

Densification of residential areas in the Canton of Geneva (Switzerland): a lever to strengthen ecological connectivity?

Since 1980, Swiss public policies have advocated rational land use in order to avoid consuming agricultural land for urban development. With this in mind, the canton of Geneva modified its legislation in 2013 allowing the densification of residential areas, to the detriment of the environmental, ecological and landscape quality of these neighbourhoods, which are often richly wooded. In this article the author illustrates the measures deployed to not only ensure the preservation of biological networks but also to reconstitute them where they have disappeared.

Général context

Geographical situation

The Canton of Geneva is relatively small (282 km²) and has a high population density (1,768 inhabitants/km²). However, Geneva is not a city-canton. Its territory is characterised by a great diversity of spaces where the countryside and natural spaces represent about 50% of the cantonal territory and form a "green belt" around the urban centre. Situated between the Alpine and Jura massifs, the cross-border dimension of the ecological networks is essential. Thus, several "Corridors biologiques Vert et Bleu" (green and blue biological corridors) contracts have been established at the scale of Greater Geneva (the Franco-Vaud-Geneva conurbation) to preserve or restore the functionality of these networks.

Legal situation

Since 1980, the date of the first federal law on spatial planning (*Loi fédérale sur l'aménagement du territoire* or *LAT*), the concept of rational land use has been advocated through public policies in order to avoid consuming agricultural land for urban development. As the Swiss institutional and legal context is based on the principle of subsidiarity, the competence to implement higher-level objectives lies with the cantons. Faced with the fact

that the objectives of the LAT were not being met, the people accepted a legal amendment in a referendum on 3 March 2013, strengthening the protection of agricultural areas. Since then, "inward densification" has become a major requirement of Swiss spatial planning. The stricter control exercised by the Confederation obliges the cantons to revise their planning and legal provisions with a view to densifying already built-up areas. In Geneva, the low-density residential zone (known as "zone 5") occupies 2,946 hectares, representing about 40% of the canton's buildable area. However, it only accommodates about 12% of the population. Considering that this space could and should be better used, the canton of Geneva amended the legal provisions governing the building possibilities in this zone in 2013.

The legal amendment

The construction possibilities in zone 5 are defined by article 59 of the Law on constructions and other facilities (*Loi sur les constructions et les installations diverses - LCI*). This specifies the maximum floor space index (*Indice d'Utilisation du Sol - IUS*), i.e. the ratio between the gross floor area and the surface area of the plot. Until the 2013 legal amendment, the usual IUS was 0.2 (i.e. a building with 200 m² of gross floor area for a plot of

1,000 m²). Derogations related to the type of spatial arrangement (multi-unit housing, attached buildings) and to the energy performance allowed to reach an IUS of 0.3 or even 0.48 for projects located on plots or groups of plots totalling more than 5,000 m².

In 2013, floor space indices were increased by about 25% overall. The usual IUS increased from 0.2 to 0.25. It was increased from 0.3 to 0.48 for attached buildings and developments with very high-energy performance. The maximum IUS was increased to 0.6 for contiguous plots totalling over 5,000 m².

The law specifies, however, that exemptions allowing higher IUS than the usual rule are possible "when circumstances justify it and when this measure is compatible with the character, harmony and development of the neighbourhood". As these notions are rather vague – and in the absence of clear criteria for assessing projects – derogations were initially granted in a quasi-systematic manner.

A rapid and drastic transformation of residential areas

This modification has had very rapid effects on the region, with developers and architects having anticipated its entry into force. Thus, since 2013 and throughout the canton of Geneva, there has been an increase in the number of building permits, an increase in the number of dwellings and in the number of dwellings per development (previously, projects included an average of two to three dwellings, rising nowadays to four to five, with some projects involving several dozen). Detached houses have fallen sharply (from 20% to 5%) to the benefit of multi-unit housing developments, which today represent the great majority of newly developed dwellings. This evolution can also be explained by the growing value of land that resulted from the increase of building rights. It is therefore less and less owners who build houses for their own needs, but real estate developers who seek to maximise their profit by building as many housing units as possible.

This results in a rapid and drastic transformation of residential areas: damage to existing landscape structures as well as to wooded areas that provide biological connections for small fauna, soil sealing and land fragmentation caused by the development of new, e.g., access roads, fences and walls. Large areas of land are thus being "sterilised".

