing infrastructure leads to a specific form of urban development rather than another.

The notion of supply and demand 'elasticity' also confirms, from a mathematical point of view, the importance of supply. Indeed, this law links an increase in supply to the proportional increase of demand, within one factor. In other words, if I build a new road with a constant population and job supply, the traffic will mechanically increase by a certain factor (the elasticity factor). This increase is called the "induced traffic". The reverse is also true and follows the same mathematical rule called "traffic evaporation". By removing a road, trips will be made according to another route, another mode of transport, or another schedule, but part of them will no longer occur.

Thinking about the offer allows identifying the "mechanical" characteristics of the different modes of transport. The two main factors are:

- The individual or collective nature of the mode of transport will determine the **variety of origins-destinations and timetables**. The two groups are, on the one hand, the pedestrian, the bicycle, the motorized two-wheelers, the car, and the taxi, and, on the other hand, all public transport modes.
- The speed, and, therefore, the **feasible distance** for daily journeys (fig.1).

The other characteristics, such as transport cost, nuisances, health gains, and resources (land, fuel, etc.), are only very marginally involved in mobility choices. Travel time, particularly, is a very subtle determinant. Zahavi observed a relative constancy in daily travel time («travel time budget», fig.2). Indeed, the improvements made to the metropolitan transport networks over the past 30 years have enabled residents to settle further away and not to reduce their daily transport time. Observation of border areas (Geneva, Luxembourg, Ticino) also shows that cross-border workers are ready to devote more extensive time to daily transport, as if transport time, fatigue, and various nuisances had little weight compared to better salaries.

With these different considerations, the natural (mechanical) forms of development are:

- **Monocentric or polycentric oil stain**. Because of their flexibility and ability to accommodate unique trips, individual transport promotes urban sprawl and sparseness.
- **The urbanized corridor**. This form stems from a service by urban public transport (tramway, BHLS, concentration of bus lines on a common trunk). The development is favored along a public transport line according to the area of attractiveness of the stops. Urban development is generally based on several urbanized corridors, and the built territory takes the form of fingers.
- **The pearl necklace.** This shape corresponds to a suburban rail network. Stations are points of great attraction along a route served by a railway line. Depending on the number of stations operated, such a configuration develops over 20 to 50 km on either side of a metropolitan center.

To these general considerations, several additional factors act to guide the territorial development of the Greater Geneva from a mobility angle:

- **Border effect.** Compared to France, the Swiss conditions (taxation, institutions, and stability) are very attractive for companies. At the same time, the construction of housing on Swiss soil cannot respond to the employment increase rate. Therefore,these inhabitants/jobs differential on either side of the border involves increasing border commuters (100,000 cross-border commuters in Geneva at the end of 2022).
- **Urban density threshold.** The analysis of population density, modes of transport, and services (shops and facilities) highlights a few thresholds (see fig.3). When the density is lesser than 25 inhabitants/ha, absolutely no mode of collective transport is economically bearable by the community. With such density, the dependence on the car is total. With a density of between 25 and 80 to 100 inhabitants/ha, the density is sufficient to allow the establishment of a bus offer whose level of service will depend on local conditions and the density of inhabitants. With more than 100 inhabitants/ha more structured public transport: BHLS, tramways become possible

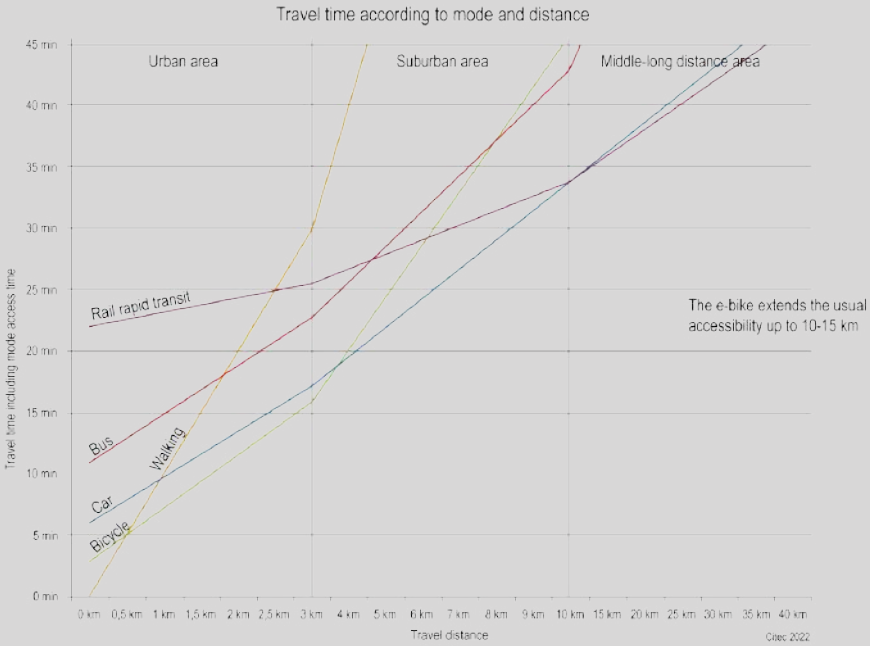

Fig. 1 Transport system efficiency in urban area, Citec, 2022.

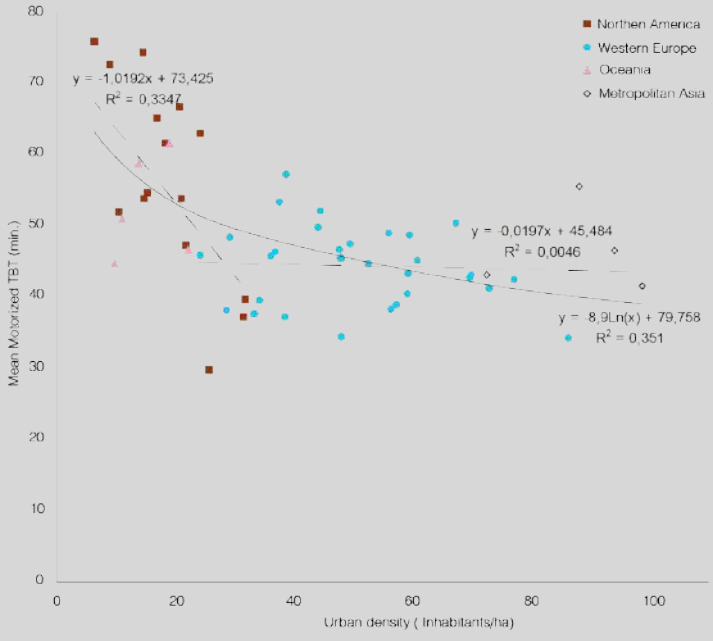

Fig. 2 Zahavi 's Law, Time budget per day for transportation (Joly, 2005).

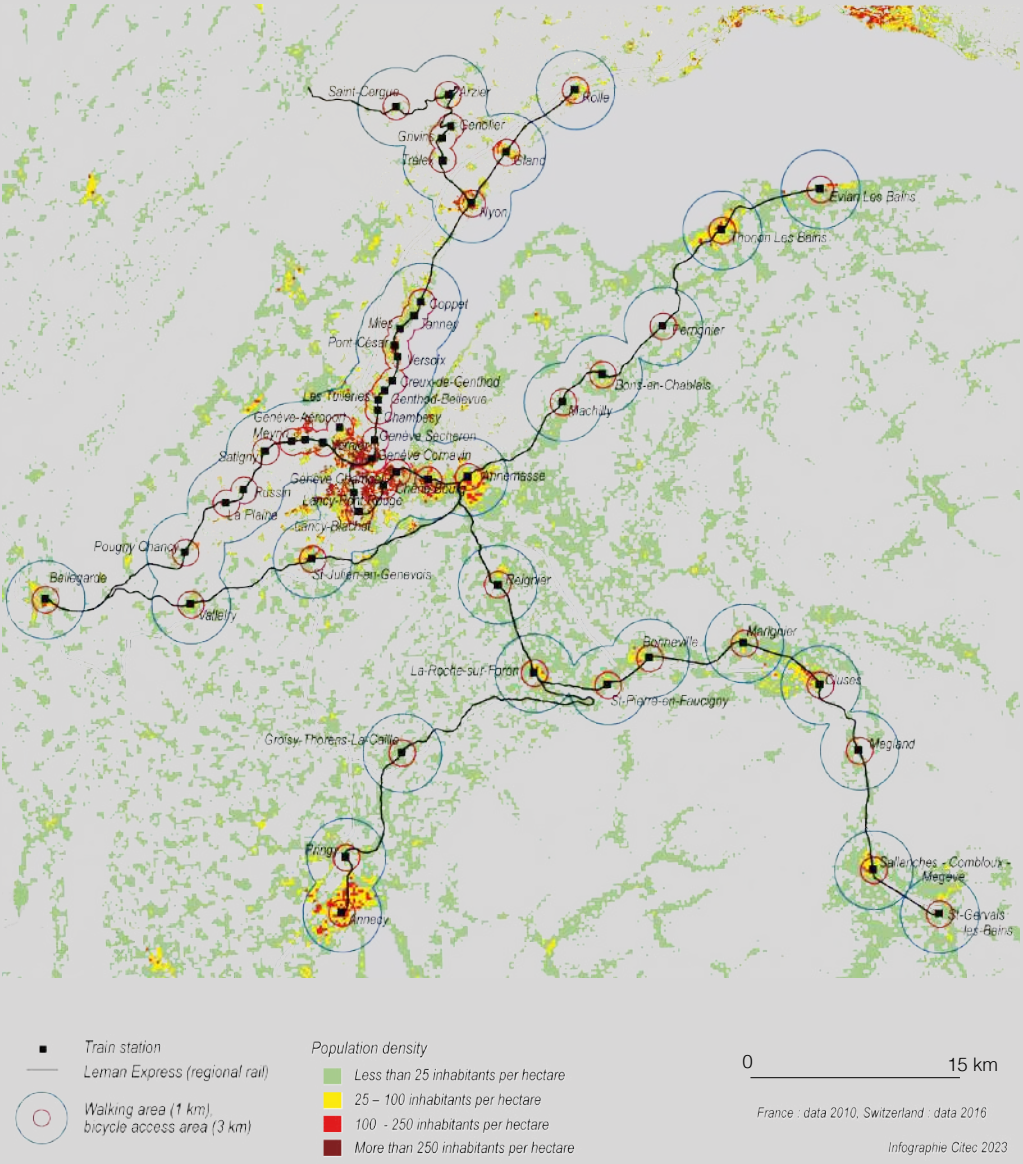

Fig. 3 Urban density and access areas, Citec, 2023.

or relevant. Unfortunately, most of the cross-border territory has a very low density (fewer than 25 inhabitants/ha). Urban development must be thought to make car alternatives possible, in other words, to concentrate new neighborhoods in areas accessible on foot from stations or along existing bus lines to improve efficiency.

- **Offer threshold.** If a public transport offer is low (frequency or time amplitude), it is only suitable for a limited amount of travel purposes. Maslow's pyramid defines the order in which human needs must be satisfied before moving on to a higher stage. Similarly, levels of transport supply can be defined corresponding to travel motives and user profiles. As with Maslow's pyramid, this inverted pyramid involves satisfying a certain level of need before covering patterns and a wider audience (fig.4).
- **Networking service lines as territorial development progresses** (fig.5). Territorial expansion follows an organic logic. The trip is always generated based on a reason and an attractive destination. The lines of desire towards this attractive point establish a "centrality-periphery" binomial. The initial centrality was often a fairground, a place of power, a bridge, a crossroads. Initially, the lines of desire towards this centrality followed paths (path, roads, watercourses). Urban settlements occurs first along these paths and are organized with varying intensity (central districts, suburbs). Without geographical constraints, this organic logic gives a star structure with a displacement network according to radials (first stage of development). As development progresses, the capacity of the network becomes insufficient. Mechanically, secondary centralities become attractive from a congested center for specific needs, and tangential movements (not passing through the center) become interesting. This second stage sees the appearance of "bypass" roads, and the urban network takes on a radio-concentric or checkerboard form. In the case of Geneva, the configuration is radio-concentric for the road (urban belt, bypass motorway) and radio-centric for public transport, except for the Leman Express. The tram network is still star-shaped, although a circular line through the middle belt is under study. A third stage of development is visible in the case of metropolises. In this case, the extent of the mesh network becomes much larger than the one necessary to cover the usual and daily travel needs. Nevertheless, the center-periphery logic is always visible for significant facilities (universities, hospitals). The metropolitan dimension can be read at different scales. Is it the Greater Geneva metropolis or the Lake Geneva metropolis? Both entities are possible.
- **The determinant of car ownership.** Is owning a car the consequence of a need for mobility or the cause of a mobility behavior? The analysis of the 2015 micro census for the canton of Geneva shows that the mobility behavior of a motorized or non-motorized household is fundamentally different (fig.6). A motorized household will mainly use the car for its trip, and a non-motorized household will travel mostly with other modes. The

interest of the analysis is to observe behavior according to the place of residence. Indeed, in the city center, the public transport offer is generous whereas the further one goes towards the countryside, the more the offer is reduced. **The disturbing result of the analysis is that for a motorized household, the use of public transport remains low and constant regardless of whether one lives in the city, in the suburbs, or the countryside.** In other words, for a motorized household, the level of public transport supply has no impact on the modal choice. This observation underlines the importance of designing a territorial development to make it easy to live without a car. If I implement an urban development with the required qualities, living without a car is possible, and a growing public adheres to it. If I develop the territory in a traditional way, with a sufficient parking supply, the dependence on the car is reinforced.

- **The carbon footprint.** Climate issues involve decarbonizing mobility, representing around 35% of the production of greenhouse gases. The transport of goods represents between 25 and 30% of emissions, and passenger travelers the rest. For travelers, the distance of the journey by car is decisive. In Switzerland, in 2015, only 12% of trips were longer than 25 km, but these journeys generated 84% of emissions. Distance is, therefore, a determining factor, and indeed, cross-border commuting and many leisure trips have this characteristic of distance and modal choice. **According to the organic, physical, and mechanical logic presented above, a natural territorial development of Greater Geneva is therefore contradictory with the objectives of decarbonization.** Massive recourse to the electrification of the vehicle fleet is not enough since it is considered that the overall balance of electric vehicles (including battery production) makes it possible to halve the CO2 impact but not eliminate it. There is, therefore, a challenge in organizing the development of Greater Geneva in a very proactive way and according to modes other than the car.

In a given territory, how can mobility practices evolve as a planner? We mainly have three fields of action:

- **Locate new inhabitants and new activities with relevance.** Organizing development by locating new housing, new jobs, and new services or equipment makes it possible to reduce travel distances and locate them in a context where alternative transport to the car is efficient. Unfortunately, acting only on new arrivals very marginally modifies the balance between modes of travel. Indeed, in the case of Greater Geneva, the new inhabitants by 2040 will only represent, at best, 20% of the current inhabitants. Even if these inhabitants make perfectly sustainable mobility choices, the existing imbalances still remain the same.
- **Develop new infrastructure or transport offers.** A new motorway in

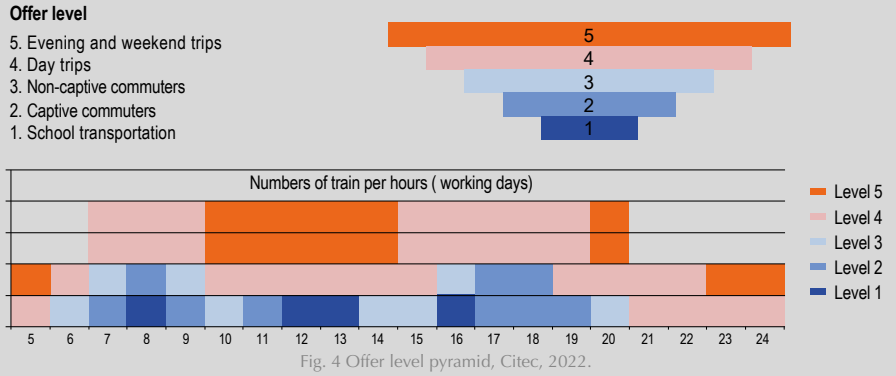

Fig. 4 Offer level pyramid, Citec, 2022.

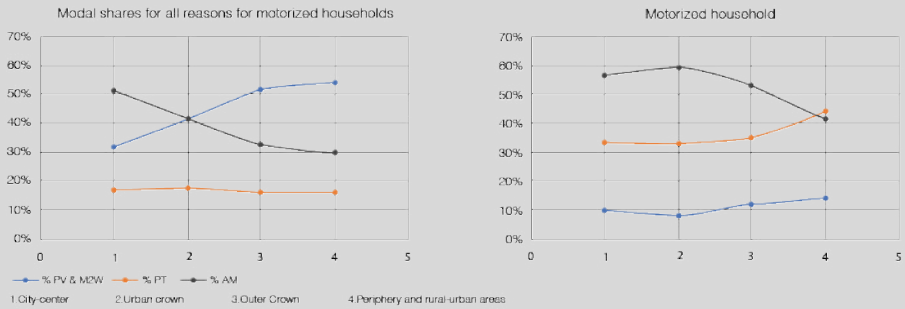

Fig. 6 Motorized and non-motorized households. Citec, 2022.

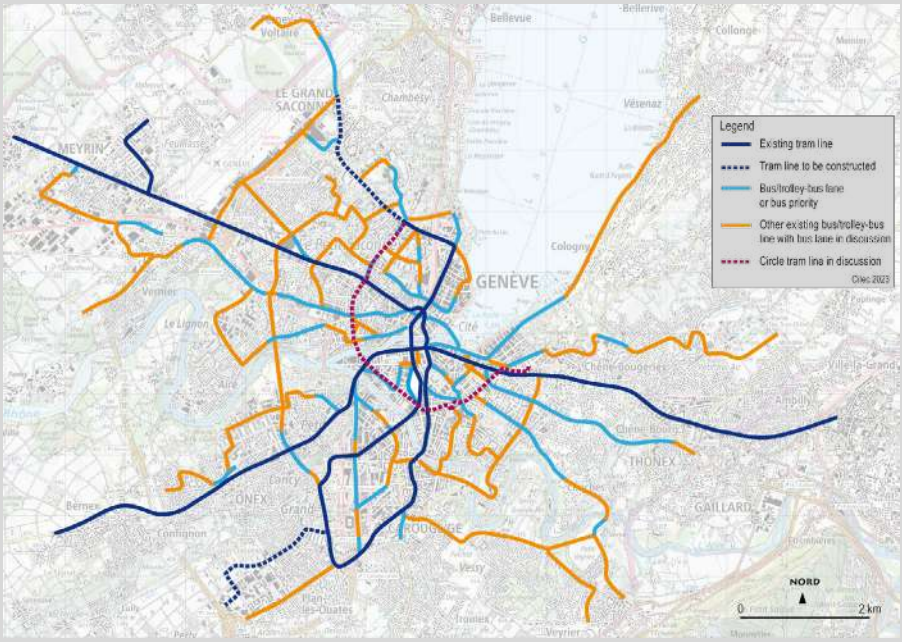

Fig. 5 Desired evolution of the urban public transport network. Citec, 2022.

Chablais or widening the Geneva bypass motorway to three lanes will necessarily increase car traffic, contrary to climate objectives. Conversely, adding stations to the Léman Express network or increasing the frequency of trains will naturally favor this mode and increase the number of public transport users. In most European cities, this strategy of increasing the public transport offer has been successfully followed for a generation. However, it should be noted that it bears fruit, especially in the city, in well-served areas. What about the rest of the metropolitan territory? It should also be noted that constructing new infrastructure requires a lot of time and resources. We can consider that nearly 95% of the transport networks that will exist in 30 years have already been built.

