

*Road Network Dimension  
and  
Average Journey Length*

*Measuring Network Efficiency  
with  
Fractal Geometry*

*by*

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## Abstract

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Urban transport has been inefficient and its energy usage and emissions have been a major source of the global environmental destruction. This is largely because land-uses have been segregated, and thus journey length has increased to the extent that essential services have been too far. International discussion has concluded that the compact city is a possible solution, which many governments have adopted without enough verification. Even the definition of compact city is not yet clear.

In this thesis, I use the concept of *fractal city* as an analytical method of the need to travel in cities, as well as a design theory of sustainable development to reduce the travel need. Indeed, this concept represents the city's internal efficiency through the 'fine grain' of street pattern to which Jane Jacobs has given the name and many urban designers have tried to visualise since then. The concept of *fractal dimension* is used to analyse the efficiency of the city's road network by desktop GIS, while that of *generator* is used to describe the design rationale of sustainable development.

Therefore, I will postulate that fractal dimension represents the city's efficiency. The average journey length is used as an indicator of transport efficiency of the city to demonstrate the hypothesis. The results of the analysis shows a high correlation ( $r^2=0.658$ ), compared to the other factors such as density ( $r^2=0.493$ ) in English context.

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