Development strategies for zone 5: examples from the municipalities of Vandœuvre and Chêne Bougeries

In order to guide this development, the Geneva municipalities, which have no real legal powers in terms of land-use planning, must establish a strategy for the development of zone 5 as part of their municipal masterplan. This strategy must set out the conditions for granting exemptions and thus specify what is "compatible with the character, harmony and development of the neighbourhood". Our office has been able to develop such strategies for many Geneva municipalities as well as to test them by giving advance notice of construction projects. The examples we illustrate below (Figure 1) are

mainly based on two municipalities on the left bank of the Lake Geneva: Vandœuvre and Chêne-Bougeries. These two municipalities have very extensive "zone 5" areas with contrasting characteristics : neighbourhoods characterised by the presence of large estates (mansions with heritage value) on land plots ranging from two to ten hectares, but also suburban neighbourhoods of small detached dwellings on plots of less than 1,000 m². These two neighbouring municipalities are also characterised by the presence of high-quality woods and trees, which gives the residential areas a certain landscape quality and plays a major role in preserving biodiversity.

The premises

The municipal strategy for the development of zone 5 is based on several premises that are translated into principles and then into conditions for densification.

The main premise underlying the strategy for the development of zone 5 stipulates that for the municipality to be able to restrict the possibilities of densification offered by the law, the provisions it enacts must be in the public interest. Indeed, inward densification is an objective set by the cantonal and federal authorities. Consequently, a limit to the application of this principle can only be envisaged in relation to other principles of public interest.

1 Excerpt from the development strategy plan for zone 5 (low-density residential area) in Vandœuvre (source: Urbaplan).



The large green arrows represent biological corridors. Existing hedgerows are represented by dark green dots, while hedgerows to be extended are in light green. The yellow line indicates the requirement for a particularly high-quality treatment of the boundaries between public and private property. The yellow hatched line highlights the efforts to be made for improving the transition to the agricultural zone. These indications make it possible to demand offsets to the densification of the plots.

▶ The elements of public interest considered have been discussed with the municipal authorities and are thus the subject of a broad consensus. These are mainly:

- the preservation or reconstitution of the landscape components that define the communal identity like oak avenues, treatment of the boundaries between public and private property and the maintenance of large, sparsely built areas;
- the functionality of natural networks: for example landscape permeability and biological connections, treatment of hedges and fences, permeability of the soil, preservation of copses, wooded strips and isolated trees;
- the functioning of mobility networks like pedestrian paths and grouping of accesses to private plots to avoid multiple breaches of wooded areas at the edge of the public domain.

A second premise is that the granting of an IUS higher than the legal index is conditional on a compensation benefiting the community. This contribution can take various forms like right of way, reinforcement of landscape components (tree planting) or provision of collective or public micro-spaces.

A third premise is based on the equal treatment of owners. Thus, the strategy applies to all applicants for a building permit regardless of a request for an exemption. It is indeed considered that any project, regardless of its index, must contribute to preserving the natural qualities and functionality of ecological networks.

A fourth premise relates to the notion of neighbourhood considered in a contextual manner and based on

the image perceived from the public space (streets and paths) in the immediate environment of the project under consideration.

A fifth premise is that the concepts of harmony and character of a neighbourhood are not subjective criteria like aesthetics. Indeed, the harmony and character of a neighbourhood are elements that can be described in a factual manner. For example, the natural or artificial treatment of a hedge along a road, the relationship between solid and empty spaces, between the height of buildings and the height of the vegetation and the presence of open views or closed horizons are all elements that make up the image of a neighbourhood or a street and thus constitute its character and its harmony. There is nothing subjective about this, as there would be about an assessment of the beauty of a building.

In order to comply with these postulates, the strategy is based on:

- principles and measures to limit densification, such as the requirement to maintain existing woody components or to replace them in situ, which should prevent maximum use of the plot by wiping out what already exists;
- principles and measures to accompany densification, such as the requirement to plant trees to reinforce hedgerows or reconstitute them where they have disappeared.

The principles and conditions

We will focus mainly on aspects relating to the natural environment. In the case of the municipality of Vandœuvres (Figure 2), we worked with the Viridis office, specialised in applied ecology, which identified the main wooded areas, their landscape and natural value as well as the biological connections to be preserved or reinforced. Consultation of historical maps also provided us with information on hedgerows that have disappeared and that we can hope to gradually reconstitute.