- **Use existing infrastructure differently.** This third field of action is the most important quantitatively in terms of the speed of the implementation and its effectiveness. On the other hand, it requires great political courage and a lot of pedagogy to obtain support and acceptability. This involves, for example, reducing the speed to 30 km/h on all urban perimeters to facilitate the integration of pedestrians and cyclists. This consists of allocating part of the road space to other modes of travel and functions other than traffic and parking.

In summary, urban forms develop naturally, according to organic logic. For mechanical reasons linked to the flows, the usual configuration of development results in a radio-concentric diagram more or less modeled by the conditions of the site (topography, borders, etc.) and the founding rules of implantation. With these premises, each mode of travel reinforces a type of natural development: like an oil spot for the car and, to a lesser extent, the bicycle, like a finger development for urban public transport, like a pearl chain for the railway. Responding to climate and sustainable development objectives involves planning for newcomers (a strategy that concerns about 20% of the future population) and reusing current infrastructure in favor of alternative mobility to the car (an approach that affects most of the current population). Somewhat caricatural, any development based on the car is incompatible with the current objectives, even with a total electrification of the car park. From the standpoint of mobility, any urban development in rural or peripheral areas should be avoided unless it reinforces, with a density significantly more significant than 25 inhabitants/ha, a corridor or an area already served by public transport.

INTO THE TERRITORY

View from a pedestrian path, Puplinge, Author's picture.

Contributions

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Contribution Jully 2023
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built residential fabric is denser in Thônex, downstream (south) of the Seymaz and the Foron rivers. Green fingers cross the plain between Foron and Seymaz, parallel to the road to Mon Idée, an East-West pendular traffic axis running between the border and the Leman eastern shores crossing the road running North-South between Douvaine, Jussy, and Thônex and crossing Puplinge, a village undertaking also densification while trying to maintain its agricultural land, 2/3 of this commune, conserving a landscape of relatively rural character.

The transect between Seymaz and Foron can be divided into 3 sequences:

1. From the Belle-Terre new housing site to La Seymaz River
The EPFL-ENAC research team arrives by public transport from the center of Geneva in the new eco-district of Belle-Terre (pict.1), which is still under construction. This 5th of September 2022 is summarily, and the first impression when getting off the bus is to arrive in an overheated mineralized space. We pursue on foot, cross a newly planted park space bordering a wide field covered with semi-spontaneous vegetation, suggesting the new urban extension to come (pict.2). We then reach the edge of the forest of Belle Idée, taking advantage of the freshness provided by its canopy and a recently vegetated swale running along it. Then we head North towards the green spaces of the psychiatric and geriatric hospitals, cross their car park, then the road Mon Idée at its bridge of Pont à Bochet.

2. From Champ Dollon jail center to the village of Puplinge
We then follow the access road to the Champ Dollon penitentiary center, which follows the Seymaz river's banks, an Arve tributary, renatured in 2005. A couple of hundred meters later, before reaching the facility of the jail, we branch off onto a dirt road signposted as a hiking trail crossing the agricultural plain, a popular promenade (pict.3). Heading east, the hikers enjoy a view of the Alps, with the Mont Blanc visible with clear weather. Closer lies the forested pre-Alpine range of les Voirons, where the Foron River originates. The Foron waters are French, but its upper left bank marks the border with Switzerland. We cross a space of allotment gardens, showing active urban gardening uses. We follow large cereal and vegetable field crops, as the path follows wooded cordons populated by large oaks and willows. The trail runs then along the edge of an agroforestry experimentation plot, composed of orchards, ponds, and gardens, showing a great diversity of plants. Even though the land and initiative are private, the place and its crop are of common use, and information on organic gardening technic provided to the visitors along the path. About one kilometer further, we reach the village of Puplinge, walking by a neighborhood of villas and fenced gardens. After crossing the center of the village, relatively mineralized but of rural character, we reach the Cornière route, which leads a few hundred meters eastwards to the border. A farm on the outskirts of Puplinge offers some locally produced fruit, grapes, and plums. We are happy to

Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

Picture 6

buy some tasty fruit and juice before reaching the border at Foron. Except for agricultural and local vehicles, the road has been closed to motorized traffic (pict.4). The farmer we meet at the shop says to welcome this restriction for safety and quality of life. She says it improves local mobility with agricultural machinery, and the road reserved for pedestrians, cyclists, and local residential mobility make shopping at the farm more attractive to customers, as they mostly come from the village nearby.

3. From the Foron River to Annemasse train station

We then joined a technician from the Syndicat Mixte des Affluents de l'Arve (SM3A) who explained to us the Franco-Swiss partnership which allowed the renaturation of the Foron River: the Auvergne Rhône-Alpes Region, the Haute-Savoie department, and the Canton of Geneva - resorted to national authorities to adjust the border. At the same time, the space of the watercourse has been remodeled and expanded. This renaturation makes it possible to secure homes by preventing flooding and from renaturing the rivers' ecosystem, consolidating an ecological corridor between the Voiron's massif and the Arve in which it flows. The technician invites us to cross the Foron jumping over stones lying in the riverbed, and shows the way to Annemasse station (pict.5). We rapidly go through the parking lot of the supermarket (pict.6), a vast impervious and treeless area adjoining the river and its forested edges. Then we pass through a suburban housing area of Ville-la-Grand, skirting the mostly exotic hedges of the one-family villas' fenced gardens. Passing through various fallow and restored land areas and construction sites, we reach the train station of Annemasse, where we aim to catch the Léman Express in the direction of Perrignier. The train happens to be largely delayed due to a traffic overload of the railway infrastructure.

The representation of the territory below shows the main environments crossed by the transect. It highlights the interfaces between the built and non-built areas represented by the urban edges (fig.1). The transect reveals an intense dynamic of landscapes at the urban edges of Greater Geneva. The interdisciplinary Interreg project team defined urban edges as «unique places, composed of diverse habitats, that are more or less connected and under the influence of nearby urban, agricultural and natural areas» (Bailly et al. 2020).

The city and the countryside meet at the fringe or urban edge; they dialogue and compete for space between multiple users. Nourished by these various rural and urban influences, they are «third» places offering social, ecological, and landscape qualities to the built and open spaces, whether natural, semi-natural, or cultivated. They are places of recreation, sensory experience, and revitalization for the inhabitants. Private, public as well as common uses rub shoulders there.

The ecosystem services urban edges provide depend on the quality of their soils and the presence of multiple strata of plants, sometimes with aquatic and mineral structures. The qualities and services of urban edges are best when they form green (vegetated) – or/and blue (aquatic), yellow (cultivated), and black (dark areas deprived of light pollution) - continuums favorable to the mobility of wildlife. They are also privileged places for the cohabitation between soft mobility networks and ecological networks, linking various types of «centralities», between biological reservoirs (of great naturalness) and urban centers (intense anthropogenic uses). These interfaces form wide, thin, or intermittent spaces of transition. The spontaneous and ephemeral character specific to urban and rural wastelands characterizes many urban edges (Vanbutsele & Decleve, 2015). These places are welcoming, inclusive, and diverse recreational activities practiced by individuals or groups, often daily, in all weathers, at all hours. They are places for the young to meet, for children to play and discover nature.

The landscape around the urban edges is particularly dynamic and fluctuates at the rate of new constructions and the extension of various infrastructure. Each construction requires stripping previously vegetated surfaces, cutting or extracting trees, and earthwork (fig.2). These landscape movements in between pictures taken of the territory over time are readable and measurable by the representation below. It shows in blue the surfaces which have a lower altitude (therefore have been cleared), and in red, the surfaces which have increased in height (therefore have been built). Surfaces with sharp edges are built surfaces, and more undulated are vegetated surfaces. The dynamics of the landscape between 2009, 2013, and 2017 (map below) make it possible to distinguish changes in the following landscape structures:

1) Earthwork and digging to make a place for the future buildings of Belle-Terre (now erected)
2) Clearings in the forest of Belle Idée, selective cutting to rejuvenate the forest favoring oaks
3) Cut off some trees along the Seymaz near the Pont à Bochet to widen its bed (and then replant)
4) Cuts in the woods near the penitentiary Champ Dollon, including to the North for a new parking
5) Vegetation growth along the wooded strips of the Seymaz plain on its protected greenway
6) The construction of a new residential area (Frémis) in the village of Puplinge
7) Cutting of trees in the wooded corridor along the residential areas of Ambilly, to widen the bed of the watercourse and renature its banks
8) The new constructions of the Moulins Gaud residential buildings and the supermarket nearby.

Above all, this landscape dynamic is due to urban growth, and it is obviously

particularly active near urban edges. The Great Geneva is an Agglomeration that experiences one of the fastest urbanization rates in Europe. Therefore, its urban edges are particularly prone to both grow and transformation.

However, it is also about understanding the contribution to the ecological infrastructure that urban edges can have if we allow them to express their environmental qualities or functionalities. The cartography representing the ecological infrastructure of Geneva (fig.3) identifies the spaces constituting biological reservoirs, relatively large natural corridors, and finer biological connections. It also allows us to determine where the values of biodiversity and ecosystem services are weaker (yellow) and could thus be reinforced. The extracted map below shows the result of a spatial resolution of 25x25 meters, with pixel evolution from 1 to 100. The more densely urbanized areas and areas along the lines of transport infrastructure, including the walked transect along the roads of Jussy, and Mon-Idée, are in yellow. By contrast, one sees in dark green the higher biodiversity values of land areas along waterways, such as the Foron and the Seymaz. Indeed, the biodiversity and ecosystem services' values are excellent where green and blue infrastructure meet (Finger-Stich, 2022).

Honeck et al. 2020 explain the method by which the Green infrastructure for the canton of Geneva (and now also for Greater Geneva) has been assessed, by informing: Species composition (900 species of fauna and flora, with their spatial distribution); Habitats (organized in over 80 categories); landscape Structure (habitats' fragmentation and connectivity and ecosystem services (pollination, carbon sequestration, water quality regulation, erosion control, regulation of microclimate and quality of air according to foliage).

A proportion of 30% of a total land's territory forming a high biological quality network is considered a condition for the ecological infrastructure to be functional and to be able to provide the ecosystem services necessary for society (Aichi Convention on Biological Diversity agreement integrated into the national and cantonal strategies for biodiversity). Currently, the portion of the territory of the canton of Geneva considered of sufficient quality (with a biological value evaluated at 70-100 points) is 20.5% of its total land surface. This entails, as an objective (according to the Aichi commitments), for the canton of Geneva to increase the quality of 10% of its territory (of which 7% for biological reservoirs and 3% for biological corridors).

To understand the interest of superimposing the models and GIS representations of the ecological infrastructure with that of the urban edges, we will briefly develop three issues that the transect illustrates: the issues of biological connectivity, the issue of accessibility to green spaces or urban forests, and the issue of soil quality. By recognizing not only the landscape as a base or «socle» but as a dynamic matrix, we argue that urban densification should adjust differently according to the actual and potential qualities of each place, environment, and habitat.

Fig. 1 Greater Geneva GIS representing potential urban edges, Dubois A., HEPIA, 2020.

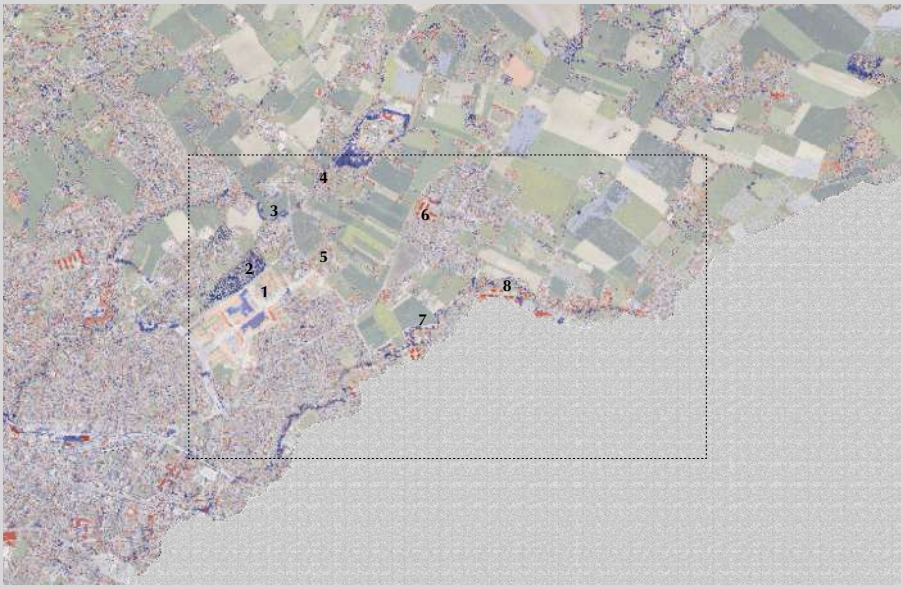

Fig. 2 Geneva landscape Evolution MNS (Numérique models of surface mapping), with LIDAR pictures taken in 2009, 2013, and 2019. Dubois A., HEPIA, 2020.

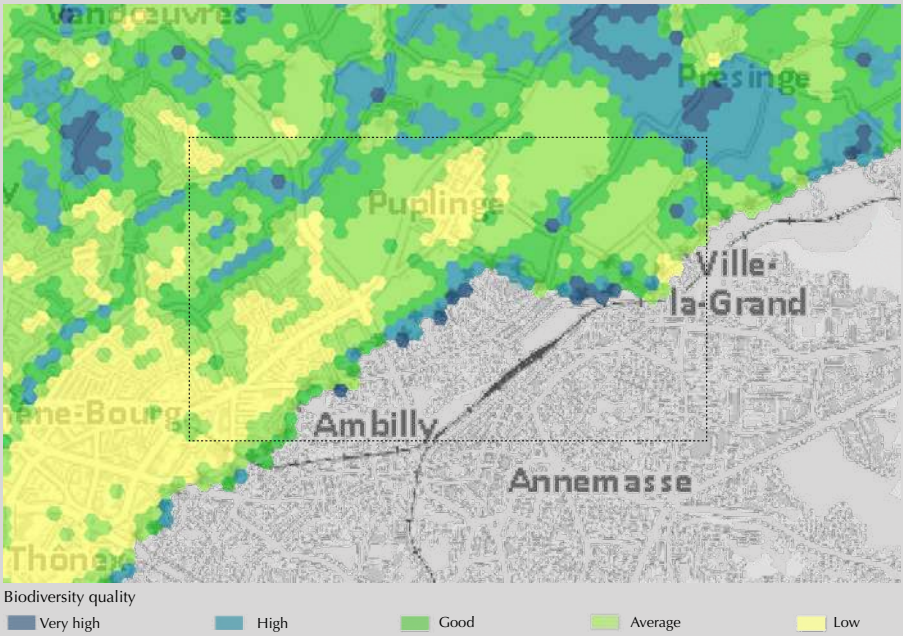

Fig. 3 The green infrastructure of Geneva (canton), SITG, 2023.

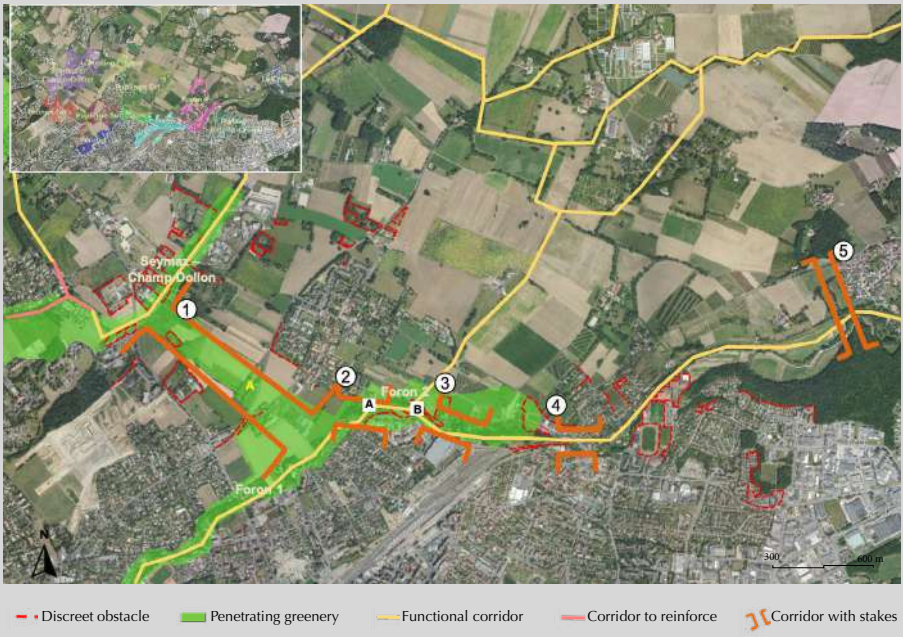

Fig. 4 Urban edge: potential connectivity maps, Sophie Komaromi, 2020.

Issue 1: biological connectivity
On the transect taken during the workshop, we can identify some obstacles to connectivity to be resolved or potential areas critical for landscape connectivity that could be strengthened through appropriate planting and adapted or less intensive land uses.

The municipality of Puplinge plans to reinforce and protect its greenways by reviewing its agricultural planning and limiting urbanization. It aims at moving allotment gardens out of the greenways' passage (the yellow arrow on the map below), by consolidating its soft mobility network in line with cantonal master plans for pedestrian paths and with paths surrounding the nearby French municipalities and the growing transboundary public transportation offer, of which the Annemasse train station is a new centrality. The Directing plan of Puplinge aims at developing its pedestrian network in an inter-municipal and cross-border way, crossing more densely built-up areas and rural areas.

Biological connectivity is based on the composition of the species present and their capacity to be mobile between biodiversity reservoirs. It must minimize the obstacles to the movement of species, such as seen on our itinerary, the cantonal road of Jussy, and the significant light pollution generated by the Champ Dollon jail. It can also strengthen biodiversity values by reinforcing the bocage by planting species adapted to climate change and the local natural and historical heritage. Consolidating the network of biodiversity promotion areas (SPB surfaces de promotion de la biodiversité) on agricultural land, in consultation with farmers, also offers a great potential for enhancing landscape connectivity. Contracts for regional agroecological networks constitute institutional and implementation opportunities to promote further and connect SPBs in Switzerland and possibly across borders.

The map (fig.4) corresponds to an analysis of biological corridors for fauna passage, here focusing on the hedgehog and the ermine (S. Komaromi, 2020). The study identifies the obstacles to wildlife movement and proposes measures at each numbered location. These measures aim to reduce the barriers (including the steep and concrete banks of the Seymaz) and reinforce landscape structures with woody plants. Objectives proposed by Komaromi (2020) include maintaining or increasing the structural variability of forest edges, the augmentation of the density and the canopy of wooded cordons, the planting of hedges in more open agricultural land, and where possible, in private gardens or public spaces, to favor microhabitats. It proposes safer road crossings (especially the Jussy road), including railways and other impermeable surfaces. It aims to remove or minimize the obstacles linked to the numerous fences (represented in red in the image above) and avoid or minimize the impacts of damaging land uses and pollution, including light pollution (such as around the penitentiary). The extension of residential areas must be avoided in already recognized and

monitored biological corridors, such as to the East of Juvigny, connecting the Voiron's forests with the larger forested area of the plain between Jussy, Douvaine, and Hermance (point 5).

Issue 2: Accessibility to the urban forest and other green spaces
Access to the forest by residents living at or near the Belle Terre housing quarter, as well as by youth and children visiting nearby schools and by patients and health professionals working at the nearby hospital facilities, is a significant asset for the population's well-being. The municipality of Puplinge plans to plant trees to reinforce these ecosystem services, increasing its canopy to both reduce light pollution and heat island effects - following the cantonal arborization strategy (increasing the current canopy by nearly 10%, to reach a total of 30% shaded land surface by 2050). The further development of its pedestrian paths will also improve the quality of life of its inhabitants.

