

## PARIS POST-OIL: ENERGY CONSCIOUS URBAN INFILL DEVELOPMENT

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### INTRODUCTION

The effects of climate change through energy consumption and emissions on urban life can no longer be ignored.<sup>[1]</sup> Thus we are creating post oil scenarios using Paris as a case study to simulate the transition from fossil fuels to renewable energy as well as reduction of path distances (“city of short distances”) in order to find out more about how urban planning can influence developments incorporating the idea of reducing primary energy demand and emissions. These scenarios include actual urban development and master plans as well as detailed test planning for certain neighbourhoods.

Based on these scenarios we analyse the effects of urban planning on energy and environment by developing a combination of methods for creating a decision and planning support tool.

Scales, accessibility and morphology are inextricably interwoven. Only a well-functioning system across scales can be highly efficient. Consequently, we offer a multi-scalar approach on the city using the method of the geometric street network modelling in combination with a lifecycle assessment method.

Paris post-oil is as much about the future as it is about the past. We analyse the urban fabric starting from the baroque grid via Haussmann’s interventions until the implementation of high-ranked road networks installed for automobiles during the 20th century<sup>[2]</sup> in order to learn more about the potential of robust and adaptive patterns and how to use them for creating highly efficient, walkable neighbourhoods for future developments – in the sense that every vision of the future is based on a vision of the past.

### METHODS, DATA AND ANALYSIS FOR SCENARIO DEVELOPMENT

Our scientific work has the aim to synthesize on future potential development scenarios for big cities based on the case study of Paris. This is directly linked to energy conscious urban planning concepts: Which places have the potential for interventions and how to deal with existing urban structures being hierarchical ordered? We are focusing on walkability and, inter alia, energy efficiency. Taking Paris as an example, we analyse how its urban system has evolved and which structures have remained most robust and have stood the test of time (shifting centres, connectivity, accessibility).

Paris, *intra muros*, is the city with the highest density in Europe (21.289 citizens/km<sup>2</sup>) and its metropolitan region (*unite urbaine*) is the second biggest besides London. Paris’ population grows approx. 50.000 per year. Prognoses say that in 2050 it will reach 15 million.<sup>[3]</sup>

There is almost no potential for urban infill development in the historic core (and the actual city in the administrative sense). The surrounding urban structure (*banlieus* = suburbs) in the inner ring (*petite couronne*) is characterized by high ranked street networks like motorways and railway structures. Significant for the situation in Paris is the *Boulevard Périphérique* – the cities ring motorway, which was installed in place of the city walls from the 1950’s till the 70’s. It is one of

the most frequented streets in Europe<sup>[4]</sup> (1.1 to 1.2 million vehicles per day) and a major barrier between the city and its suburbs.

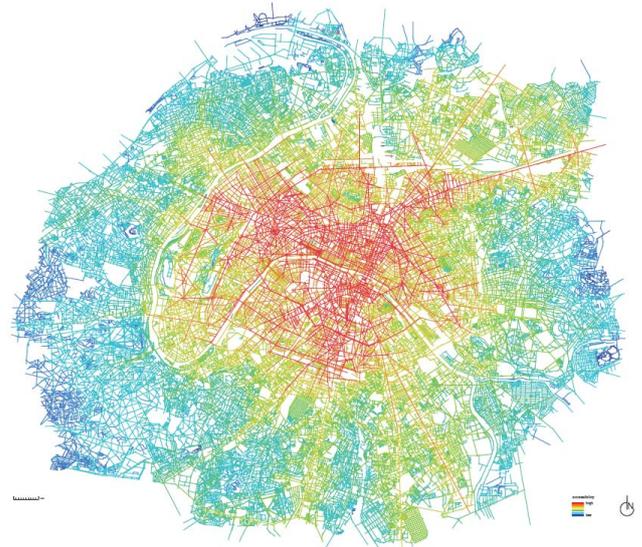
Our objective is to create a test scenario for potential urban infill developments based on the concept of emergence linked to walkability; post-oil strategies using the historic as well as the transformation potential of space-consuming structures in the centre of *Grand Paris* (the metropolitan region) designed by highway engineers<sup>[5]</sup> during the 20th century. On a neighbourhood scale (local) the method of test planning (Scholl)<sup>[6]</sup> will be applied. These very detailed urban scenarios can be extrapolated to other similar neighbourhoods and incorporated in the overall evaluation on a global scale (urban region). For the creation of the scenarios a detailed analysis of the status quo is essential. Thus we are analysing provided data (e.g. movement patterns, urban morphology, mobility and modal split, green space etc.) of the current status to preserve a multi-scalar approach.

In order to verify and compare the scenarios, different methodologies and special software will be applied: depthmapX (by Space Syntax) is a multi-platform software to perform different spatial network analyses. In the research-models it will be applied on a citywide and neighbourhood scale. urban scale. GaBi (by thinkstep) will be applied to compare and forecast energy consumption in various scenarios. For the first time we link the GaBi database with the Space Syntax model database in order to investigate, verify and understand parameters concerning: primary energy demand, CO<sup>2</sup> emissions, greenhouse effect potential, fine dust pollution, acidification potential, POCP. As one result a decision and planning support tool is to be developed.

This PhD research is supervised by Prof. Andreas Voigt and part of the EWARD doctoral college (Energy and Resource Awareness in Urban and Regional Development) and in close thematic consistency, not only with the members of the EWARD PhD college at TU Wien (Prof. Rudolf Giffinger) but also with UFR Géographie et Aménagement at Université Paris-Sorbonne IV, France (Prof. Anna Geppert) and the Faculty of Spatial Sciences at University of Groningen, the Netherlands (Prof. Claudia Yamu).

## REFERENCES

- [1] UNFCCC Paris Agreement (as contained in the report of the conference of the Parties on its twenty-first session, FCCC/CP/2015/10/Add. 1), pp. 4-12, 2015
- [2] Marshall, Stephen: Streets and Patterns. Oxon and New York: Spon Press 2005, pp. 6-17
- [3] Alba, Dominique; Mancret-Taylor, Valérie et. al.: Abécédaire de la future Métropole du Grand Paris, Carnet 1: État des lieux thématique, 2014, p. 98
- [4] Passalacqua, Arnaud: La Bataille de la Route, Paris: Descartes & Cie, 2010, pp. 45-48
- [5] Marshall, Stephen: Streets and Patterns. Oxon and New York: Spon Press 2005, p. 28
- [6] [http://www.sia.ch/fileadmin/TEC21\\_2010\\_29-30\\_Testplanungen\\_Scholl.pdf](http://www.sia.ch/fileadmin/TEC21_2010_29-30_Testplanungen_Scholl.pdf)



**Picture 1:** Paris 2015 – Strategic pedestrian model, interaction global [INT N]