For the municipality of Chêne-Bougeries, we were able to benefit from a study drawn up by the Conservatory and Botanical Garden of the city of Geneva, which identifies the vegetation structures and their importance in terms of biological connectivity ("cores"). This mapping of the ecological network has been integrated directly into the strategy map for the development of zone 5, with the obligation to assess the impact of any construction project on biological connectivity and, if necessary, to take compensatory measures if their function is affected.

The three main principles (hereafter A, B and C) relating to the natural environment are set out below and are translated into specific measures for building permits (Figure 3).

A. Preserve the characteristic landscape components and consolidate the green structure of the municipality, in particular the hedgerows, which form the essence of the historic paths and play a major role in terms of biological connectivity and adaptation to climate change.

A1. Hedgerows and tree avenues

A1.1 The densification of zone 5 is subject to the preservation of existing hedgerows and tree avenues, which are characteristic of the municipal landscape. Thus, for any construction project:

- the felling of trees of the tallest class ("*de première grandeur*", above 30 m) and of the second tallest class

2 Orthophotography of the municipality of Vandœuvres (1/12'500 scale, 9/20/2016).

A dense network of hedgerows is still present in the north-western part of the municipality, whereas in the south there are only remnants (the hedge structure is visible in red on the picture).



("de deuxième grandeur" from 15 to 30 m) in hedgerows and tree avenues identified in the plan is prohibited (except for major reasons);

- the owner proves that measures are taken to guarantee the preservation and viability of existing trees in the hedgerows and tree avenues identified in the plan (sufficient setback from buildings);
- multiple accesses are prohibited within tree avenues. Owners should seek to combine accesses through the registration of an easement. Thus, each applicant must ensure that the opportunity is taken to combine his access with that of his neighbour;
- only one access is authorised per plot.

A1.2 Along certain axes identified in the plan, the development of plots is subject to the extension of tree avenues:

- a space free from construction and at least 5 m wide is required in order to allow the reconstitution of hedgerows;
- the planting of oaks or other large trees contributing to the extension of tree avenues is required. If that is not possible, indigenous shrubs may be planted instead.

A1.3 The choice of indigenous species is favoured for all new planting projects.

B. Maintain and enhance the functionality of natural networks and corridors

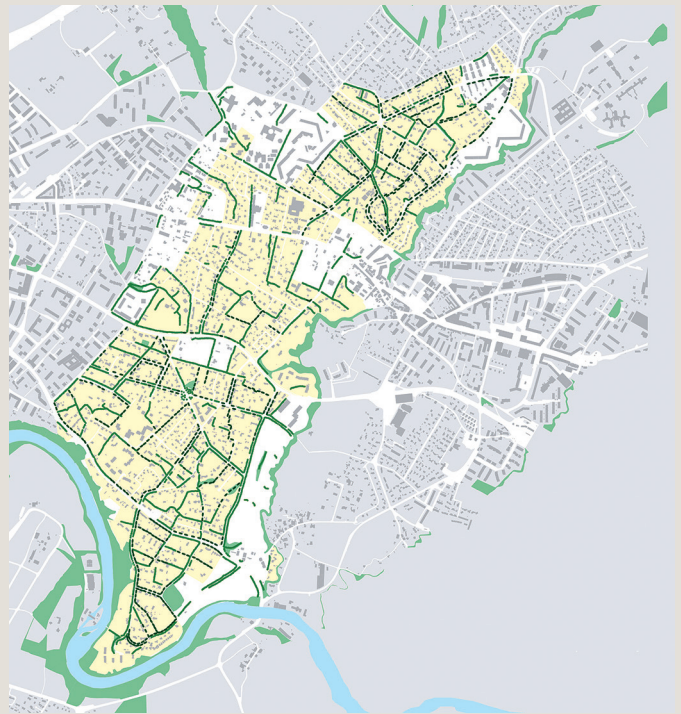
B1. Wooded strips, copses and isolated trees:

- the layout of the buildings must preserve as much as possible the major plant structures present on the plot and in particular the "cores" identified as very important by the Conservatory and Botanical Garden (Figure 4). In the event of damage to the latter, the project must provide for measures to reconstitute these elements;
- the fragmentation of wooded strips is kept to a minimum;
- the buildings respect the vital space of the wooded strips and no building is located less than 1 m from the crown;
- for all new planting projects indigenous species are favoured;
- the compensation for the value of the removed vegetation must be mainly *in situ*;
- Regardless of any felling, the municipality may require the planting of large trees as a counterpart to densification particularly on sites or areas where there are few.