Issue 3 : Soil quality
Soil quality is a key indicator of the ecosystem services that urban edges can provide. The visual assessment test of soil quality conducted near the Foron River, between Puplinge and Ville-La-Grand, shows that forested or wooded land surfaces have the best soil quality compared to the other land surfaces of the urban edge transect. Even though these riparian woods are crossed by numerous paths, causing soil compaction, the soil's deeper layers (under 5 cm) remain of good quality. By contrast, near built areas soils have been compacted (low soil structure quality = score 4-5). Finally, intensively farmed soils present a low score for their soil's structure's quality = 4-5), (K. Gondret, HEPIA, 2020, in Bailly et al, 2020).

To conclude, urban edges, these interfaces of transitions between urban and rural areas, between built and unbuilt spaces, are still largely forgotten by land use regulation and land planning processes. However, without addressing them explicitly, there are many policies, strategies, laws, regulations, and institutionalized planning processes to strengthen their qualities, such as river contracts, regional contracts for protecting or reinforcing biological corridors, regional or cantonal agroecological networks, and biodiversity promotion areas; classified wooded areas (at the municipal or district level of planning in France); various water - forest - pastoral and soil conservation / sustainable management strategies; biodiversity action plans; landscape quality promotion subsidies (Swiss farming law), cantonal – city or municipal level arborization strategies; regional (greater Geneva) or city level (Geneva) climate mitigation and adaptation plans; and also pedestrian mobility plans.

At the scale of the territory visited, we can underline the importance of the regional ecological infrastructure. However, it needs to be reinforced as urban extension and densification continue, together with the development of roads

and various types of public transportation by rail and bus lines. Even the development of lanes dedicated to soft functional mobility can conflict with biodiversity, as when the Via Rhôna cuts across greenways (pénétrantes de verdure), or when they entail sealing soils on the edge of watercourses and forests, such as along the Foron at Ville-La-Grand.

However, addressing mobility issues from the wildlife standpoint, particularly at urban edges, can be treated in concert with improving pedestrian mobility. This could consolidate the regional ecological infrastructure as a structuring network of the Agglomeration of the Greater Geneva.

Thinking about the porosity between the built and non-built fabrics of the transboundary Agglomeration is key to better integrating nature around- and in-the city and valorizing the ecological qualities specific to each place in the project territory. Near urban edges, densification must be more permeable, allowing continuities of the green and blue mesh to persist, giving space and depth to transitional environments for deploying a landscape dynamic that engenders ecological, environmental, and social qualities.

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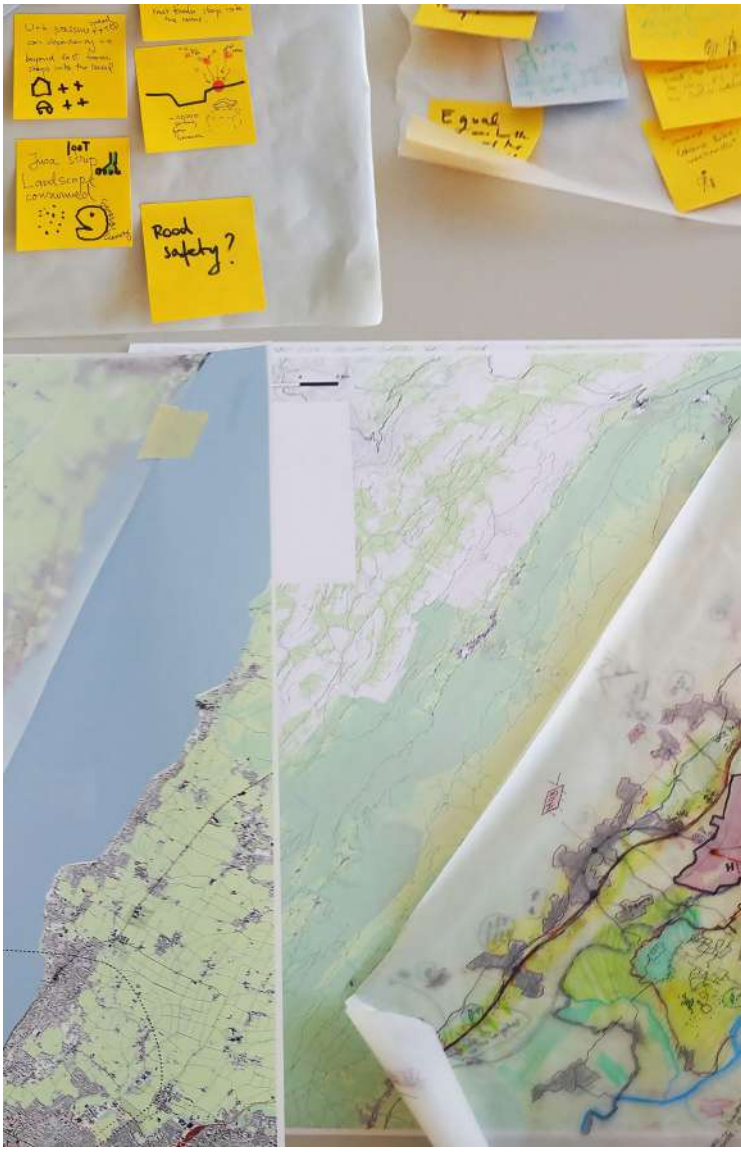

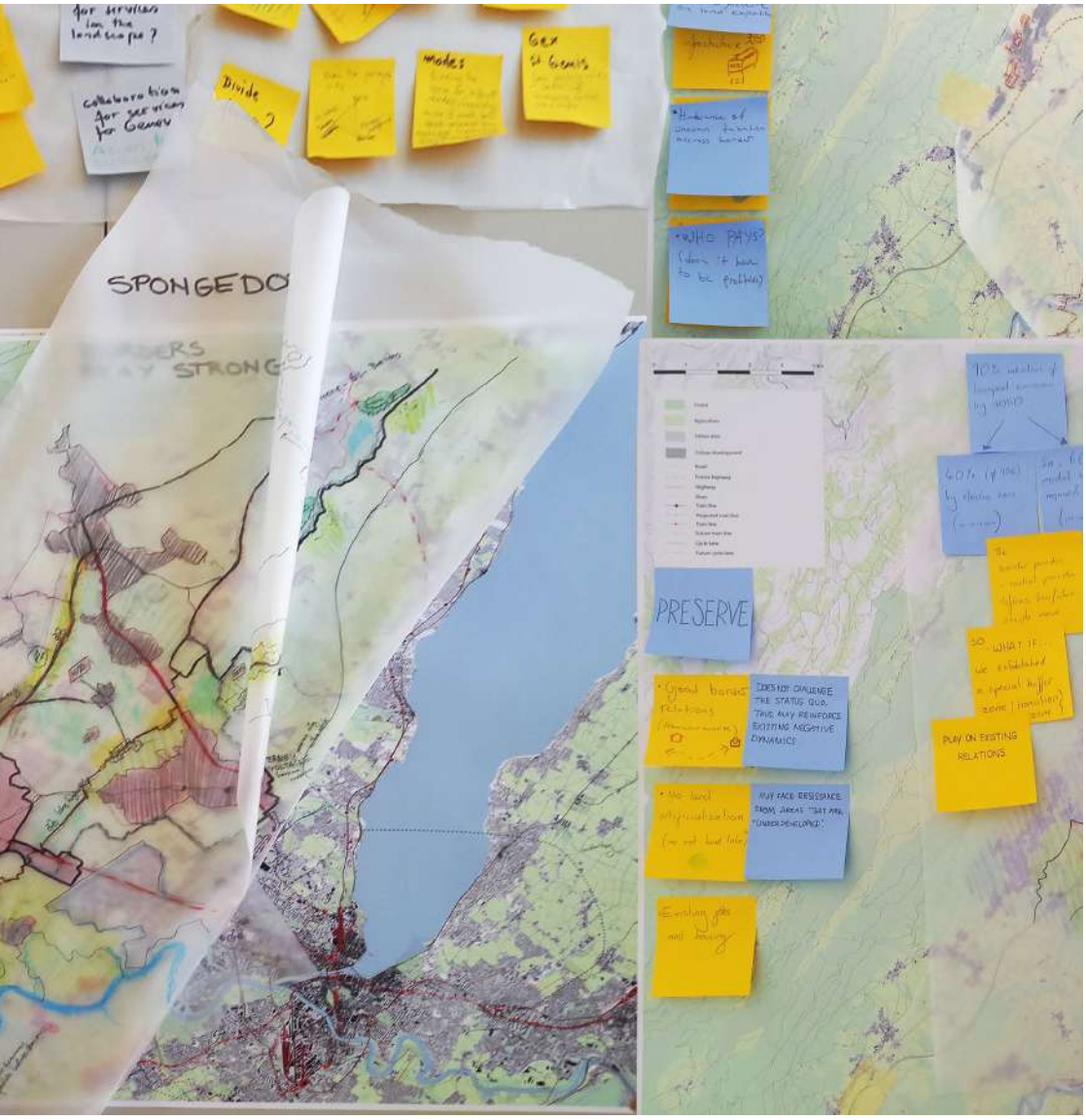
modes
PRESERVE
DOES NOT CHALLENGE THE STATUS QUO. THUS MAY REINFORCE EXISTING NEGATIVE DYNAMICS
MAY FACE RESISTANCE FROM LARGE "BAY AREA NUMBER DEVELOPERS"
PLAY ON EXISTING RELATIONS

Transport-urbanization and beyond.

The workshop was the occasion to organize a confrontation of views between actors from different disciplinary fields and practices on the challenges of the socio-ecological transition in metropolitan contexts. This contribution intends to translate the principal axes of reflection, questions, and strategies that emerged from this interdisciplinary and transdisciplinary exchange. The specificity of this cross-border case of the Great Geneva is the occasion to debate the classic relation between transport and urban planning but also brings further socio-economical complexities into the collective reflection.

Discussants: Philippe Gasser (traffic engineer), Mario Werren (CEO of the SBB), Andrea Finger (Ecologist), Charlotte LeGouic (urban planner for the Genevois Francais), Paola Viganò (Researcher and Urbanist)

Actors' role in bridging transport and urbanization together.

Relation to actors depends significantly on the context and which body of actors takes the lead in a given project. Each set of actors has an agenda, specifically in today's complex private-public agreements around urbanization and transport projects. Extra political, cultural, and administrative dynamics must be understood in a cross-border asymmetrical context. The Leman Express cross-border RER network is an excellent example of this complexity. In France, the administration and its different layers lead infrastructural projects, whereas, in Switzerland, a proposition can be brought out to the public. However, in Switzerland, due to the specific democratic framework and sectionalization, coordination of transport and urbanization cannot come as a given. Meanwhile, in France, tools to foster such coordination exist, but the lack of public investment leaves urban development in the hands of private developers. If we take the examples of the new radial tramways, we must recognize the limits of the current system. Tramways that should be considered at a metropolitan scale to reach French polarities stop at the frontier; urban projects justifying tramline extensions through the empty green belt are blocked. Here, we see an evident malfunction in terms of metropolitan governance and interactions between different territorial planning and development sectors.

The problem is also that of long-term planning. In Switzerland, due to both the rail culture and capital that is already present, planning is aimed at the future. In France, there is less of an infrastructural culture, specifically in rail transport. French authorities are often skeptical about public transport ridership previsions. This position, coupled with administrative complexity, limits actions or at least makes it longer and less able to react to unforeseen effects. This partly explains the underestimation and, therefore, underdevelopment of the Leman Express on the French side regarding infrastructure (number of tracks) and possible associated developments. Without visions, mobility transition will not happen because it will never constitute a real alternative. If we want to speak about transition and new means to relate urbanization and transport for the future, we need ambitions at the height of the challenge ahead. This is why public-private cross-border configurations of actors and governance must be reflected upon thoroughly in the Great Geneva.

Efficiency for what? For whom?

Efficiency is a prominent theme in transport infrastructure discourses and is rarely challenged. An efficient transport network will serve only the essential points (in terms of job and population density) in the fastest way possible. We must be clear about what mobility transition means. If we intend to compete with the efficiency and flexibility the private car allows today, such a transition is impossible. However, we realize that travel time or «efficiency» is not the

only or even not the most attractive aspect of public transport. Nevertheless, if we want a transition that can significantly impact current Co2 emissions, we will need massive investment in collective transport infrastructure. As for today, even in Switzerland, infrastructure cannot sustain a drastic modal shift from the car to public transport. It is essential to understand that even Geneva's inner network is not ready to answer the demand that its engagement in terms of ecological transition requires; Cornavin Central Station is, for example, already saturated as it is. Therefore, it is illusionary to think that the French outer region would be able to follow the same path to mobility transition. Though the metropolis needs to be considered as an entity, mobility urbanization strategies must be reflected upon according to each environment's context, opportunities, and limits.

If the efficiency of public transport is a vector for behavior change, more accessibility always means more movement. Today, it is faster to live in Lausanne and work in Geneva than to live in some part of the Great Geneva and work in Geneva. This paradoxical relation between space and time questions the territory's future, specifically when we speak about a metropolis «of proximity». At the same time, we know that socio-spatial marginalization and fragmentation are increasing. This is why articulating the different scales of networks, modes, and actors is so important. We can no longer work with the traditional hierarchies between modes and functions. However, having cars, buses, bikes, trains, or metro all at once and for everyone is probably not possible. Especially if we no longer want to build new roads and want to capitalize on what already exists. Therefore, the question is: what territorial project is fostered by which network? If we keep increasing accessibility in the same points and de facto for the same people without balancing development and opportunities, then mobility will continue to increase and the gab in accessibility between inhabitants will also continue to increase. To sum up, there is a democratic positioning regarding the mission of transport, which is too little questioned.

To be more pragmatic and give concrete examples, planners, stakeholders, companies, and administrations mainly base new transport provisions on efficiency measures (in responding to current demand). First, efficiently responding to today's «car-based» demand is very uncertain in such a volatile metropolis as the Great Geneva. Meanwhile, some infrastructure, such as the bike lane toward Annemasse, shows very well that infrastructure can generate demand. In addition, people's mobility patterns can also evolve, such as with home office practices. Hence, thinking about transition is not only trying to provide efficiency but also thinking about the most essential mobility for the future. Second, as mentioned, many factors can impact modal shifts. For example, we could add spatial justice or impact as a criterion to balance out efficiency criteria, just like it was done with the ecological impact.

Mobility networks, scales, and budgets.

It is sticking to see how much and with which ease money is invested in rail projects compared to how complicated and little budget active and proximity mobility have. Sectorial and administrative hierarchy drive territorial development. It pre-defines the scale for which an infrastructure network is planned, and which budget should be allocated. Therefore, extensive transport infrastructure is convenient because they are planned at the regional and or national scale and comply with broader climate agreements. In comparison, local actions are influenced by local government and financing capacities. In addition, despite their capacity for action, which depends mainly on their density, communal actions also depend on the political stand of the municipality.

With the new paradigm shift that the socio-ecological transition entails, these hierarchies may need to be revised to enable more actions and synchronization across scales. For example, only recently has the bike network been thought of at the metropolitan scale in the Great Geneva, and still, no specific budget is allocated to it beyond the communal abilities.

The main problem in low density is the economic logic behind transport today. Transition needs a metropolitan stand, but the available budget, except for large public transport infrastructure such as tramways, remains dependent on smaller entities such as sub-agglomeration for buses and communes for pedestrian and bike infrastructure. Could transport be associated with a basic need, such as health care? Is it the role of the hole to sustain «unsustainable» transport systems and networks if it means better living conditions for the future? In the Great Geneva, low-density housing represents not a small but an essential part of the population already living in car-dependent areas. If we do not give them alternatives, both in their lifestyle and modes of transport, Co2 emissions will not be reduced in the future.

Densification around strong nodes, at what cost?

The unbalanced nature of the Great Geneva territory makes the housing market extremely hard to manage. We know that communes in France have a limited ability to drive or to go against development. We also know that Geneva's workers will target new station areas of the LEX. Therefore, two outcomes are to be expected. First, development will mainly be located on the French side rather than per se around the stations. Second, this will further enforce living costs in those areas, encouraging local inhabitants to sell, since most local inhabitants have no reason to live next to the station, augmenting kilometers traveled by new households not only by train, since those «urban» inhabitants will not find the amenities that they will require at walkable distances.
Regarding actions that could be undertaken, we can provide social housing,

which is not required in France for small towns, but affordable housing is also a good option. Annemasse agglomeration, for example, is now applying a one-third policy on a third of regular housing, one-third of affordable housing, and one-third of social housing. Such strategies are particularly relevant in a territory where, due to the difference in income and social protection mechanisms, the middle class is the most fragile social body, which cannot buy a house in the private sector or access social housing. However, managing space with such differences in income between people and proximity versus long-distance lifestyles takes a lot of work. It has a significant social impact on small communes whose population is growing at an impressive rate. Since housing development depends a lot on the private sector in France, we must find means to capitalize on private development to ensure inclusivity and services to the population.
Regarding transport, travel pricing is crucial for territorial cohesion and integration of the different systems in a single «metropolitan» ticket, which is not the case yet. Finally, integration between various modes and the actor responsible for them is crucial for suburban or rural-urban space, mainly where stations are often a-centered. In low density, the car will remain a means of access to the station, and buses can only be a punctual alternative. The bike has great potential but is still too dangerous in these areas. So, we must focus on the connection between the suburb and the station. Electric bicycles have become a good alternative, more inclusive than traditional ones, but we cannot rely on active mobility alone. It is necessary to diversify the offers while containing car efficiency to avoid rebound effects from accessibility augmentation as much as possible.

The role of landscape rationales.

Theoretically, it is hard to argue against the engineering logic that sustains the necessity to urbanize in priority around a strong transport network station. However, from the ground, such mathematical and technical rationales are not the only matters at hand. Let's look at it from the question of land protection, for example. It is a challenge, specifically in rural or rural-urban environments, where the development is usually targeted since land availability is more significant. How do we position ourselves toward new developments that are exceptionally well placed in terms of access but are on arable and precious lands from an ecological point of view? Which logic is or should be favored?

We can also see an opportunity to re-enact the relationship between mobility and green spaces. We need to start asking: How are people moving and why? With the digitalization of activities related to labor and consumption, will leisure and recreational mobility become dominant? Is this the only mobility that is necessary? Can mobility choices be influenced by spatial quality and landscape enjoyability? Is this the future of decarbonate mobility? Landscape

rationales are more valuable as lines of desire than main used car routes. The active networks could be in terms of compatibility, interactions, and uses together with natural continuities rather than from two sectorial perspectives.

Dependency and vulnerability.

When discussing the transition concerning transport and urbanization, we must face the question of time. We have a tension between the long-term evolution of the urban fabric, the infrastructural implementation time, and the urgency of transition. The urban fabric that we inherit is a given condition. Regarding infrastructure, what we decided today might still need to be implemented in 2050. Therefore, zero-CO2 emissions must rely on the infrastructure that we have today. At the same time, the construction of a new highway is underway in the Chablais region of Great Geneva. We must stop ignoring how path-dependent we are and start planning with drastic contextualization that can work with all the existing urban or infrastructural conditions.

