

CONSIDERATION OF GROUNDWATER VULNERABILITY AS A SPATIAL CONSTRAINT IN THE CONTEXT OF URBANIZATION SCENARIOS IN THE WALLOON REGION BY 2050

Promoters : Serge Brouyère (HGE | UEE) and Jacques Teller (LEMA | UEE)
 Author : Victoria Collignon (HGE | UEE) victoriacollignon@uliege.be

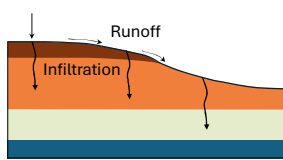


1. Groundwater vulnerability mapping

I. Distribution of the contaminant on the soil surface and preferential infiltration pathway

Surface hazard

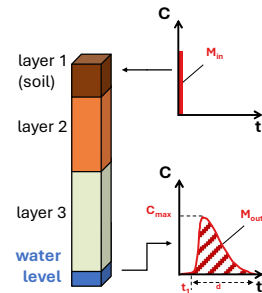
Direct & lateral surface hazard



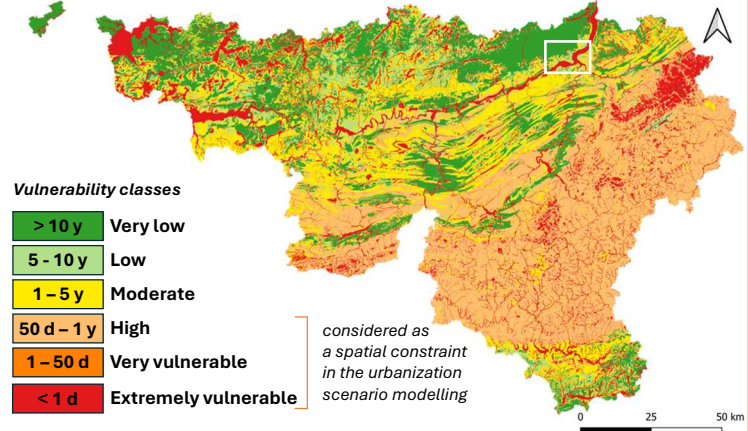
II. Transport of the contaminant through the unsaturated zone

Subsurface attenuation capacity
 1D equation advection-dispersion + (sorption and degradation) if specific vulnerability is considered

$$\frac{R\partial(\theta_m C)}{\partial t} = \frac{\partial}{\partial z} \left(D \frac{\partial \theta_m C}{\partial z} \right) - q_d \frac{\partial C}{\partial z} - \mu C$$

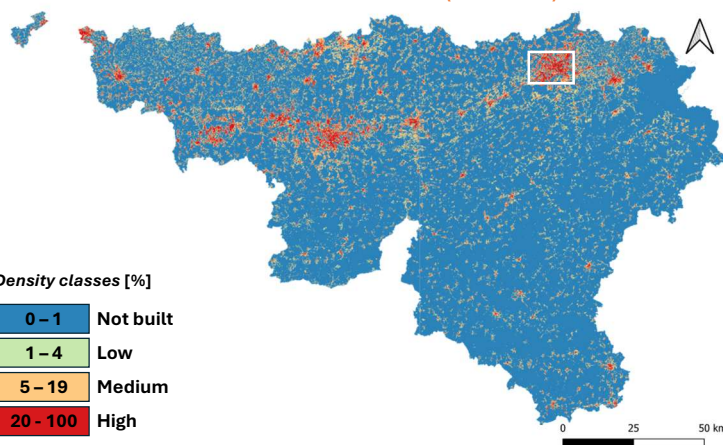


III. Intrinsic vulnerability of the first aquifer encountered expressed in weighted and ranked transfer times



2. Urbanization scenario modelling

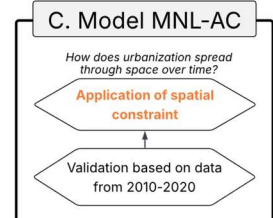
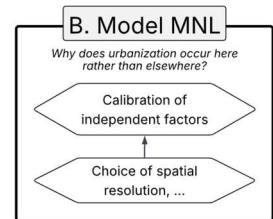
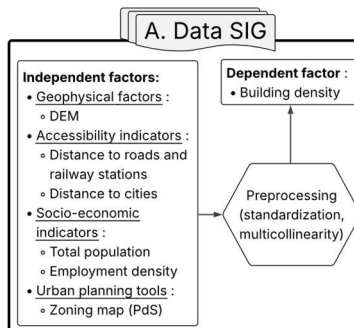
I. Use of a grid model (100 × 100m) representing the evolution of built densities classified based on cadastral data (1990 - 2000)



II. Use of a calibrated MNL-AC model validated on cadastral data from 2010 - 2020

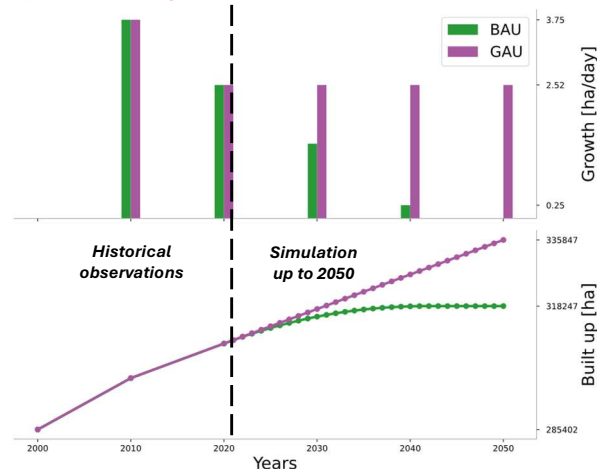
List of independent factors

- Explains building density
- Derived from literature reviews.

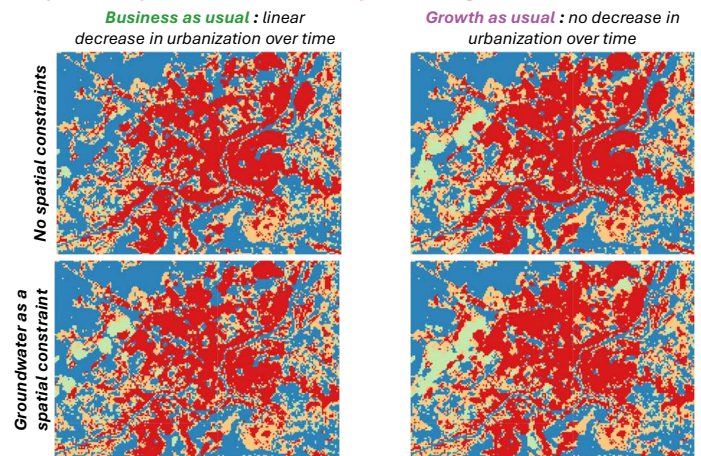


3. Analysis of urbanization scenarios considering groundwater resources as a spatial constraint

I. Quantitative analysis of the evolution of urbanization over time



II. Spatial analysis of the urbanization by 2050 in Liège



4. Conclusion

Applying groundwater vulnerability as a spatial constraint shows that the **theoretical demand of both scenarios is still met**. Only its spatial allocation is modified.

Also, the GAU scenario demonstrates the **importance** of the **urgent** implementation of **territorial development strategies**.