B2. Greenways and biological connections:

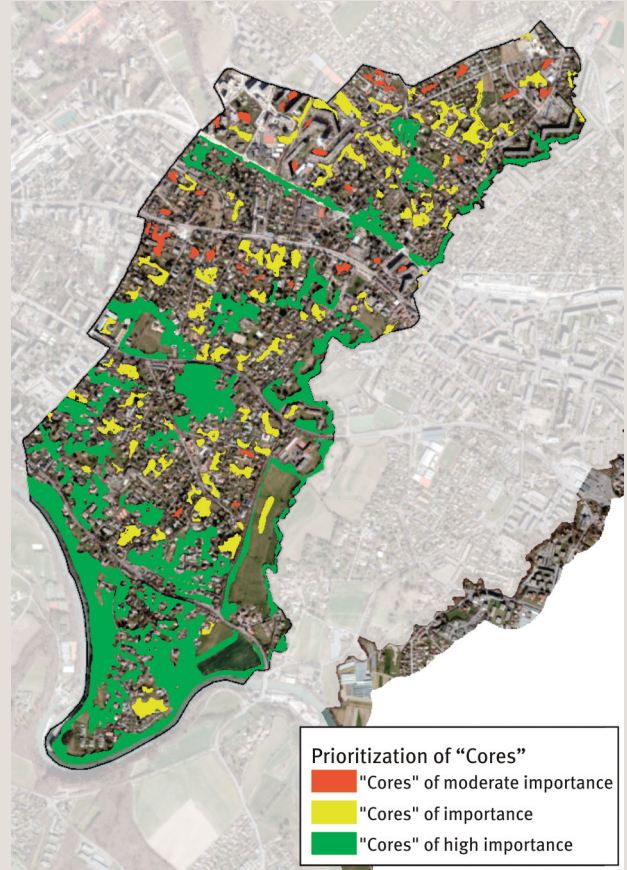
- the location of buildings and facilities (paths, car parks) must take into account the "cores" identified as very important by the Conservatory and Botanical Garden. In the event of damage to the latter, the project must provide for measures to reconstitute these elements;
- development is subject to the maintenance of undeveloped gaps, in order to preserve and strengthen landscape and biological connections;
- the maintenance of a higher proportion of undeveloped areas is required;
- with reference to the standard SIA 491, stray light sources directed towards trees or hedges are prohibited. Restrictions apply to the type and density of illumination and the wavelength of the lights;
- fences allow the passage of small fauna.

3 Municipality of Chêne-Bougeries: identification of the existing hedgerows (solid line) and those to be extended (dotted line) (source: Urbaplan).



4 "Cores" identified by the Conservatory and Botanical Garden in the municipality of Chêne-Bougeries (source: CJB).

The "cores" – of moderate importance (orange), of importance (yellow) and high importance (green) – are defined by polygons of favourable habitats, characterising the ecological connections at the scale of the municipality.



- **B3. Soil sealing and water runoff:**
- the orientation of basements does not create obstacles to water flow;
 - in principle, the basement area does not exceed that of the above-ground building, with the exception of shared parking between several buildings or specific elements required by technical or operational constraints;
 - no construction is allowed in the minimum water-course area and natural solutions are required on its boundaries;
 - for projects with ten or more parking spaces, development is subject to the obligation to provide underground parking and visitor spaces on the plot concerned.

C. Protect objects or sites of heritage value (built, landscape and natural heritage)

C1. Areas to be protected or managed

The plan identifies land plots or plot groups which are of interest from a heritage point of view: estates, houses and gardens which have been listed or inventoried, large plots of lightly developed land and which are of landscape and natural interest (particularly as a biological connection). Their development can only be envisaged by taking into account the characteristics of the site. This is why in the areas identified in the plan, all development is subject to:

- either the establishment of a leading spatial concept validated by the municipality and the competent cantonal services;
- or the establishment of a site plan or a localized neighbourhood plan ("*plan localisé de quartier*" or PLQ) equivalent to a site plan, for sectors of great heritage interest (in particular when the buildings and/or gardens are listed or in the inventory).