Beyond this, such projects and the recent COVID crisis also show that territorial relations are much more complex and unstable than the radio-centric high-end employment interactions prefigured by the current transport model. But the current dominant movements are radio-centric, directed toward Geneva. Here, a political stand will be necessary to try to even out rents, salaries, and, more generally, equality on both sides of the border to balance population movements. But imagine for a minute that such a political agreement happens. The entire movement pattern in the metropolis would change nearly instantly. This is how fragile the metropolitan system is and why it is so complex to plan for the future. In the context of the Great Geneva, transport policies and development can only go with political engagement. But further than this, co-constructing the metropolis can only happen by building local resilience, specifically in the French part of the metropolis. Hence, like public transport, developing local economies is a necessary collective measure for transition, but building houses is not. We can only reach the transition if we promote and sustain a model oriented only toward Geneva. We must rethink the French dependency on Geneva and, therefore, reconsider the model of the metropolis.

The question is also that of vulnerability within this dependence. In the current radio-centric model, heavy transport perpetuates this vulnerability in terms of jobs, health, natural resource availability, etc. By considering daily life quality and experience, the lens to transport planning would change. We have different ages and different needs. And so, the vulnerability is differentiated according to who we are and in which environment. But what is essential is to grasp that human beings are not equal and all have limits weither physical, cognitive, economic, etc. Therefore, the vulnerability angle allows us to no longer look at masses of people moving from A to B but at transport as a public good, able to mitigate individual vulnerabilities. Of course, it shifts the discourse from metropolitan growth to something economically

and politically much more complex. But it is also an opportunity to work with a broader range of elements systematically. In this perspective, we need to think about access to public transport but also access to greenery, commerce, social encounters, and so on.

However, we must acknowledge that transport is the main drive in our current economy and territorial setting. Geneva is in a situation of delay, and this lack of investment in infrastructure also creates vulnerability from an economic point of view. So, we are returning to the political and even philosophical stand toward transition. What do we mean by it? And are we able to address the cause and not the consequences? And what is the role of economic growth and urban development in this regard?

How do we anticipate what tomorrow will be?

We know that transport everywhere by train for everyone will not be possible and that local living is not accessible to everyone either. But practices are also changing; how do we adapt planning practices? Should we capitalize on large infrastructure or more ephemeral and testable requalification strategies? How do we accompany changes while planning for an uncertain future? Going toward more inter- and trans- disciplinary thinking is necessary to face the current complexity, but we also need to work with the populations on the imaginaries that will shape tomorrow. We all need to step out of our comfort zone. Rather than thinking of responding to a current need and cultural acceptance of policies, we need to imagine new proposals with old tools.

Contribution

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Contribution Avril 2023
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DISCREET URBANIZATION AND ACCESSIBILITY: FROM TOD TO DOD

Addressing mobility in spaces characterized by discrete built morphologies, in the sense of physical discontinuity, specific to both suburban, and rural areas, from which they originate, means confronting all of the past decades' presuppositions about planning[1] , among which: urban fragmentation, metropolization and/or persistence of the rural world, inadequacy to the environmental challenges of what is not the dense and compact city, etc. If we approach mobility in all the diversity and complexity of the territorial configurations that characterize these discrete urban figures[2], a change of gaze is necessary. Only from this premise can their grain and texture be understood, and the framework for approaching people's access to shops and services, and more broadly to amenities in all their diversity, be modified.

At the meso and regional scale, of the geography and history of human occupation of these spaces, some of the main determinants of mobility patterns emerge in the present situation while paving the way for the future. Among these principles leading toward a renewed resolution of mobility challenges are:

- The distribution of populations in the different types of human settlements.
- The distribution of services and shops and their accessibility.
- The capacity to address the territory from a bottom-up perspective, starting with daily needs.
- The contribution of citizen initiatives in the various fields of the ecological transition.

From the fringes, many rich and stimulating clues of possible alternatives emerged, far removed from what can be proposed by the dominant downward hierarchical vision emerging from and for the city center or the metropolitan pole.

What the change of focal point renders visible

The first lesson that can be drawn from a refined morphological approach to the urbanization of discrete spaces, with an inversion of gaze that combines both shift of the observation frame and change of focus[3], is that it finds its origin not in hypothetical «urban sprawl» but in various processes of mutation of built aggregates resulting from a rural substrate. We witness an extreme diversity of spatial configurations which testify to the links between human settlements and territory. Hence, in edge spaces categorized as suburban or rural, we have not lived, and we still do not live the same way in the metropolis of Lyon, Nantes, or Montpellier, Occitanie. Therefore, there is no ready-made solution. A careful spatial reading depending on the contrasting granularities of these regions[4] , on how populations are distributed differently in number and types of human settlements allows us to characterize the presence of more or less villages, small towns, and towns, as well as the different distances between them. Despite their morphological diversity at the regional scale, a constant remains: the relatively small distance between settlement patterns, which on average varies between 2 to 4 km.

What proximities draw

Secondly, observing the ability to access shops and services encourages us to reverse the usual problem definition: do not start from travel but from the available offer. In other words, the question is not how to reach the city center, with the a priori that it is where everything is, but rather where to find enough to meet different kinds of needs and expectations from the population, starting with the most basic and daily ones, especially food. This reformulation is what the «proximity clusters» intend to show, the greater or lesser deployment of which reflects the number and distribution of shops and services. From this representation, we can draw that nothing is ever very far whether we are living in a village or a town, in the suburban or rural countryside - less than 5km for a «daily» shopping center, such as a bakery, and 10km for an «intermediate» center with its mini-market. However, it is essential to note that we still witness substantial disparities between regions depending on their granularity (fig.1).

What the prism of the ecological transition reveals

Suppose we continue exploring what is present in terms of offer by looking at the spatial deployment of citizens' initiatives contributing to the ecological transition. In that case, we observe both their proliferation in all fields (food, sociability, energy, economy) and the transversality and proximity of their relations[5]. A rich and tight local network emerges a mosaic of «small, interconnected worlds»[6] concretizing a practical relationship to distance resituated in an ecological concern valuing proximity. This last stage thus opens up stimulating avenues for resolving the mobility/accessibility binomial: what could be closer in the village or the small-town next door than the farm-shop or the community grocery store (possibly mobile), the solar or methanization

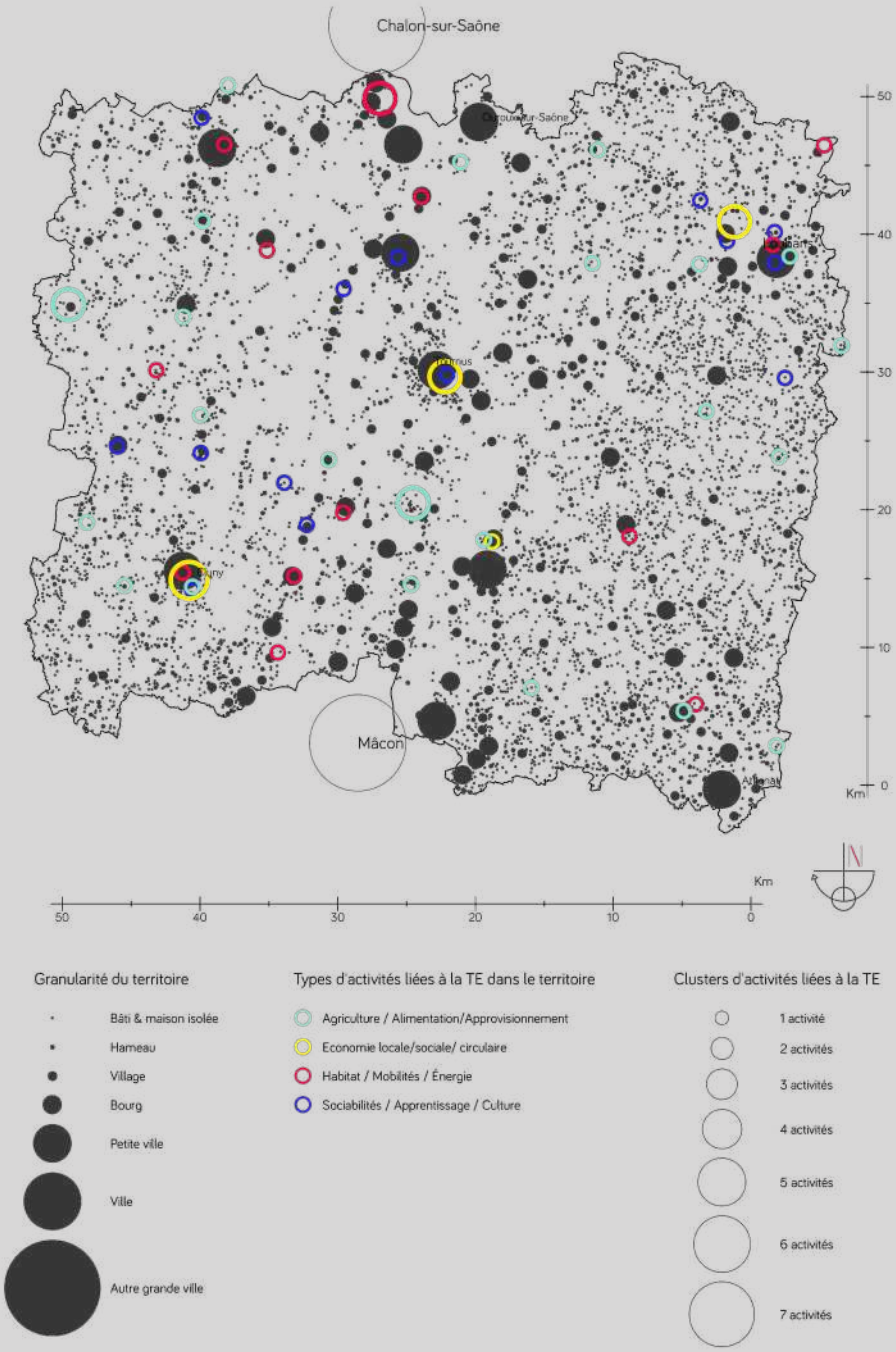

Fig. 1 « Fenêtre Bourgogne » - Granularité des établissements humains et localisation des initiatives citoyennes en faveur de la transition écologique, Brès et Mariolle, 2021. Source: Le local au prisme de la transition écologique, ANCT-PUCA

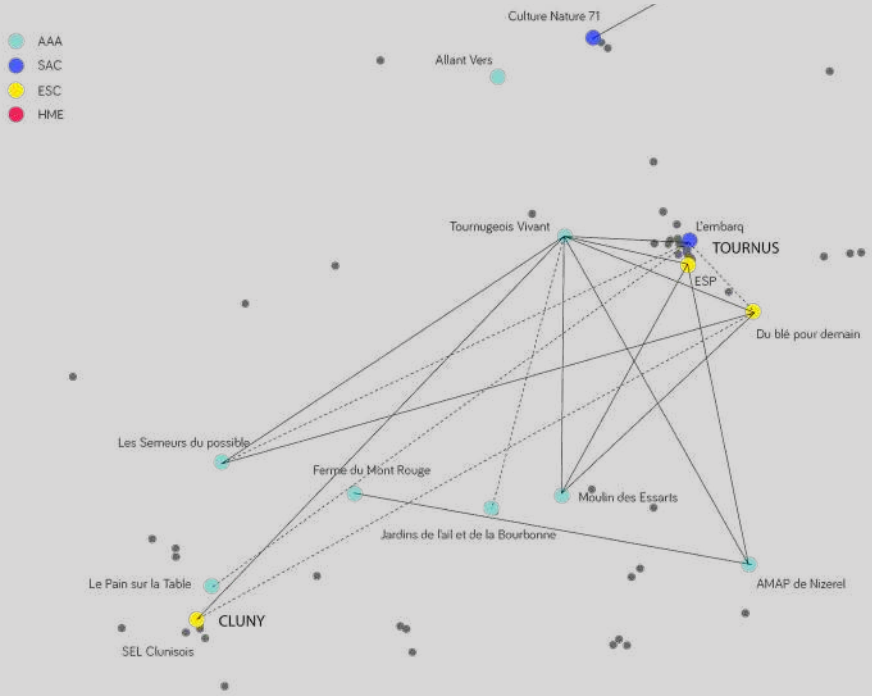

Fig. 2 Fenêtre Bourgogne » - Le réseau local des initiatives citoyennes en faveur de la transition écologique enquêtées, Brès et Mariolle, 2021. Source : Le local au prisme de la transition écologique, ANCT-PUCA

	Villages. Local center and periphery	French side of the Agglomeration	[illegible] periphery
68-2018	62,3	63,7	63,7
99-2018	42,6	66,7	66,7
82-1999	79,1	72,8	72,8
75-1982	77,2	71,2	71,2
68-1975	50,4	44	44
54-1968	15,6	33,8	33,8

Fig. 3 Centralized, decentralized and distributed network models by Paul Baran (1964)

energy plant, the recycling center, etc. So many activities involved in a social and solidarity economy often compensating for the remoteness and/or disappearance of public services and shops (fig.2).

A renewed approach to access to amenities

As we can see, and more obviously in the suburban or rural countryside than in cities, the resolution of the mobility/accessibility binomial is to be found not in any model but in meticulous observation and projection of strategy based on concepts and tools rooted in these discrete spatial configurations, the development of which is to be prolonged and enriched. Thus, we can compensate for the relative invisibility of these living spaces, encourage the local initiatives already being deployed there, and perpetuate them. This means drastically rethinking the hierarchies in the infrastructures, not favoring the «drawback» on transport hubs by thus favoring long-distance journeys, but enhancing the network of rural roads and itineraries capable of structuring a «vicinal town planning»[7] .

This reflections intel a significant investment in time and space. It may seem contradictory with the urgency of implementing the ecological transition, which encourages the public authorities to work in large numbers and quantitative terms. But what this meticulous observation teaches us is that alternative solutions are possible and that they are already in the works: it would rather be a question of adding up various actions, multiple and distributed over the territories, albeit small ones in terms of the economy and employment, but whose impact would depend on their number and the scale of their territorial coverage. So, let's leave the concept of TOD to main agglomerated spaces of large cities and metropolises whose public transport networks are not yet saturated, and let's start thinking within urban areas about spaces in which public transport service is not economically viable in methods for a distribution-oriented development or DOD (Distribution Oriented Development)[8](fig.3). In this sense, scattered populations would be offered alternatives between near and far to ensure that proximity is no longer experienced as confinement and mobility as a constraint.

Therefore, almost a century later, we intend to put to action Lewis Mumford's quest for «regions to live in» where: «the population and civic facilities (would) be distributed [emphasis of mine] so as to promote and stimulate a vivid, creative life throughout a whole region [...] and so that the population will be distributed so as to utilize, rather than to nullify or destroy, its natural advantages.»[9]

Notes

1 Brenner N., 2014, Implosions / Explosions Towards a study of planetary urbanization, Berlin, Jovis.
2 Brès A., 2015, Les figures discrètes de l'urbain, MétisPresses, Lausanne.
3 Ibid note 2
4 Ibid note 2
5 Brès A., Mariolle B., 2022, Le local déployé, Les campagnes au prisme de l'écologie, PUCA.
6 Brès A., Mariolle B., 2023, « La transition écologique en campagnes : de petits mondes interconnectés », CRAUP n°17, Que font les mobilisations environnementalistes à l'architecture, à l'urbanisme et au paysage ?
7 Ibid note 6
8 Brès A., 2020, « Faire durablement territoire sans densifier les villes », Métropolitiques, https://metropolitiques.eu/Faire-durablement-territoire-sans-densifier-les-villes.html

9 Mumford L., 1925, « Region To Live In », The Survey Graphic Number, vol. 54, n° 3.

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Scenario exploration

The workshop develops a research-by-design methodology to reflect on the radio-centric TOD model application in the Great Geneva territory. Such a process is at the crossroads between a productive and critical practice. It intends to construct knowledge on the territory through reading, designing, and retrospectively to give some insight into the models' limits and potentials.

The Great Geneva is a highly complex but not unique metropolitan context that is trying to reform its planning vision to face the multiple contemporary challenges of the socio-ecological transition. As a metropolis «in construction» the Great Geneva reveals itself to be a fertile ground to question current planning rationals.

The scenarios start from a hypothesis of gaze inversion upon metropolitan dynamics. It interrogates the radio-centric structure from its edges, namely the Jura and Chablais regions. If most territorial visions have been thought from the center toward the periphery, what other narratives emerge from this change of gaze? What opportunities for the ecological transition reside in edge metropolitan territories?

In the Great Geneva, the current model generates political and grounded conflict and expresses paradoxes between transition and metropolization dynamics. Identifying such paradoxes is key to conceptualizing the current challenges and defining hypotheses from which possible future scenarios may emerge. Therefore, starting from territorial paradoxes, the scenarios are a means to conceptualize and test systemic mobility-urbanization relations in a context characterized by inherited and dispersed urban forms. They intend to broaden the prism of TOD and its territorial integration in the face of the challenges of the socio-ecological transition.

Scenarios are not abstract; they come from an understanding of the territory, and even if they might seem radical or utopian, they rely on current projects and reformulate them to bring visions closer to the concrete conditions in which the transition project needs to be rooted. They are necessary to put forward the questions, values, and rationales that future spatial projects support and to identify the opportunities that emerge from the ground up.

Case studies I

The Jura region

The Jura region stretches along the right bank of Leman Lake, the Jura mountain. It encompasses the district of Nyon, parts of the Pays de Gex, and the Canton of Geneva. In part of the region, the border passes through the plane along the Geneva canton rather than the mountain ridge. Because of its morphological condition, this region is characterized by its strong dependence on Geneva, with about 70% of the Pays de Gex's active population working in Geneva.

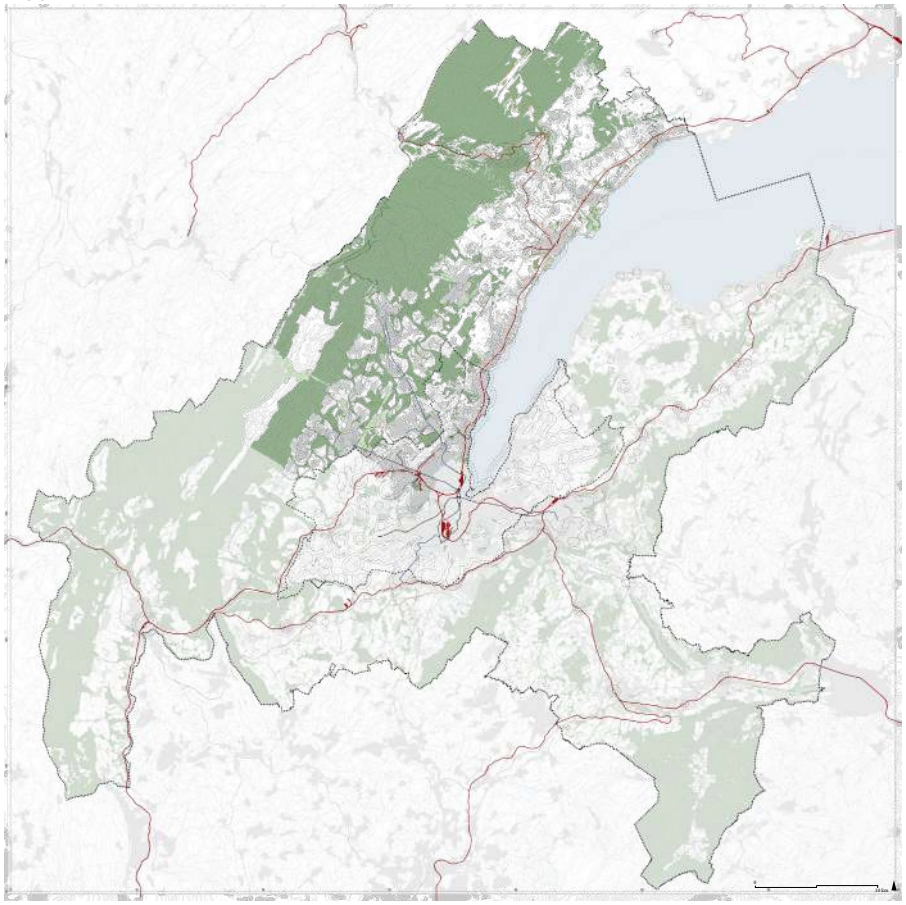
In this part of the metropolis, the encounter between two forms of urban development is clearly readable. First, chronologically speaking, a linear, neckless-like urban development stretches on the foot of the Jura mountain. Based on parallel topographic lines, these ex-villages and hamlets used to be connected by a tangential railroad, which was progressively shut down starting in 1980. Second, the progressive urban expansion along the main radial axes from Geneva created more or less continuous radial urbanization corridors (Genève-Gex, Geneve-Saint-Genis-Pouilly, and Geneve-Role). The main secondary poles of the region have developed at the crossroads of those two urban logics (Gex, Rolle, Saint-Genis-Poully) and on the axes encounter with the administrative border (Meyrin, Ferney-Voltaire), constructing a multipolar region. Smaller ex-village settlements have developed mainly through individual housing development.

