3.3. FRANCE: IGN-COGIT

Simulating surface buildability to assess land prices based on 3D geodata and urban rules

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Since 2015, IGN COGIT laboratory collaborates with the Institute of urban planning of Paris region (IAUIdF, Institut d'Aménagement d'Urbanisme d'Île-de-France) in order to produce a buildability database on the region territory. The IAUIdF intends to use it to assess land prices which are correlated with what can be built on these lands. Buildability simulation necessarily refers to local urban regulation (PLU for Plan Locaux d'Urbanisme), elaborated by municipalities to define constraints that new buildings must respect, and to the existing topography and land use. For example, the PLU may limit the distance between a window and a new construction or the recoil to parcel boundaries.

In order to improve the buildability simulation, the PLU must be translated from textual format into a database of rules, which evaluation also requires reference data about the existing buildings, roads, windows, etc. During a former collaboration between IGN-COGIT, a municipality and a land planning cabinet, such a format was proposed to encode urban rules like constraints on morphology of new buildings, limitation of the maximal height or definition of a maximal authorized floor area ratio as 3D objects and tractable constraints (Brasebin et al, 2016).

Once rules are encoded, the assessment of buildability can be done visually by an expert on a small area, based on a proposed visualization of the rules together with the urban space. On a large area, automation is required. (Brasebin, 2014) designed a method to generate 3D buildings from PLU regulation encoded with the above format. The result of this work is released as the SimPLU3D open library (https://github.com/IGNF/simplu3D), that includes :

- A generic 3D model that allows the representation and the checking of PLU regulation ;
- A loader adapted to French datasets that describe mainly parcels, buildings and roads ;
- A building generator based on an optimization algorithm that proposes buildings composed by a set of parametric objects (for example, cuboids).

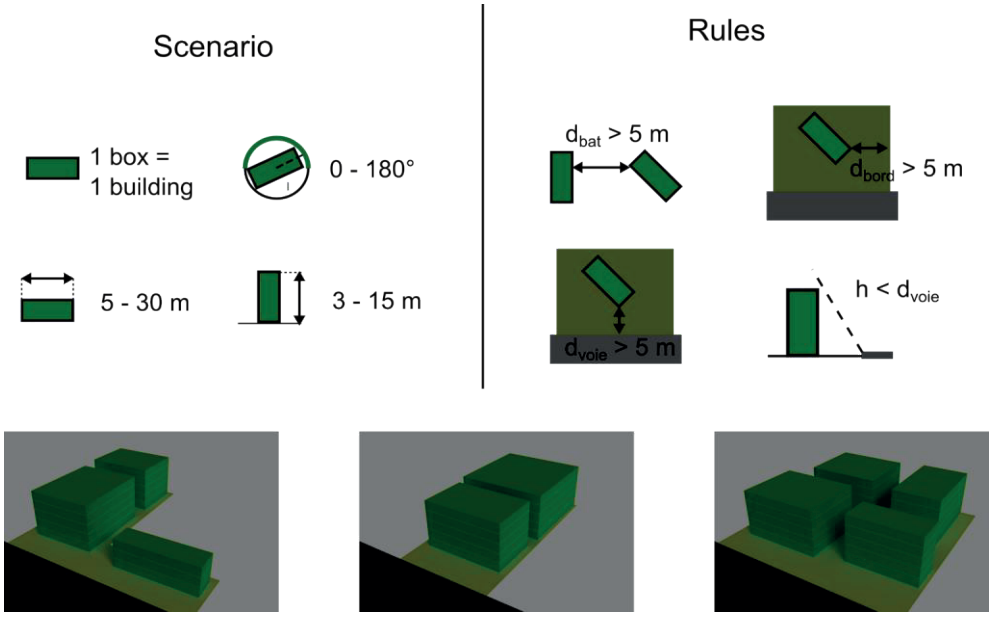

Figure 3: Several simulations with a same set of rules on different parcels.

This software was used to compare the floor surface of existing buildings to the floor surface that could have been achieved considering the actual regulation. The input data about the territory only where the road network and parcels. The simulations of possible buildings, compliant with the regulation

were processed on a set of 500 hundred parcels. The output was that it would have been possible to build denser in this area with the current regulation. More precisely, the simulator showed that the current regulation allows to add two floors to existing buildings on 210 parcels, This kind of information is interesting because it highlights zone where future land transactions may occur. In fact, when the difference is important for a given parcel, a promoter may be eager to buy this parcel in order to add new levels or to build new extensions or buildings.

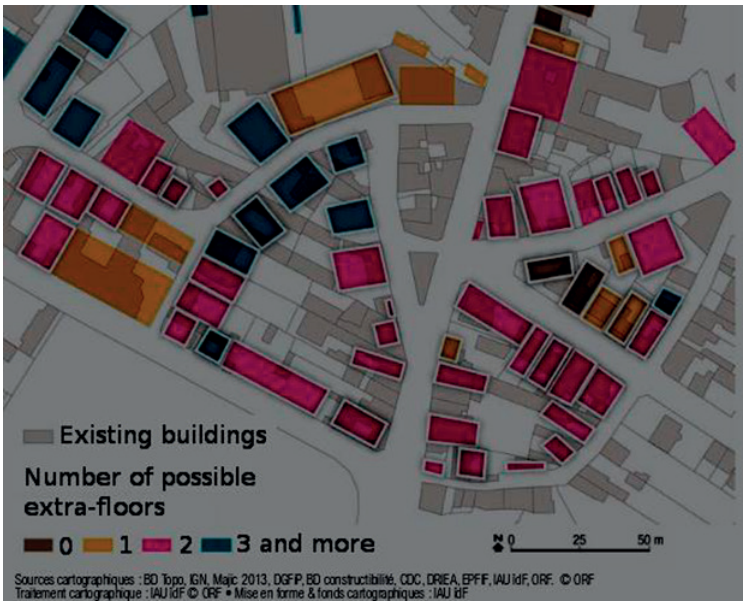

Figure 4: Example of map produced by IAUIdF (IAUIdF, 2015) with existing buildings in grey and simulated buildings colored according to possibilities of floors addition.

Future work will target the validation of the simulation by checking the quality of the buildable floor surfaces evaluation with land planner and to produce data about possible densification of Île-de-France.

Brasebin, M. (2014) Les données géographiques 3D pour simuler l'impact de la réglementation urbaine sur la morphologie du bâti. Ph.D. thesis, Université Paris-Est.

Brasebin, M., J. Perret, S. Mustière and C. Weber (2016) A Generic Model to Exploit Urban Regulation Knowledge, ISPRS International Journal of Geo-Information, vol. 5, n. 2, pp. 14, doi:10.3390/ijgi5020014

IAUIdF (2015) Note de conjoncture, de l'ORF , octobre 2015 - http://www.orf.asso.fr/uploads/attachements/orf_nc7_ok_lg.pdf