The extent of these studies will be determined specifically according to the context and the nature of the project. It will have to be validated by the municipality and the competent cantonal services.

The leading spatial concepts define as a minimum rules concerning:

- measures to preserve the heritage qualities of the buildings, gardens and environment of the estate or group of buildings;
- preserved buildings and the layout of new constructions;
- existing and planned vegetation;
- access (avoid a multiplication of private accesses);
- parking (encourage shared parking);
- the landscaping of gardens;
- the landscape treatment of the boundaries with the public domain.

Historical or heritage elements must be documented.

The municipality reserves the right to request a precautionary refusal from the canton pending the preparation of a site plan or a PLQ valid as a site plan.

Conclusion

The densification of low-density built areas is an objective of land-use policies aimed at preserving agricultural and natural areas. However, depending on the way in which these densification projects are carried out, they can undermine natural structures that play a role in pres-

erving biodiversity. This is what happened in Geneva with the modification of land-use indices. Most of the projects resulting from these new playing rules have been detrimental to natural and semi-natural environments and have contributed to the "sterilisation" of neighbourhoods. In view of this, the cantonal authority decreed a moratorium on the application of these derogations in November 2019 in order to allow all municipalities to put in place the necessary tools to better frame the projects. In addition, despite a housing crisis that has been ongoing for decades, several development projects for new neighbourhoods have been the subject of referenda challenging them, particularly because of the damage to vegetation. These referenda were all won by popular vote and thus highlight the difficult balance to be struck between the need to "densify inwards" in order to preserve vast natural and functional territories, and the need to maintain a strong natural presence in urban areas.

Initially, the municipalities, which had no strategy for dealing with these developments, sorely lacked arguments to put forward against the developers. The competent department within the cantonal administration thus systematically granted the requested derogations. With the strategies for the development of zone 5 and the emphasis on other criteria of public interest, a weighing of interests must now be carried out. The maintenance or reconstitution of vegetation structures is also an argument of public interest, all the more so as it is also the subject of public policies ("Biodiversity Strategy").

As the implementation of these strategies is very recent, we do not yet have sufficient hindsight to assess to which extent these measures are actually working. Moreover, the administrations that issue building permits are rather inert and therefore not particularly reactive in adopting new practices. Paradoxically, the evolution is more rapid among construction professionals who, for the most part, have understood the interest they have in taking into account the municipal provisions, at the risk of seeing their projects delayed by oppositions and appeals.

The interest of the established measures lies not only in seeking to achieve a balance between densification and the preservation of existing landscape and biological qualities. It seems particularly interesting to us to have the possibility to demand, as a counterpart to the densification, the planting of large trees allowing the reconstitution of hedgerows, especially in neighbourhoods where these had disappeared. Indeed, without the introduction of such a derogation in the law, the municipalities would not have had any negotiating leverage to recreate landscape structures and improve the functioning of biological connections within residential areas. ■

The author

Marcos WEIL
Urbaplan, Case postale 1722,
1211 Genève 1, Switzerland
✉ m.weil@urbaplan.ch



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- 📄 RÉPUBLIQUE ET CANTON DE GENÈVE, 2021, *Marche à suivre pour la densification de la zone 5*,
🔗 <https://www.ge.ch/document/marche-suivre-densification-zone-5>
- 📄 RÉPUBLIQUE ET CANTON DE GENÈVE, 2019, *Zone villas: gel des dérogations à la densité*, 16 p.,
🔗 <https://www.ge.ch/document/zone-villas-gel-derogations-concernant-densite-0>
- 📄 RÉPUBLIQUE ET CANTON DE GENÈVE, 2017, *Les nouveaux quartiers-jardins du XXIe siècle. Guide pour une densification de qualité de la zone 5 sans modification de zone à Genève*, 56 p.,
🔗 http://etat.geneve.ch/geodata/SIAMEN/Publications/Densification_Zone5_guide_web.pdf
- 📄 FREI, A., BISCHOFBERGER, Y., 2015, *Les chemins historiques, un patrimoine fragile : chemins et bocages à Vandœuvres*, IVS, 2 p.,
🔗 <https://www.vandoeuvres.ch/wp-content/uploads/2015/04/les-chemins-historiques.pdf>