In the past 20 years, the region has undergone significant demographic growth, multiplying its population by two and creating extreme urbanization pressure. This urban growth spread throughout the region but more vigorously in smaller communes.

Today, the foot of the Jura settlements have close to no access to public transport. A bus line was set to replace the tangential railroad but with an extremely low cadence. Discussions on the possible re-opening of the train line failed. Today, it has been partly reconverted into a bicycle line in some communes. The radical axes have been targeted in the last Agglomeration plan to provide cross-border structuring of public transport lines. However, on the axes from Geneva to Saint-Genis, political opposition has led to the failure of the tramway line, which was stopped at the border. While on the axes from Geneva to Gex, defining a single transport line has been deemed impossible.

Hence, a tramway is under construction from Geneva to Ferney-Voltaire, and a high-frequency bus will connect Ferney-Voltaire to Gex. These axes are also home to major economic poles such as the Geneva airport, the CERN, the district of international organizations, and the headquarters of multinationals. Many commercial centers are under construction in the region to address the need for more services and attract Swiss consumers. Meanwhile, the French part of the region drastically lacks health and educational amenities due to its rapid growth.

Finally, this territory also has significant ecological value, home to some of the most important perpendicular ecological corridors leading from the Jura mountain to the lake through both blue and green continuities. This landscape is also constructive to the region's historical and contemporary identity. For the same reason, the area is an important recreation area for the entire Agglomeration.



Jura region defined by the Perimètre d'Aménagement Coordonnés d'Agglomération (source: SITG)

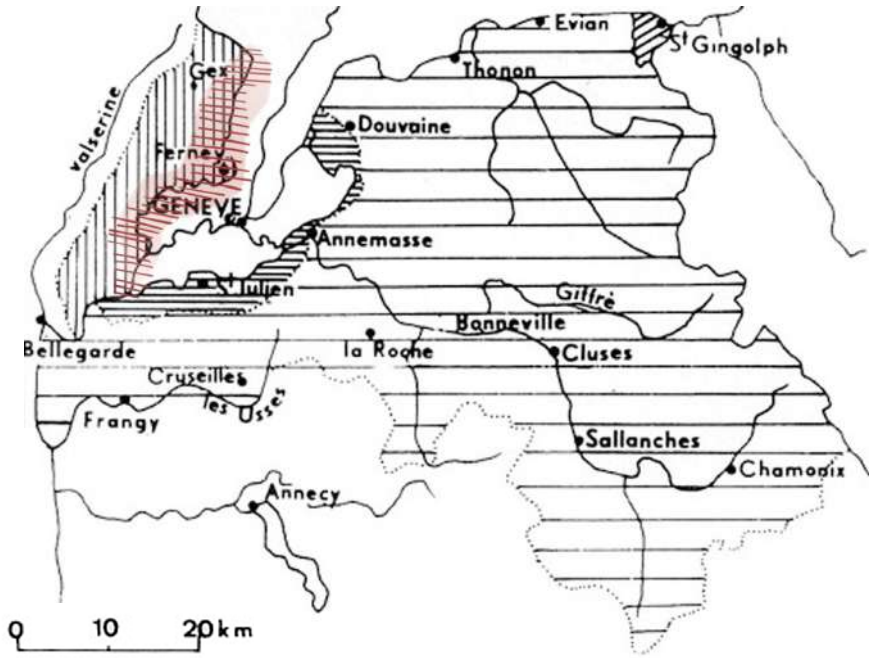
Scenario Zone franche
Jura

This scenario focuses on the challenges and potentials brought by the current regional «cross-border paradox». The cross-border nature of the metropolis is as much an opportunity as it is an impenetrable wall for different social groups. It crystallizes and materializes an uneven center-periphery relation drastically enforced by financial and political power imbalance.

'WHAT IF 'we take advantage of the border as a spatial component? What if the border becomes a buffer zone between France and Switzerland? The buffer zone would be an area of special rules and special relations – neither Swiss nor French. This is a way to both play on and contest the existing socio-spatial relations across the border. This idea is not new; the 'zone franche' around the Geneva canton can be traced back to the 13th century. Still existing today, it is a tax-free region, allowing the French producer to sell their good in Switzerland. It symbolizes not only the dependency but the inter-dependence between these two territories, between the 'city without land' and the 'land without city' around a major, yet today undervalued, aspect: food supply. However, a main difference is to take into account here the buffer zone would go over the border and not only on the French side.

This was an explorative exercise to imagine radically different ways of dealing with socio-spatial tensions we observed during the immissions inside the Greater Geneva territory. The idea of developing a buffer zone was based on the presumption that it would create a flexible framework for development capable of accommodating the unique needs of the region. In short, it would ease transnational collaborations and possibly advocate for a more balanced metropolis in an a-centered way.

However, one difficulty we encountered while constructing this scenario was determining where this zone would be spatially drawn. That is, which criteria would we use to say whether a certain area belonged or not to this new arrangement? This question remained open as we continued with the exercise. In addition, whether this political and institutional construction might push the problem even further is uncertain. Our focus was to play on existing relations and propose new socio-spatial connections to mitigate regional disparities. While considering potential solutions for our buffer zone, we also considered



Map of the Zone franche, 1934. In red, the buffer zone. Source: Archive Canton de Genève. (source: ge.ch)

various tensions and shortcomings. Such a scenario is delicate since a buffer zone could aggravate local disparities and make discussions more complex as it would introduce a «third» border which could amplify current socio-spatial differentiation and desplacing the problem yet further.

The details of the scenario were organized around three themes: preserve, restore, and grow. These themes aimed to recover and value existing socio-spatial relations while creating new regional connections to evolve (we call this growth). The rest of this work describes our themed propositions and is structured accordingly.

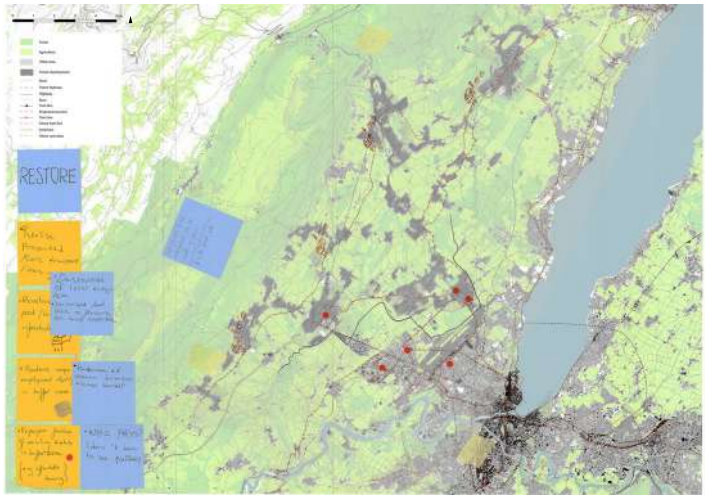
Preserve
The preserve theme focused on preserving the region's positive features, as listed below. Existing beneficial relations across borders should be reserved, both economic and political. However, the buffer zone could allow to spread employment more evenly across the border, using most of the vacant office spaces in the French towns. This will enforce movement but in a bidirectional manner, making transport infrastructures more viable. Such a relation would also allow to dynamize and connect smaller urban settlements beneficiating from the proximity to the border rather than enduring it. With punctuality and spread densification targeting newly transort connected villages and poles on each side of the border, no artificialisation of land would be necessary to host the new population. Existing amenities and commerce are imprortant along the border though spatialy specialized. Specific agremanets could allow undifenciated acces to amenities such as hospitals and schools, while subsidies could regulate conusmptioin products prices could be regulated. This would minimize movement and allow for more balance repartition of commerces.

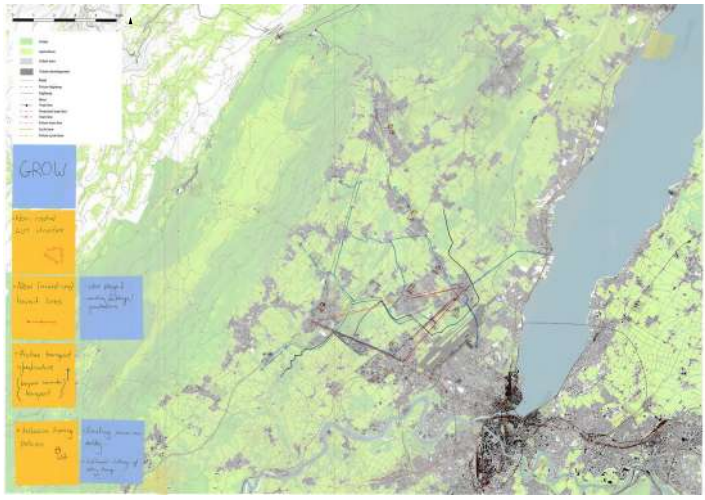
Restore
The restor theme focused on restoring past planning and infrastructural features that we consider valuable for a buffer zone. The buffer will become a space in itself, foresting cross-border but also tangential relations. In this context, reactivating past infrastructure would be necessary – for example, the existing railway line at the foot of the Jura. This line could also move goods produced by small local industries and agricultural production, which would develop thanks to tax incentives and beneficiating from the labor force price differential. For transversal movements, the small border crossing road becomes extremely important. They are rehabilitated for shuttles and soft mobility. One of the tensions of such strategies is the impact on current ecosystems and ecological continuities in both directions. New transport investment, with low development, might also increase the pressure on land value and associated land exploitation. To capitalize on the new lines, repurposing areas of already artificialized land, such as commercial centers, into affordable housing could help mitigate such effects. The tangential connection will also restore local identity and boost jobs in French towns. Repairing and reinforcing natural areas in-between is crucial in this polycentric buffer system.

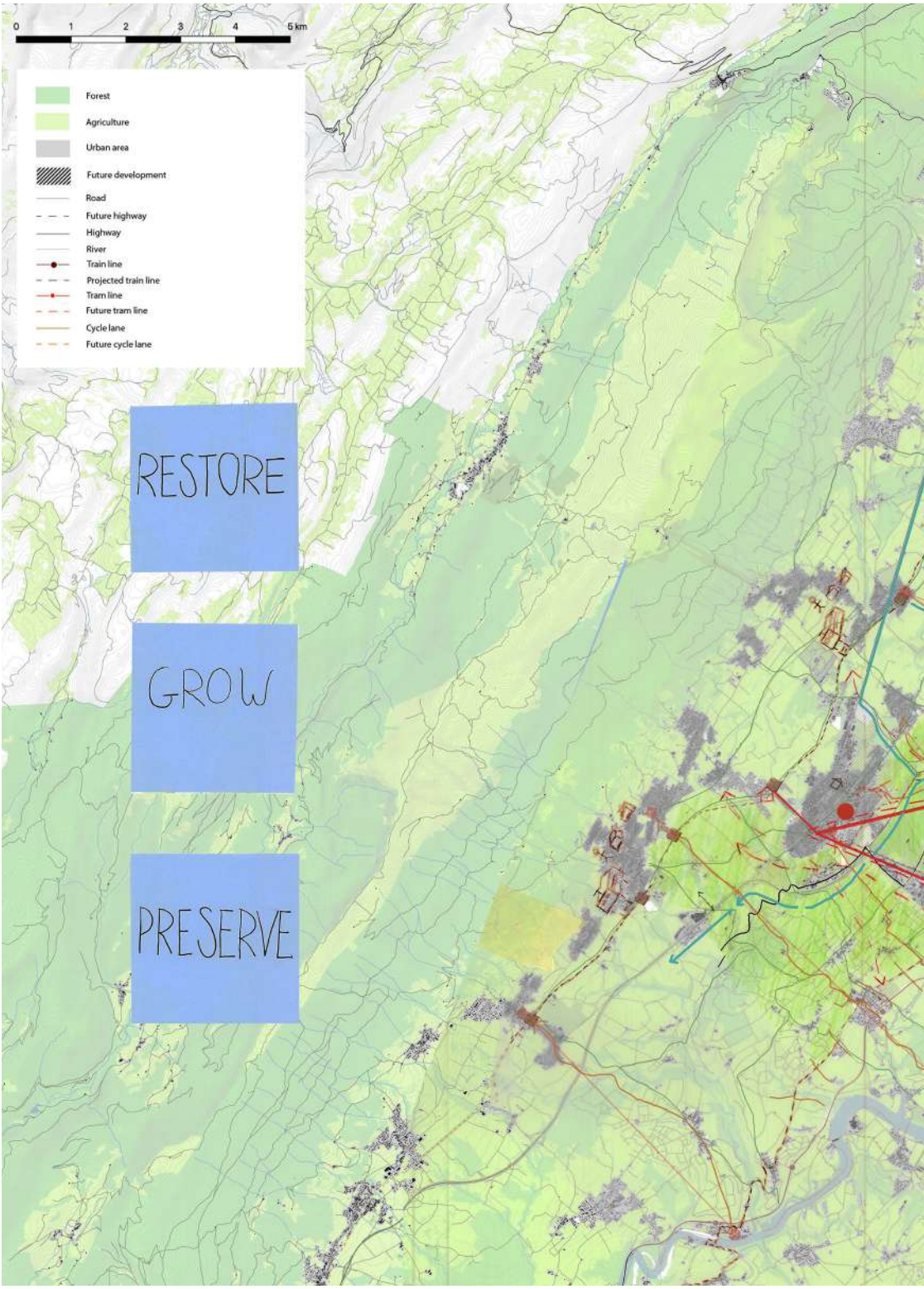
Grow
The Grow theme focused on necessary additional interventions to realize the buffer zone. A non-radial transport structure, or triangle, will be necessary to strengthen the polycentric urban core of the buffer zone between Meryin, the CERN, Saint-Genis-Pouilly, and Ferney-Voltaire. However, such a new infrastructure is complex and expensive, specifically since it will run through an already densely built fabric. Here, using the secondary road would minimize the impact. The question of the cost still needs to be solved. In addition, it would sear some already fragile natural continuities. New active transportation infrastructure, both between urban centers and through recreational routes, would connect the different urban cores on either side of the border.

Harriet Dunn, Mariana Reis Santos & André Klaassen


PRESERVE


RESTORE


GROW


0
1
2
3
4
5 km
Forest
Agriculture
Urban area
Future development
Road
Future highway
Highway
River
Train line
Projected train line
Tram line
Future tram line
Cycle lane
Future cycle lane
RESTORE
GROW
PRESERVE

The Sponge DOD Scenarios
Jura

The two extreme initial scenarios that take cross-border cooperation as the point of departure are proposed to explore spatial and governance possibilities for Greater Geneva. The thrid scenario tries to find a more balance future going beyond the ural-urban paradox.

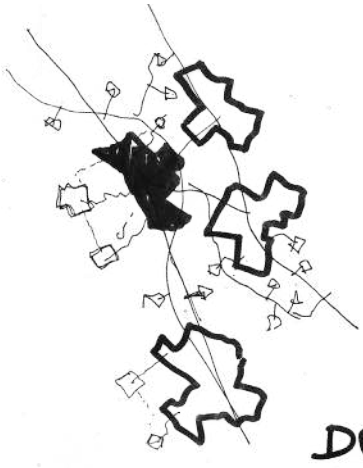
SI."Borders stay strong" and "cooperation is weak"

First, a "borders stay strong" scenario was discussed. In this business-as-usual scenario, we assumed that the Swiss authorities continue to limit access to cross-border car traffic, putting additional pressure on the cities close to the border. These main poles of the Jura are targeted for mass densification. In addition to being dormitory cities, where 80% of the population commutes daily, they become 'parking cities' with extensive park-and-ride facilities, accommodating the increasing car traffic from the French rural hinterland, coupled to massive-shopping centers. Questions of taxation, access to health and education services remain unanswered. Regarding public transport projects, enormous investment in public transport is necessary to sustain mass movement across the border, which remains monodirectional. In the rest of the urban settlements of the region, frozen development increased land value, and dependent on car mobility which is today highly taxed, they become high-income single-family enclaves. Likewise, the ecological corridors and patches between the Jura mountains and the Geneva Lake water system are only punctually enhanced through specific projects, and the lack of coherence at the regional scale, with contrasting textures and ecosystems across the borderline, increases. Greater Geneva stays, in this case, a fragmented region defined by a rural-urban paradox: Geneva is a centrality dependent on its rural hinterland, on which its living quality depends, and this rural hinterland, pressured by unsustainable urbanization-mobility, is collapsing under the pressure coming from Geneva, fragmenting ecological networks at small and large spatial scales. This feeds economic growth (as usual), inequality, and consumption of land resources, which stand in contrast with the current sustainable agendas of Geneva, such as 'the doughnut economics' model (Raworth, 2017), which advocates for finding a balance for 'past the sustainability limits' territories.

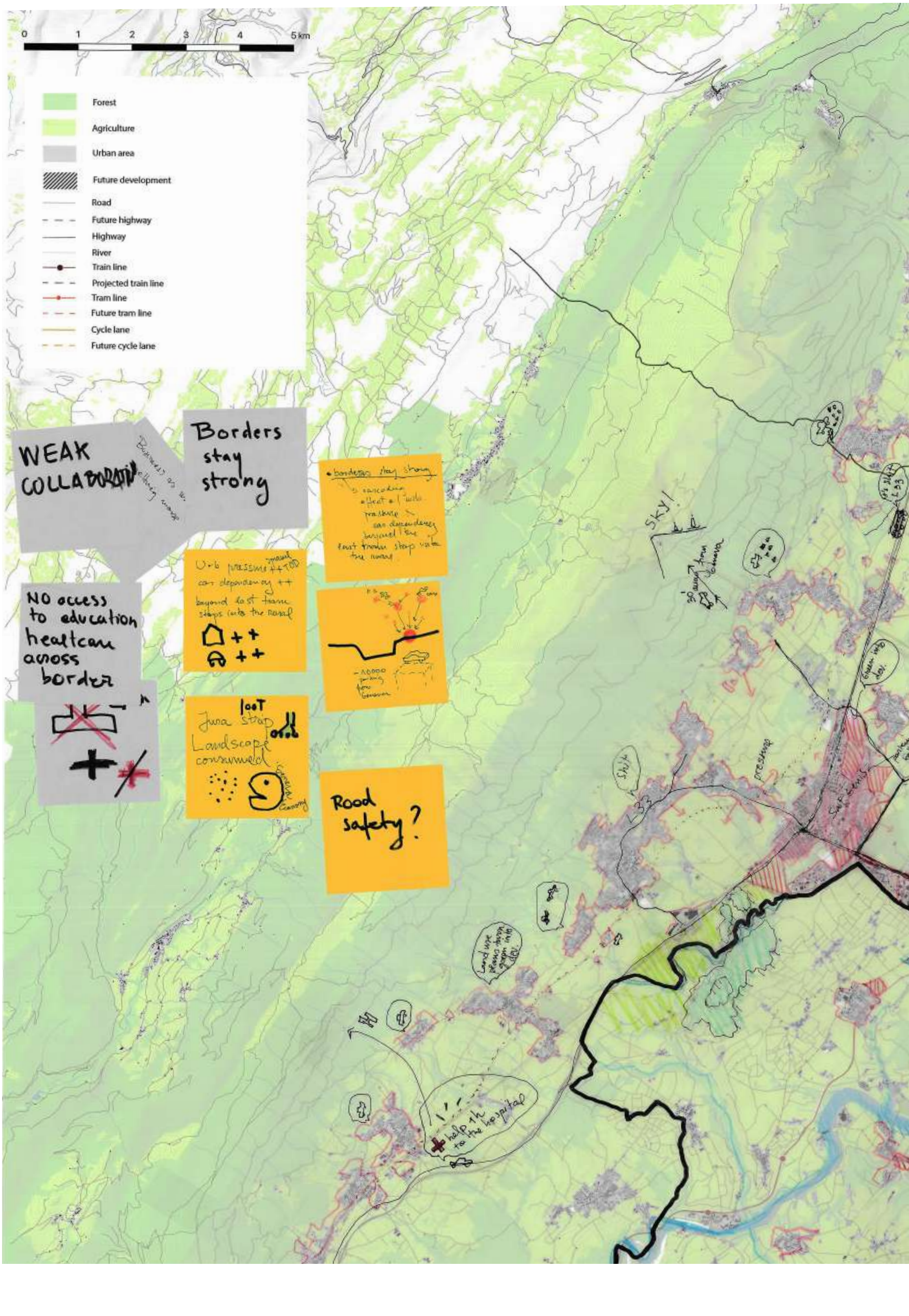
Radio centric to ... - .

Decentralise, secondary, tertiary coherent lines
TANGENT LINES

IDENTITY ON THE FRENCH SIDE



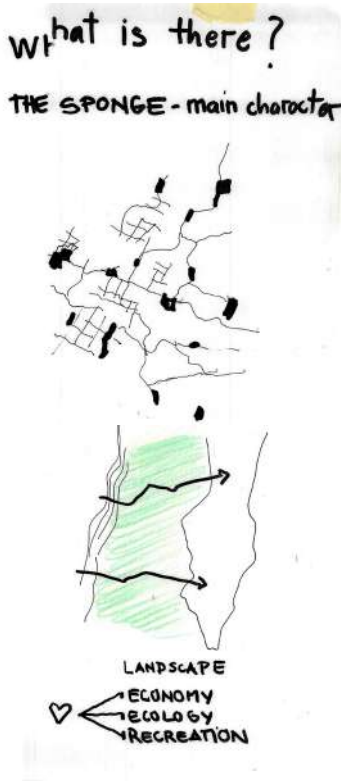
DOD

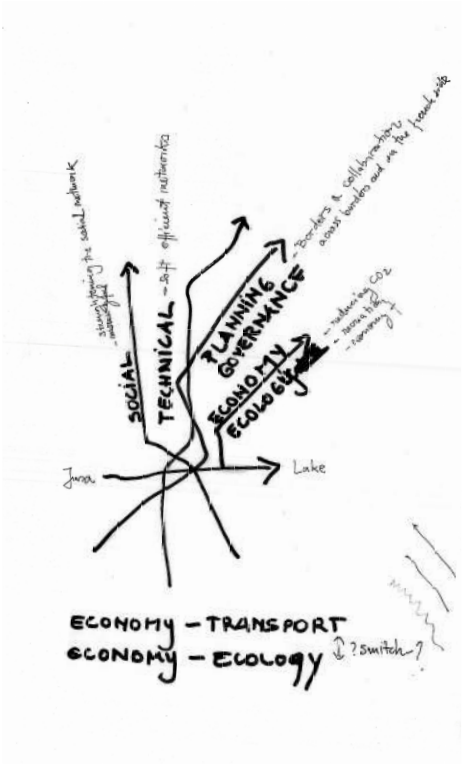

0
1
2
3
4
5 km
Forest
Agriculture
Urban area
Future development
Road
Future highway
Highway
River
Train line
Projected train line
Tram line
Future tram line
Cycle lane
Future cycle lane
WEAK COLLABORATI
Borders stay strong
NO access to education healtcare across border
Jura strip
Landscape consumed
Rood safety?
SKY!
L33
help to the hospital


BORDERS
STAY STRONG
BRT?
CAVE U
VOLTAIRE

S.II"Borders become weak" and "cooperation is smooth"

In this scenario, the cross-border cooperation intensifies, with additional funds made possible for the French municipalities. This alleviates some of the most pressing challenges and expands the tram/rail infrastructure. Taxation mechanisms are evened to allow job creation on the French side of the border. Additionally, people living in France but working in Greater Geneva can use the Swiss health and education systems, making it easier for young families to micro-manage their everyday lives. Cooperation on the French side plays an equally important role. The French territory across Jura with cities at the border becomes a stronger network, also allowing decentralization to smaller urban centers. Furthermore, Saint-Genis-Pouilly, benefiting from the proximity to CERN, could become an innovation hub and accommodate a research hospital. In terms of ecological performance and connections, at the local level, the sharp border line would turn into a gradient landscape. This recommendation also stays for integrating infrastructure and ecological pathways, whether active, car, or public transport mobility. At the regional scale, the ecological system between the Jura mountains and the lake water system would be enhanced by recognizing the tributaries' valleys' ecological potential and the rural landscape's dispersed patches.





S.III. The Sponge DOD

This approach formulates a strategy for a more inclusive and sustainable rural-urban and cross-border situation, in-between the two scenarios described above. The sponge metaphor highlights the non-hierarchical and networked nature of the envisioned mobility system. The proposed mobility projects would not additionally stress the existing territory and landscape by downgrading and upgrading existing infrastructure and paths and following routes already used for local trips and recreation. The reference to DOD, or distribution-oriented development (Brès, 2020), highlights the dispersed nature of the existing settlements and proposes to strengthen the interconnections between the smaller towns and villages on both sides of the border without necessarily relying on their connection to Geneva. In this sense, the proposal also tries to break away from the dependence on Geneva. It recognizes the potential of the rural–suburban area to become more resilient and self-reliant. Foregrounding the tertiary and secondary rural-urban systems, which are not Geneva-oriented, allows to break apart from the radio-centric model of the region.

To achieve this, we envision three strategic projects depicted as future narratives: The current bicycle path running along the old railway tracks is upgraded and becomes the backbone of the active mobility network. This main slow route connects with the fine-grained mesh of local roads and walking paths in the area, which act as capillaries for the main arteries. On these lines, shuttle buses are used to provide mobility for the less able-bodied or people with reduced mobility from more peripheral areas to the main arteries. The shuttles are used differently depending on the season, accommodating more demand in the winter, for example. A network of mobility hubs has been created at the intersection of the primary and secondary routes. These hubs do not only allow switching between different modes. They are hotspots to organize flows of goods, accommodate activities and act as public spaces. The two valley routes ((1) Rhone - Nantes D'Avril – Meyrin; (2) the rural route along Jura) and (3) the lane through the rural landscape (CERN – terrain Jakob – Bellvue) have been designed as part of a slow mobility 'parks' that integrate economy, ecology, and recreation. In principle, these routes could (1) accommodate active and slow mobility in the valley topography, (2) are the most fertile lands, thus close to local production and small businesses, and (3) are already frequented by locals and citizens for weekend activities due to their attractive rural-natural scenery. These 'parks' consolidate the identity of the rural landscape through soft interventions that consider water safety and natural dynamics, highlighting the existing actors, socio-economic initiatives, and landscape qualities.

0 1 2 3 4 5 km
Forest
Agriculture
Urban area
Future development
Road
Future highway
Highway
River
Train line
Projected train line
Tram line
Future tram line
Cycle lane
Future cycle lane
BORDERS are weak
collaboration ++ taxes --
↗ % redistributed
Coll ++ on the French paths
healthcare
education
less pressure for services in the landscape?
collaboration for services for Geneva
Access to services
Equal part on both sides of the border → hospital!!
Jura strip
soft backbone
network mediators
Ecology Economy Recreation
functional locally recreational net
HUB
shuttle


bike lane
industry
industry

Case studies II

The Chablais region

The cross-border Chablais region joins the Haute-Savoie and the Geneva canton. It is a hilly plane caught between the shores of Leman Lake and the pre-alpes massif.

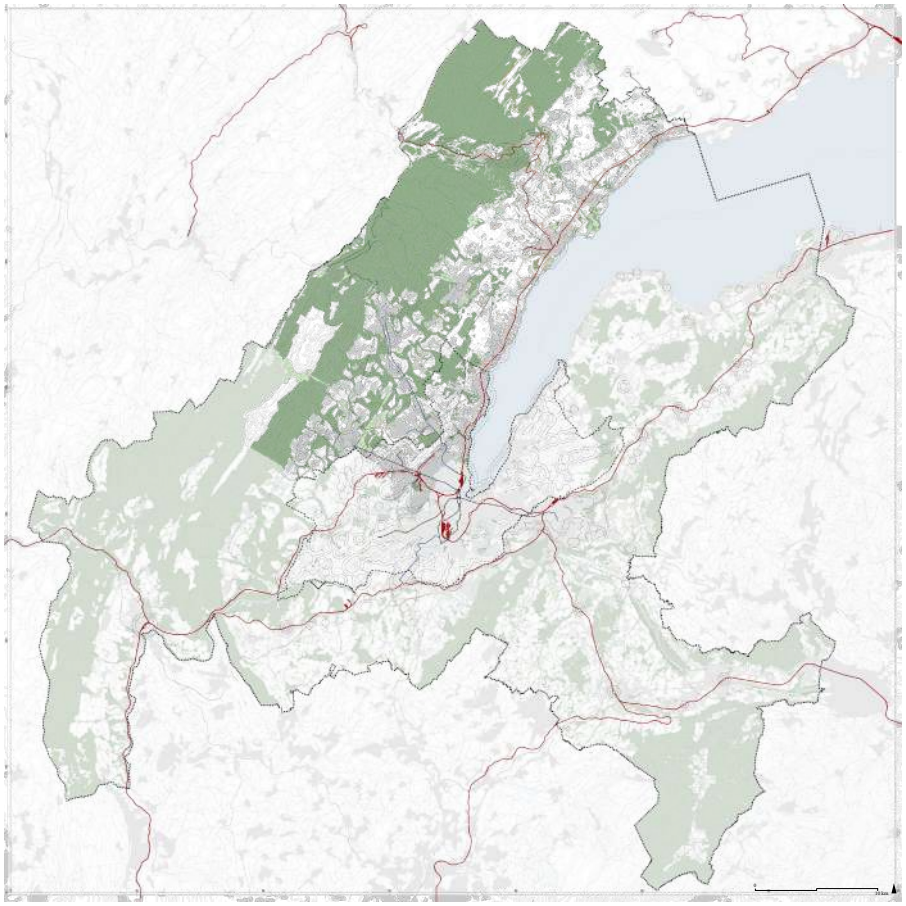
Compared to other parts of the Great Geneva Agglomeration, the Chablais region is functionally independent from the Swiss side regarding daily activity and workflows. It is both pulled toward Geneva's and Thonon Agglomeration living areas. In addition, there is a strong cultural fracture, where the region is unknown to the Swiss population, and the French side feels unrelated to the Great Geneva Agglomeration.

Compared to the rest of the Agglomeration, the Chablais region is highly residential with a « measured » demographic dynamic and a relatively low and homogeneous job/housing ratio.

The region comprises one of the major continuous cross-border urban axis running from Geneva to Annemasse. Apart from this urban corridor, it is characterized by a very fragmented urban structure made of regional Agglomeration (Thonon-les-Bains, Annemasse), local centers (Douvaine, Sciez, Bons-en-Chablais), villages, and numerous hamlets, some of which have an important heritage character and strong tourist assets. These different urban forms are structured by three principal mobility axes: the villa-based urbanization on the lake shore road, the Thonon road (RD1005), which connects Geneva and Thonon, serving numerous localities, and the axes joining Annemasse to Thonon through Bon-en-Chablaison, composed of a branch of the newly-in-service Léman Express and the D1206 road. On the one hand, the RD1005 is today overstated by both individual and truck mobility, going through the centers of many polarities along these axes. A high-level service bus will still be developed on this road but remains highly constrained in the one-lane road. On the other hand, the Leman Express infrastructure still has to find its place in the urban fabric it crosses. Today, the variety of urban forms and positioning of the train stations are mainly considered for massive development projects rather than for integrating the existing dispensed village structure. Villages such as Perrignier are suffering greatly from the car-inflow that the train drew. In contrast, small urban centers such as Bon-en-Chablais face the challenge of

merging the station with the historical development. Meanwhile, a highway project to join Machilly and Thonon is still being discussed despite Swiss opposition and ecological impacts. Moreover, transversal axes are still to be provided to allow more efficient use of the railroad infrastructure.

The region provides open spaces, mainly composed of large wooded areas, agricultural surfaces, waterways, and the lake shoreline. Its incredible landscape and environmental qualities constitute its identity and tourist economy. This landscape is also productive, specifically for wood exploitation and cattle breeding.
Finally, the region invests in new amenities to support its demographic growth. However, a new high school and sports facility will be located in Douvaine, away from major transport infrastructure. Finally, the region comprises commercial and industrial areas connected only to the road network.

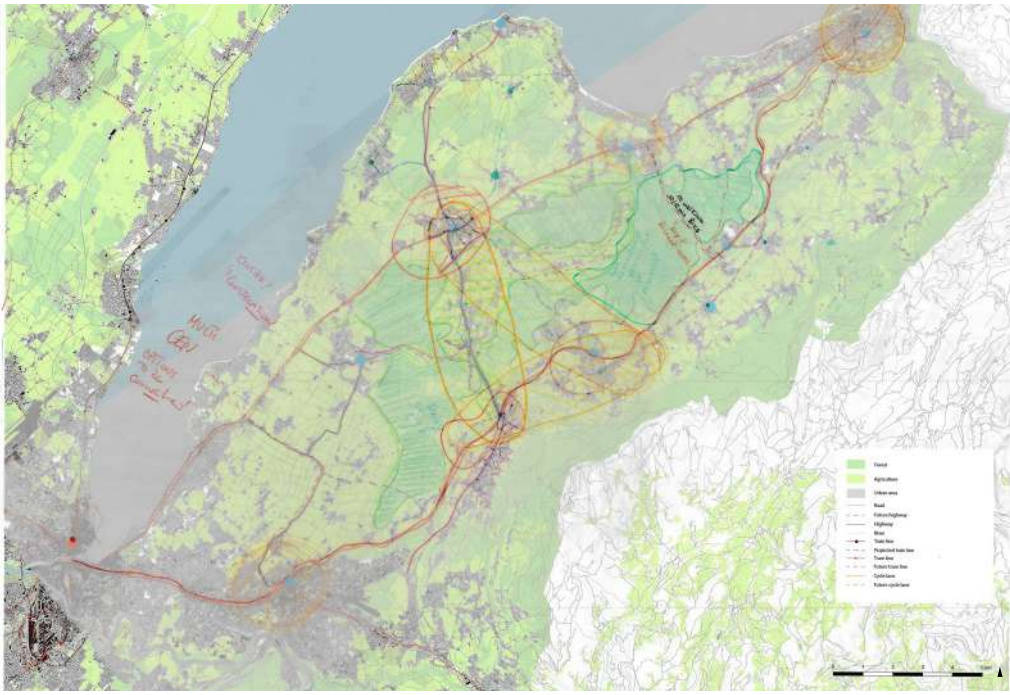


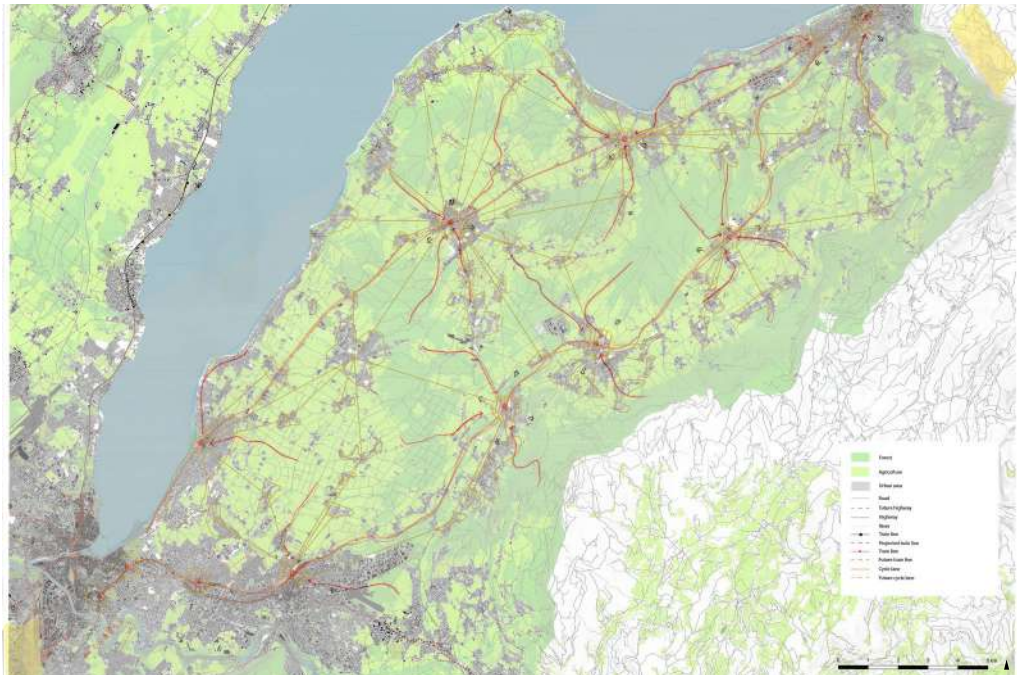
Chablais region defined by the Perimètre d'Aménagement Coordonnés d'Agglomération (source: SITG)

Autonomy Scenario
Chablais

With rising energy prices, mobility is likely to increase, so people are likely to live more precariously in the future; one of the key challenges is reducing dependence on centers such as Geneva rather than enforcing it. This vision is not an 'anti-geneva' stand but comes from observing the vulnerability of the Chablais territory toward geneva's unilateral decisions. Our approach to this exercise on scenario building for the Chablais region began as a general scenario ('What if we decentered/shifted the focus from Geneva?') to that of a deep exploration instead of what we deemed critical questions which emerge from the ground, i.e. of the people who inhabit the Chablais. There was an attempt, to begin with, the map on which we identified potential and multiple centers. Still, this was abandoned - instead; the map was written on, reflected upon, and momentarily discarded as we recognized that this territory must first be understood in itself for our aim to be completed. Hence the change of gaze also intends to capture the territory's potential from the ground up rather than from a top-down TOD logic.

From a flow of thought that began from decentering and thinking of the territory as porous to then distributing micro-mobility hubs and dispersing them throughout the area, we considered other grounded mobilities beyond train mobility, as it may be considered as a vector of dependence toward Geneva. We also found it to be more productive among us to begin problematizing why these hubs must then be connected (and what could happen when we do), why people there move, what would make them move (and where), and how we must rethink, for instance, understandings of everyday mobilities so typically gleaned from an urban perspective and then imposed onto rural-urban settings such as Chablais. We also questioned the meaning of being 'metropolitan' in these contexts because here in Chablais, inhabitants considered themselves urban, an essential insight into a region that was otherwise regarded as rural.
By understanding the inhabitants and their motives for mobility, then we





can better answer the question of if we give them other options besides a car, under what conditions would they change, and to do what?

T1. Along the Leman Express, these small and medium villages were becoming dormitory cities. The idea was to reinforce the existing qualities of these villages, small towns, and hamlets to develop their own 'autonomy' in the territory. How about reinforcing recreational activities and developing the local production economy in these areas? This could help regenerate jobs and develop activities on the local scale capitalizing on existing infrastructure rather than trying to implement tertiary activities which lack competitiveness toward Geneva. If nodes on the CEVA can only accommodate new populations dependent on Geneva, why don't we consider TOD nodes not as housing hubs but as central amenity locations? And reinvest in these villages?

T2. What would happen if we stopped amplifying the radio-centric transport infrastructure? Can we think about limits to mobility? Can we think about the limits of a lifestyle based on the idea of «speed»?
Hence, these territories open up discussions of lifestyles and mobility habits. Can we keep sustaining a movement system dependent on and based on urban criteria? As lifestyles can not be the same as in urban areas, we should start considering larger walking distances, other metrics, and other forms of mico-amenities. As basinc necessities, as transport is subsidies, could we subsidies such aminities?

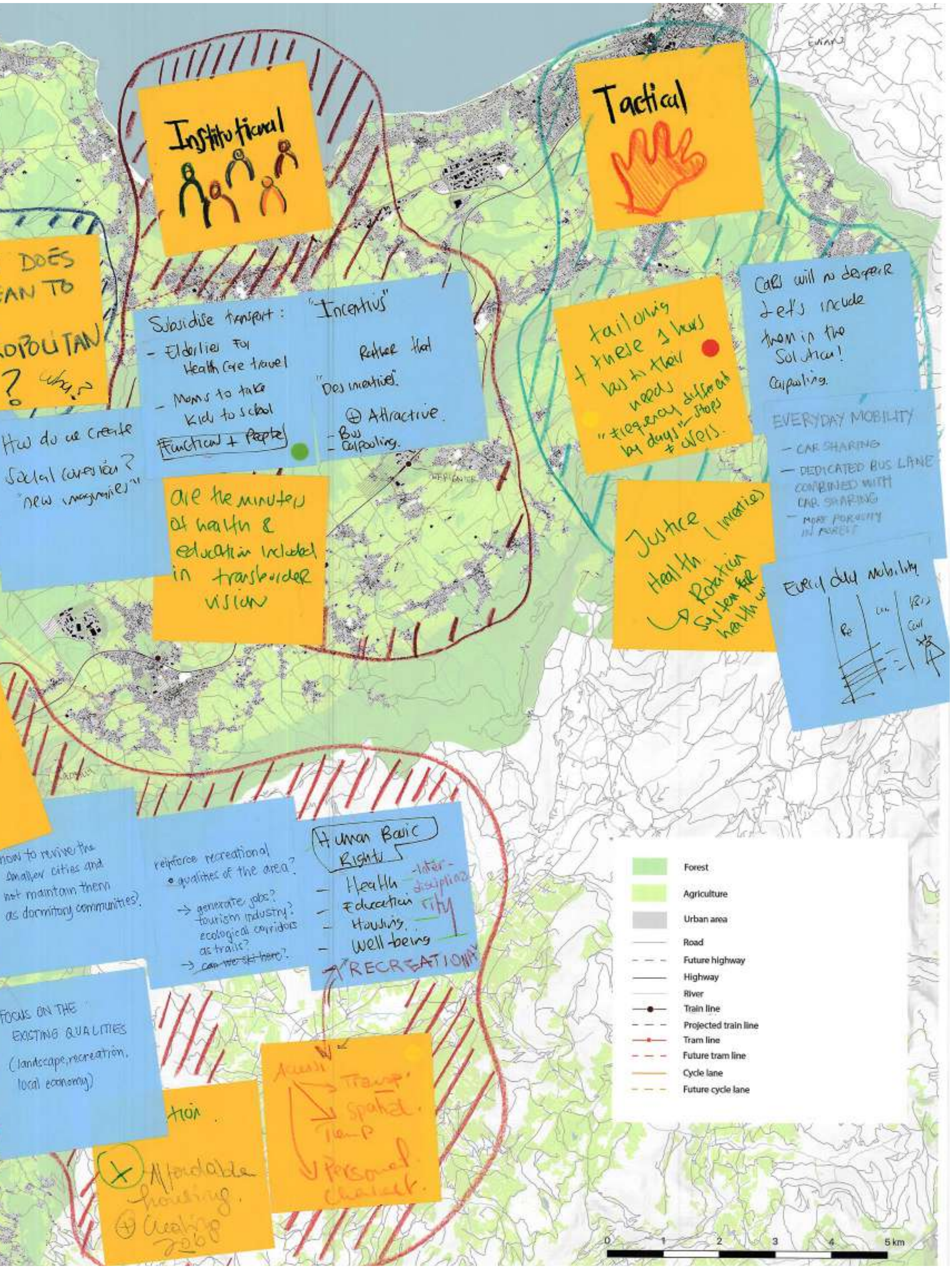
T3. The centrality around Geneva and the wage inequality across borders have created surrounding areas at the service of Geneva. This has led to perverse effects on access to health and education for people living on the «French» side. The same persons that work as nurses, for example, in Geneva hospitals, cannot access the health in those same hospitals they work for. Can we talk about mobility and accessibility without including health and education? Can we re-center the discourse around basic human rights: Health, education, housing, and well-being?

This exercise allows us to imagine essential questions we need to address to construct future scenarios

Carla Cruz, Maya El Khawand & Sandra La Rota


Ouvert


QUESTIONS
WHAT INDUSTRY?
Price of energy ↑
Price of mobility likely to increase and so people are likely to live precariously
REDUCING DEPENDENCE ON OTHER CENTRES
How to convince public authorities to invest in the territory & How to distribute the resources
What is the Role of Public authorities + Politics? & who is envolved in the Process
what is walkability in these Areas? and How to put down the urban to understand this question?
WHY DO PEOPLE MOVE?
SHIFT FROM WORK - HOME FOCUS
"they do exist beyond these lines"
What do they value?
IF WE GIVE THEM ANOTHER OPTION THAN THE CAR UNDER WHAT CONDITIONS WOULD THEY CHANGE?
Why do we need to connect the lines? What happens
Scenario
Positioning
WHAT IF WE SHIFT THE FOCUS FROM GENEVA?
TRANSIT LINES?
POROUS TERRITORY (IMPERMEABILITY)
DISTRIBUTED DEVELOPMENT
HIERARCHY
EXISTENCE OF These VILLAGES.
Do THEY EXIST BEYOND This Corridors?
MAKE Them a DESTINATION
HIERARCHY OF THE TERRITORY.
Mobility
Autonomous. + strength local regional
MOBILITY HUB that is focused on other types of mobility (not just train mobility)


Institutional
Tactical
Subsidise transport:
- Elderlies for Health care travel
- Moms to take kids to school
Function + People
"Incentives"
Rather that "Des incentives"
⊕ Attractive
- Bus
- Carpooling
How do we create social cohesion? "new imaginaries"
are the ministers of health & education included in transborder vision
tailoring these 1 bus to their needs
"frequency different by days" stops + offers
Cars will no disappear
Let's include them in the solution!
Carpooling
EVERYDAY MOBILITY
- CAR SHARING
- DEDICATED BUS LANE COMBINED WITH CAR SHARING
Justice Health
Every day mobility
how to revive the smaller cities and not maintain them as dormitory communities?
reinforce recreational qualities of the area?
→ generate jobs? tourism industry? ecological corridors as trails?
Human Basic Rights
- Health
- Education
- Housing
- Well-being
RECREATIONAL
FOCUS ON THE EXISTING QUALITIES (landscape, recreation, local economy)
Affordable housing
Forest
Agriculture
Urban area
Road
Future highway
Highway
River
Train line
Projected train line
Tram line
Future tram line
Cycle lane
Future cycle lane
0
1
2
3
4
5 km

No-car Scenario
Chablais

This scenario starts with a simple question: can TOD solve car dependence?

The Great Geneva knows and is intended to know, in future decades, an important demographic growth of over 2,6% per year, which means around 26 000 new inhabitants will need to house themselves in the territory every year. Meanwhile, newly developed housing, completed with great effort due to the price of land and increasing scarcity, specifically on the Swiss side, reached around 6500 per year between 2006 and 2013 and is likely to decrease if land use restrictions are taken seriously.

Therefore, we can say that new housing projects around the station will only allow hosting new inhabitants. In contrast, local inhabitants often find themselves forced to relocate because of increased land prices or because they disagree with changing living conditions. In villages close enough to new Transit-Oriented Development, inhabitants will now be able to commute to the train station but needing their car nonetheless. Meanwhile, the rest of the inhabitants will mainly see their living conditions unchanged. The settlement will remain too small to develop proper accessibility by public transport, and their ability will remain dependent on the car.

An endless game of chase arises, where improved rail infrastructure allows and/or forces people to move even deeper into the territory. Therefore, TOD solution, in a dispersed context such as the Chablais remains very partial; if it might allow for a mobility shift for new inhabitants, it will have little impact on the overall mobility shift. Should we just keep adding rail lines deeper and deeper into the territory at enormous ecological costs? Or can we break the pattern?

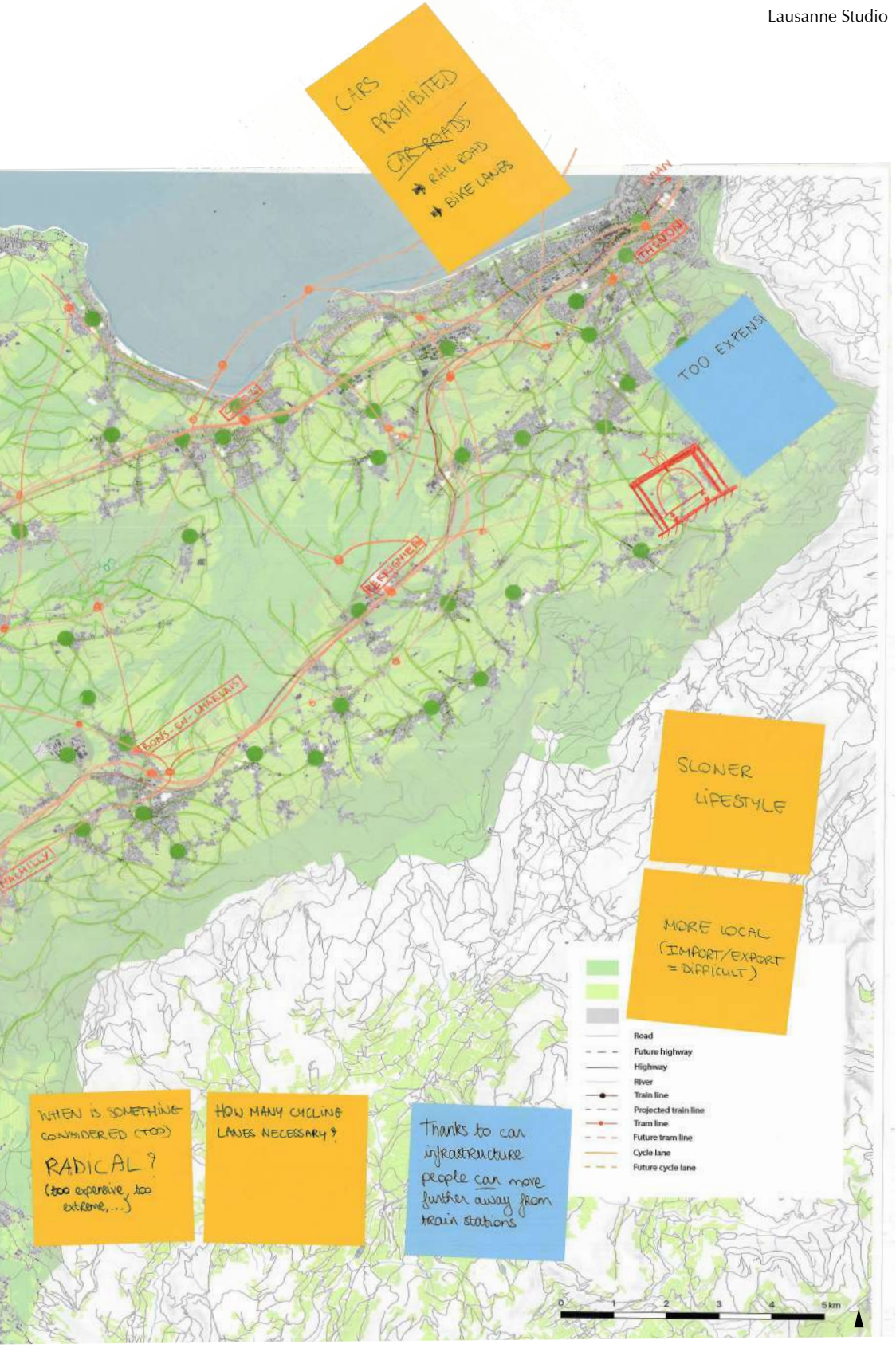
We identify the expensive car infrastructure as a crucial prerequisite for this perverse effect. What if we could invert this reality? What if cars were no longer allowed in the region? The transversal lines of the Léman Express and the RD1005 road would become the high-speed connections (both train, bus, and bike) to Geneva and the rest of the territory. All other roads would be converted into safe and pleasant roads for slow transport: walkers, cyclists, bike taxis, low-speed minibusses, bicycle delivery vans, etc. Village centers split in two by

saturated car roads could now be reunited, no longer having to deal with poisonous traffic jams. Ecological barriers could become safely crossable for animals. Some redundant roads could even be destroyed and given back to nature.

This radical change in the transport network would necessarily lead to a different lifestyle: the slowness of permeating the territory could foster a slower life. Local production could become cheaper than alternatives that have to travel further. There would be a need for small distribution centers along the train lines, which could create local jobs. At the same time, car-oriented commercial areas could become a resource for future development. For people having to reach locations outside of the region, there would still be the option to take the car, but the car would have to be left at the entrance to the region, on a park-and-ride near Annemasse. The periphery inverts it relation to the centers, no longer a car-buffer but an entity. With our scenario, we touch upon an important question about radicalness. When is something considered too radical, too expensive, or too extreme? Is not either the current reality of an expansive, fine-grained network of kilometers of asphalt and concrete, dominated by fast and dangerous cars, a radical situation?

Lisa Buldeo Rai & Leon Vauterin


INVERT THE SYSTEM
CAR ROADS
→ TRAIN, TRAM, BICYCLES
PEOPLE NEED TO GET TO CAR ROAD:
+ cycle
+ bike taxi
+ walking
+ (mini)bus
+ bus-tram
NO BIG INVESTMENTS
+ NO NET LAND UPTAKE
JUSTICE:
MORE ACCESSIBLE TRANSPORT MODES
INFRASTRUCTURE FOR WHOM?
IS CAR ROAD STILL NECESSARY?
- YES: CONNECTION TO OTHER PLACES + LOGISTICS
- NO: PRESSURE ON ONE ROAD + VILLAGES
- COMPETITION WITH TRAIN


CARS PROHIBITED
CAR ROADS
RAIL ROAD
BIKE LANES
TOO EXPENSIVE
SLOWER LIFESTYLE
MORE LOCAL (IMPORT/EXPORT = DIFFICULT)
WHEN IS SOMETHING CONSIDERED (TOO) RADICAL? (too expensive, too extreme,...)
HOW MANY CYCLING LANES NECESSARY?
Thanks to car infrastructure people can move further away from train stations
Road
Future highway
Highway
River
Train line
Projected train line
Tram line
Future tram line
Cycle lane
Future cycle lane
0 1 2 3 4 5 km

Learning from Scenarios

The Great Geneva constitutes an extreme metropolitan case. As one of the most dynamic cross-border European regions in a bounded natural landscape, it is characterized by amplified and complex metropolization dynamics. Over the past decades, the metropolitan has thrived by exploiting economic and socio-geographic disparities (Raffestin, 1973), facilitated by planning disconnection and asymmetry on each side of the border (Bertrand, Cremer-Schulte, Perrin, 2015). Regulatory gaps, particularly prevalent on the French side, coupled with abundant land availability and fuel for individual mobility, have enabled this self-directed, or economically directed, development over the past fifty years. This development model, in turn, fostered important spatial and socio-economical asymmetries and a frantic rate of consumption of natural resources. Today, transition objectives clearly expose the metropolitan system's vulnerability and the uncertainty towards its future.

On the one hand, economic growth and the proudly protected rural green belt around Geneva depend on France's capacity to host urban development (Lambert, 2023). The newly adopted Zero-Net-Land-Take, adopted by the French authorities, promoting ambitious land sobriety, puts the current urban growth dynamic at an impasse. On the other hand, the Zero Co2 emission objective demands avoiding, shifting, and improving transport. However, the exacerbated land value gap related to urbanization dynamics, supported by the fiscal differential between France and Switzerland, ultimately increases the border effect. This leads to the augmentation of the distances between places of employment and residence, as well as spatial specialization, and, therefore, the permanent increase of commuter movements. Hence, the ability of such a metropolitan system to avoid transport is unlikely. Modal shifts are based only on improving the radio-centric transport system aimed at commuter mobility. Meanwhile, half of the current metropolitan population still needs a real alternative to car mobility.

Three paradoxes emerge from the current radio-centric Transit-Oriented Development metropolitan vision between the support of the metropolization process and the socio-ecological transition, between a method of increasing economic concentration, polarization, and spatial differentiation and the systemic transformation needed to respond to the social and economic crisis.

The first paradox that emerges is of a spatial nature. The mobility transition project supported by heavy infrastructure is aimed to accommodate the new population. Hence, it only impacts half of the current metropolitan population, clashing with the necessity of transition strategies encompassing all parts of the territory.
The second paradox is of a socio-economic nature. The cooperation between land use and transport is enforcing spatial specialization and social polarization for its economic growth, which relies on a dynamic of ever-increasing mobility and land use while trying to build a coherent transition project.
The third paradox is of an ecological nature. The model is established in a metropolis comprised of discontinuous built spaces intertwined in landscape and well-connected unbuilt spaces fostering normative urban growth at the cost of ecological values and local identities.

Therefore, the socio-ecological transition does not demand merely an adaptation of the transport system but is a critical systemic juncture point for the metropolis. In such a context, cross-border coordination must now bring new political action and spatial tools to mitigate metropolitan externalities and address the territorial imbalance at the roots of these paradoxes. Thinking from the edges to redefine the relationship between center-periphery, radial and tangential, and between urban and rural spaces is essential to define a coherent transition project. In this regard, the Great Geneva is a striking laboratory for imagining the new systemic relation that the socio-ecological transition demands of metropolitan spaces.

Across scenarios

The scenarios investigate the possibility of a federating transition project from the edges of the metropolis. What appears from transport and urbanization relations for the transition from the edges? Or from the 'city-territory' perspective? Beforehand, it is important to recognize that the scenarios developed in the two contexts have different orientations. This shows how particular each context is regarding interaction and spatial configuration and, therefore, the inability to provide ready-made solutions. Despite these differences, the scenarios bring to light several « materials » or existing spatial features that can participate in reforming the spatial project.

The (not so) new materials of transition

The first material is the existing infrastructure. Whether in its current, transformed, or rehabilitated use, the existing and already available infrastructure is the backbone of all scenarios. However, secondary roads and paths are highlighted even more than the strong infrastructural lines. These dense networks appear as a specific rural-urban feature based on agricultural heritage, with significant

potential. Its « reuse » demands a minute and careful understanding of territorial relations to question the road system's hierarchy and usages. Second, the existing build fabric is an anchor in discontinuous and scattered urban contexts. The scenarios all search for ways to enforce connectivity between the existing built nodes, regardless of their normative qualification. Promoting Zero-artificialization starts with the already-built capital (Bewiy, 2022). Rather than driving urban growth, mobility must adapt to the existing urban fabric. The question of « growth », in the traditional sense, becomes a last resort. Densification is even imagined as a tool to « restore » territorial equilibrium by spreading population growth punctually in the territory rather than concentrating it. In addition, rather than the traditional recourse to industrial platforms, the commercial car-oriented area appears as the main 'stock' available for future development through their connection to the transport system. Finally, natural landscape structure constitutes a backbone for every contribution. What is mobilized, however, is not so much the « particular » ecological corridors but the « ordinary » horizontally organized agricultural and forested landscape. Rather than protecting, the capacity to restore and expand open spaces is put forward. The urban-rural edges' cohabitation between land uses creates more or less friction to sustain different forms of inhabiting the territory and other mobility behaviors.

These materials, which the four scenarios work with, are far from new; they are the embodied territorial capital, either natural or man-made, that construct the contemporary environment. Recycling, reusing, transforming, preserving, and expending are the leading principles that guide the ability to engage these materials in the transition project.

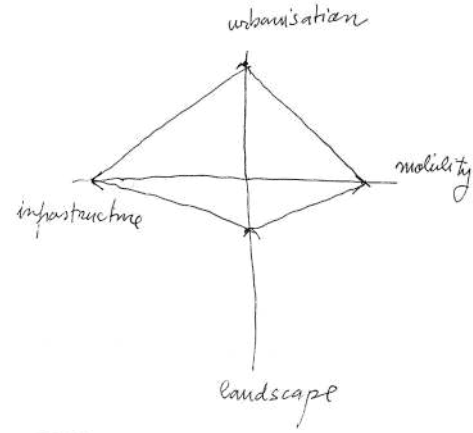
On strategies

Three central research themes and associated strategies arise from the scenarios that transversely participate to challenge current territorial paradoxes.

Car or No-car?

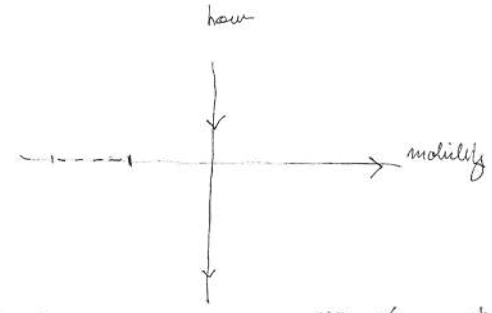
All scenarios confront themselves with car-based mobility, which in rural-urban regions remains both unsustainable and irreplaceable. The possibility of a 'no-car' scenario might seem radical in suburban and rural-urban contexts. However, in recent years,' no-car' designs have become a reality for city centers, reporting or postponing car externalities to metropolitan edges. What does it mean to invert such strategies and think about it from the edges?

Of course, the question is not the complete disappearance of car-based mobility, which has yet to be reached in city centers. But to support the capacity of suburban territory to operate beyond the car. Experts agree that the car will be



mobility possible at the cost of economic growth & urbanisation → landscape consumption.

A conflict : mobility – ecology – economic growth



Ecology & economy.

mobility & ec. growth

needed for these spaces, but the nature and place of the car in these territories are called into question. This reflection is, therefore, a necessary and radical reflection around rural-urban spaces, not as submitting to a modal shift but as the engine of a new spatial and political project.

With its grid network, the existing Leman express backbone, and the future BHNS road, the Chablais region's capacity to support most of the territory through alternative modes does not seem so far ahead. In the Jura, the lesser road capital orients rather toward strategies of hierarchization and the exclusive dimension of the car's grip on the road network.

Regarding economic rationals, such strategies only demand limited investment compared to large infrastructure creation and allow plural, light, rapid, and «testable» implementations, which are already appearing punctually in the territory. In addition, it solicits local and communal actors who have control over the secondary road network, which can lead to an incremental implementation. Whether it is a reduction of circulation lane, the reduction of speed, or a conversion for other usages, such strategies are shown to have multiple impacts. The development of slower rhythm support the enrichment of life quality, specifically in villages saturated by traffic today, and the development of new forms of micro or local commerce and amenities. From an ecological perspective, despite the spatial gain, which can support linear connectivities, reducing the speed of human traffic allows for mitigating the « wall effect » that roads have on animal mobility.

Beyond mobility, such scenarios also interrogate the relationship between the center and the periphery. In the No-car scenario proposed for the Chablais, it is not the center but the periphery that gets rid of the car. It is not the center that overloads peripheral traffic but the reverse. This paradoxical situation demonstrates the importance of having concomitant strategies on both sides of the border and between the center and the periphery. Further, it related to the autonomy of part of the metropolitan system. Reducing car accessibility redefines the identity of what is today a « pathing through territory ». Finally, what appears is the potential that questioning the car hegemony and the space allocated to it permits impulsing systemic territorial transformations.

Can the border be a resource?

The cross-border nature of the metropolis is the most challenging aspect of the Great Geneva territory. From it, the primary source of mobility externalities is derived. But it is also a constitutive part of the territory that needs to be acknowledged for its specific potential. The contributions question the border as part of the spatial project in three ways: taking the border in its current state, that is, of selective permeability, erasing it, or enforcing its spatial reach.

However, the main challenge is less the border than the ability to find cross-border cooperation systems and governances that mitigate its externalities, ultimately turning the border condition into a resource for the transition project of edges territories. The main targeted problem at present is border permeability and impermeability. On the one hand, it is highly permeable to labor force drainage from Swiss to France. And on the other hand, it is impervious to other movements related to leisure, health, education, housing, and production.

The current differential of the territory could serve to develop complementary economic activities on the French side, taking advantage of the cheaper labor force and availability of land; this would include small local production, repair, and craftsmanship, which would favor short circuit and beneficial from tax agreements such as the ones applied on agricultural products. On the other hand, bilateral agreements could encourage enterprises to localize in the French part of the aggregation.

Many amenities are concentrated in the bordering territory, functionally differentiated on each side, and therefore inaccessible by parts of the population due to national systems. International agreements could take advantage of this condition and mitigate the lack of amenities on the French side, such as schools and hospitals, and favor more proximity living for its inhabitants while providing recreational activities for the Swiss population.

The 'buffer zone' and 'sponge scenario' highlight the potential of cross-border construction from an ecologic and landscape point of view. Considering the bordering space allows for coherent preservation and enforcement strategies. Furthermore, it could become a park project constructed around the landscape identity of the region, enforcing cultural, economic, social, and recreational interactions.

Finally, more border interaction means smaller and more dispersed flows. It favors the existing movement that runs through the border beyond the center, reinforcing its multipolarity and allowing it to build a multipolar cross-border transport network with distances small enough for a high-frequency bus. In addition, the permeabilization of the border through secondary roads would allow the development of a wide range of modal choices, including active mobilities, which remain misconnected today. Small settlement relations and partnerships across borders would be promoted based on physical proximity.

Scenarios allow us to envision possible strategies acknowledging the border as a resource for the transition project and show the necessity of taking a political stand on its role in metropolitan construction.

Autonomy through proximity?

The third axe implicitly tackled by this design research is the relation of dependence toward the center of the metropolis. Even though unequal in both case studies, this one-sided dependence has a significant role in the movement generated in the Agglomeration. Such dynamics in asymmetrical territories are ever present in the production of extensive infrastructure, such as the Leman Express, which, while offering an efficient alternative to individual mobility to new residents, facilitates distancing residential functions, participating in rebound effects and the development of dormitory settlements. Here, this question is tackled from another angle, from the ability to build territorial autonomy or resilience by cultivating rural-urban identity supporting more proximity.

First, the attractiveness of rural-urban territories relies on their landscapes and natural amenities. Enforcing and protecting such qualities is necessary to conserve territorial identities and their ecological value. Active modes of infrastructure allow the development of recreational and leisure activities and the structuring of daily activities around the landscape qualities as a support for new means of inhabiting these territories. Reducing mobility speed, specifically in the village cores, would also allow the reclaim of public spaces and capitalize on the social quality of such places. Ultimately, such strategies could lead to a « park » vision integrating economy, ecology, and recreation.

Centralized poles of activity mean significant distances to travel. In an autonomy scenario, the notion and scale of 'multipolarity' needs to be revised. In a dispersed context, the contribution highlights the necessity of having dispersed amenities to allow shorter displacement, which can be done by alternative modes while enforcing life's quality. Micro-amenities, direct-selling, and small commerce are indispensable to the transformation of practice and could even be subsidies to ensure their access to the whole population. (Micro) Mobility hubs or nodes are targeted not for new housing development but for collective needs, showcasing the importance of multifunctionality in such living environments.

Finally, the territory's autonomy also relies on providing jobs and developing its local economies, which do not try to compete with Geneva but take their root in the rural-urban landscape, beneficiating from the labor force differential with Switzerland, such as craft and production.
Obviously, the Jura or the Chablais are not contexts in which the ten-minute city is relevant. In this context, proximity means strengthening the relation between the diverse urban cores to benefit from the plurality of opportunities and qualities of urban and natural environments. This is done in different scenarios through service provision and the combination and plurality of

networks, speeds, and modes, participating in building local resilience.

TOD in rural-urban regions?

Thinking about mobility transition from the edges of the metropolitan territory is a significant challenge. It demands to go beyond normative TOD-like thinking when confronted with the actual territory. Dependent on the car, energetically and spatially dispendious, it requires careful understanding and imagination to find opportunities in suburban and rural-urban areas, usually seen as incompatible with transition objectives. Mobility habits and patterns are a consequence of spatial configuration. Therefore, as these contributions demonstrate, mobility transition, especially in edge territories, demands a systemic approach, leading to a plurality of strategies dealing with political, institutional, and administrative logic and economic, social, and ecological relations. Even more so, reforming a spatial project for transition can only go with political stands in a context such as the Great Geneva. The question remains open on which governance tools could favor such a project.

Beyond the radio-centric transport model at the agglomeration scale, new figures emerge from the edge territories in each contribution. These figures are more articulated, less hierarchical, and rooted in multimodal coalitions; they work on complementarity rather than superimposition. We can read the different figures - the polycentric diamond, the rhizome, the multimodal mesh - as other means of reconciling mobility and the existing dispersed urbanization pattern. These figures go hand in hand with different spatial projects that question the balance between interdependence relations and local autonomies, from multipolarities to dispersion. These figures call into question the compact city's unequivocal project imposed by the strong network's punctuality. The relationship between strong transport and lighter mobility networks is blurred in the different propositions. This goes beyond thinking of movement through modes but also through the prism of individual 'needs' for mobility. Here, the figure of labor-oriented mobility is not necessarily predominant. Recreational and qualitative mobility are highlighted, relying on natural networks and the landscape to promote or minimize their adherence to the territory. By looking at scenarios rooted in rural-urban regions, what appears, therefore, is not a rejection of the radio-centric TOD model but the necessity to territorialize and hybridize it, acknowledging territorial inertia and transformation capacity.

Contributions

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Contribution Januray 2024
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PARADOXES FOR CRITICAL «FUTURE THINKING»

To conclude this publication, it is important to underline some of the more general outputs of the workshop and the lines it draws for further research investigations. As revealed during the collective activity on site in Geneva and at the EPFL in Lausanne, the interest of such a workshop lay both in the complexity of the context (with its specific, geomorphological, economic, and transborder conditions) and the methodological aspects (highlighting paradoxes that constitute the ground of present and future challenges), explored through scenarios. Both points are relevant for the joint TOD-IS-RUR research. I will start from the methodological one to conclude with the lessons learned in the context of the Great Geneva.

Building scenarios through paradoxes: research-by-design as a critical tool
The idea of the future as a construction, rather than a destined to be condiction, inspires all scenario building. It is a well-known tool for nourishing debate on contrasted or complex issues and enhancing the collective understanding of possibilities, risks, and potential in a set of hypotheses. Territorial and urban designers rely on such a tool to overcome juxtaposed, chaotic, or difficult decision-making. By developing scenarios, design reveals its ability as a knowledge producer (Viganò, 2016) and its fundamental necessity and legitimation in the context of any societal, ecological, and spatial transformation. The workshop's viewpoint consisted of the understanding, through the exchanges with different local actors and experts, of the contradictions and paradoxes animating the unresolved ongoing discussion on a possible/feasible/realistic reinterpretation of the TOD model in a context of rural/urban extended urbanization.

The search for paradoxes is particularly fertile because it highlights opposite facts or characteristics that develop unclear and «impossible» relations or

unusual mixes that are not always evident to understand. The potential of paradoxes in structuring research is well known (especially in organizational and management studies) (Putnam, Fairhurst, Banghart 2016). It inspires attention to nonlinear facts, tensions, and conflicts inside social, organizational, or spatial conditions. Authors even consider such an approach too successful sometimes, generating a specific «success paradox» (Pina e Cunha, Putnam 2019). However, revealing paradoxes is an exciting tool to connect critical reading of geographic and socio-political contexts with future challenges and interrogations through scenario building and vision construction.

The workshop hypothesizes that today's territorial paradoxes can reveal potential space for future exploration. There is no positioning on the positive outcome of those scenarios, but the idea that testing them can uncover hidden sides of a given problem, eventually nourishing the original hypothesis about the future evolution of territorial phenomena, conditions, or functioning.

Expanding on a paradox theory is outside the scope and possibilities of these conclusions. Still, it is essential to remember that it stems from Deleuze's reflections in his Logic of Sense and reading of Leibniz's contribution. The paradox breaks common opinion (good sense and common sense) simultaneously in the direction of «becoming mad and the unforeseeable» and of the «nonsense of the lost identity and the unrecognizable.» Through this criticism, an original thought process can develop, fed by both directions at once. Deleuze firmly distinguishes between paradoxes and contradictions, the first applied to the realm of impossibility, the second to the real and the possible from where it comes from. This separation is less clear and maybe less crucial in our «more to the ground» experience. The point is open to the imagination of new relationships among them, not simply flattening the asperities of realities, reversing paradoxes and contradictions, but questioning the very nature of economic, socio-ecologic, and spatial tensions, highlighting possible synergies or mutualization of potential positive effects. Today, beyond the recognition of different types of paradoxes, there is not enough attention paid to the relationships within paradoxes, and the action research approach proposed by the workshop showed to be a good testing ground to explore them (in the tradition of Donald Shon's reflective professional - or academic field (Schon, 1983). Paradoxes' epistemological strength is their ability to dis-organize, trouble, and dis-equilibrate our gaze and transform scenario construction into a critical tool.

Context-specific research: lessons learned from Great Geneva

The Great Geneva agglomeration is a vivid example of all the limitations and contradictions of the traditional TOD model. In that sense, it is a salient reference for the TOD-IS-RUR network, concentrated on the encounter between that model and the urban-rural space, which characterizes enormous portions

of contemporary urbanization. The perspective investigated by the workshop is the rising tension between such a model and the social and ecological transition.

The first TOD strategies have nourished and structured the series of Agglomeration Plans for Great Geneva under the obligation of accessing federal funds dedicated to transport infrastructures. However, TOD logic met with little social acceptability. Their implementation has revealed unresolved questions and a debate on shared priorities still needs to be added: is the further urbanization of the countryside what we want? Is the TOD efficiency principle enough to legitimize sound and fertile land transformation in streets and buildings? Or is the Great Geneva facing a paradoxical situation where rail development intends to reach grounds that might not be able to turn into new neighborhoods?

In the same vein, Is the densification of the Leman express stations on the Chablais side (a decision that structured the requalification of the existing line) worthing the urbanization around them on the rest of a fragile wetlands landscape, which still characterizes the region? The impossibility (from the point of view of the importance of the wet areas), but also the lack of pertinence of densification around a station in a rural/urban context where urban development is scattered in the traditional hamlets and village structure, or, in recent times, along the main roads parallel to the lake, by far not related to railway stations still deserves investigations. Is there an inadequacy of the model in the territory or of the territory to the model? Should we adapt the territory to the TOD imperatives, or should we rethink the TOD idea?
And what if a new structuring TOD line on the axis connecting the main centers of Chablais (Thonon) and Geneva was almost impossible because of the road profile and the many commercial, economic, and residential activities along it? Should we renounce the A to B efficient line in favor of a less rigidly transit-oriented conceived line? And how far can we push soft mobility (integrated into the heterogeneity of the urban patterns) as a substitute for a simple solution that might never work?

In the Pays de Gex region, an unprovided public transport structuring line: is a new soft mobility axis the best way to valorize an ancient railway line, bringing the necessity to look for other new tracés? Or is this a paradox regarding land use, energy consumption, and embodied energy loss?

Last but not least: are the old projects of new highways on both sides of the lake, including the lake crossing, still meaningful in an ongoing ecological and social transition? Is locating a strong public transport line on them a sufficient justification for their realization? Is the argument of the enclaved territory enough to support the destruction of excellent agriculture in the prairies of the

Reblochon cheese production in the Chablais?

The scenarios developed in the workshop have brought an exciting understanding of such a collection of paradoxes, inviting researchers and actors to accept the ambiguity of many of the proposed projects and go beyond TOD common sense. The scenarios do not intend to draw a solution, but the beginning of critical thinking crosses and influences the reading of existing conditions, future challenges, and possibilities.

Conclusions

Many questions remained open after the workshop and after the in-depth study conducted by several teams to support the new agglomeration plan, whose primary goal is to lead Great Geneva through the social and ecological transition. However, the clarification of the paradoxical nature of the TOD in the urban and rural territories does not deny its importance as a lever to let original and productive images emerge. Imagination is the best and easiest way to reopen old, shriveled-up discourses, deconstruct them, and interrogate them about their legitimation in a context of profound social and economic transition.

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Afterword

On vulnerability and path dependency

The greater Geneva metropolitan region is structured by asymmetrical socioeconomic conditions perpetuated by the prevailing radio-centric cross-border development model. This logic reinforces spatial specialization and the ever-growing dependence of the outer regions on the center, resulting in an overall vulnerability of the metropolitan system. In such conditions, the question arises: How can we promote a socially just ecological transition in a metropolitan territory shaped by such asymmetry? What alternative approaches can we employ if the current radio-centric model perpetuates inequality? Moving beyond the radio-centric development model prompts reflection on the territory's historical, present, and future dimensions.

The territory is a tributary of past decisions and development, which, as Philip Gasser points out, result from complex, socio-economical, individual, and collective choices of transport modes and urban development patterns. At the same time, labor-force attraction to Geneva justifies the focus for the past 20 years on a radio-centric public transport network; the inherited urban pattern resulting from these multiple choices cannot and will not be solved by spatially selective TOD strategies. This implies the need for nuanced and multifaceted strategies to develop, re-use, optimize, and innovate the relationship between transport and urbanization.

Fieldwork involves moving beyond maps and theoretical models. As Andres Fingers' contribution highlights, going into the territory invites one to explore the richness of stratified interactions at the edge of the built and non-built environments, both from a social and ecological perspective. However, it also underlines the fragile equilibriums at play. It emphasizes the need for a multi-scalar and multi-actor approach, allowing local initiatives to emerge and hybrid spatial qualities to be recognized.

Hypotheses developed through scenario-making allow us to question recurrent themes, the role of the border or the center-periphery relations, autonomy versus dependence, and the role of cars in rural-urban multimodality. Research-by-design enables a territorial and systemic approach to Transit-Oriented Development (TOD). Exploring the territory from its edges and on a smaller scale reveals various, supporting Antoine Brès' claim for a form of Distribution-Oriented Development (DOD). What comes out is the complementarity of these figures, which could complement the radio-centric model, both addressing current vulnerability and enhancing resilience.

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