Behind Rossmo's assumptions : further hypotheses to make geographic profiling more operational

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Reducing the Nb of suspects saves large amount of money and time

$\Rightarrow$ Need for methods such as geographical profiling

Rossmo defines the following assumptions to apply GP

Link between crimes must be accurate and complete

The offender must be local (not too long journey)

He should not change his anchor point

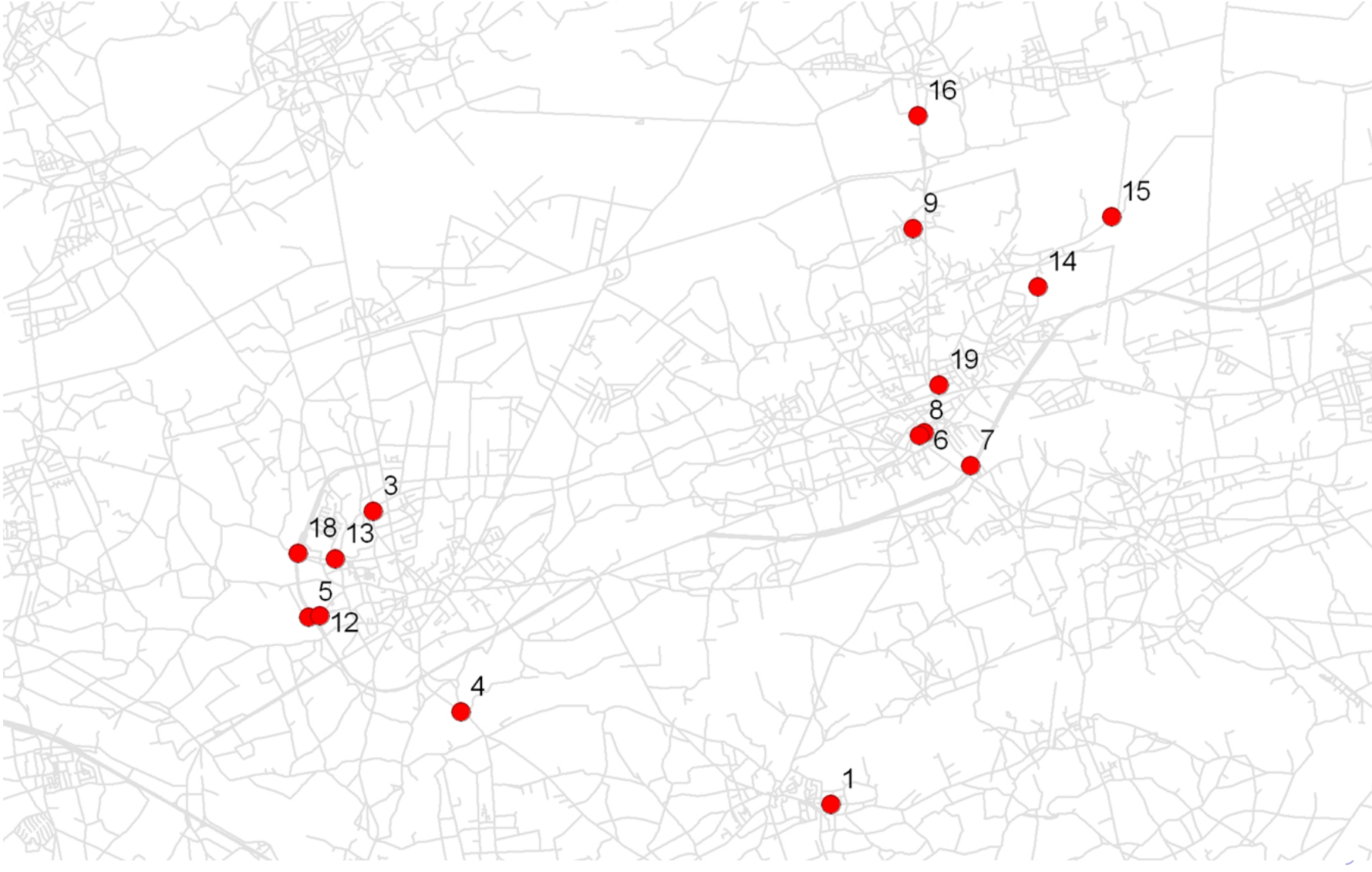
Crimes must be committed by a single offender

From solved series in Belgium, we observed

Link	Systematic comparison of modus operandi only for violent crimes
Local offender	Distances can be about 10 km or more and few consistency between offenders
Change of anchor point	A lot of series with mulitple residences or infuence of past residence

Before applying GP methodologies,we should be abble to estimate if those assumptions are met

Will GP be effective or not ?



To answer to this question, I decided to combine theoretical and operational approaches

A literature review to identify the assumptions in GP and criteria favouring their meeting

The study of what is behind those assumptions in terms of research methodology with an unsolved series as illustration

A better understanding of the spatio-temporal context of the crime should improve GP effectiveness

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Rossmo's assumptions : description, ante-evaluation and applicability

Case study : development of another spatial hypothesis for the offender's behaviour

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I. Link The degree of certainty for the link between crimes depends on

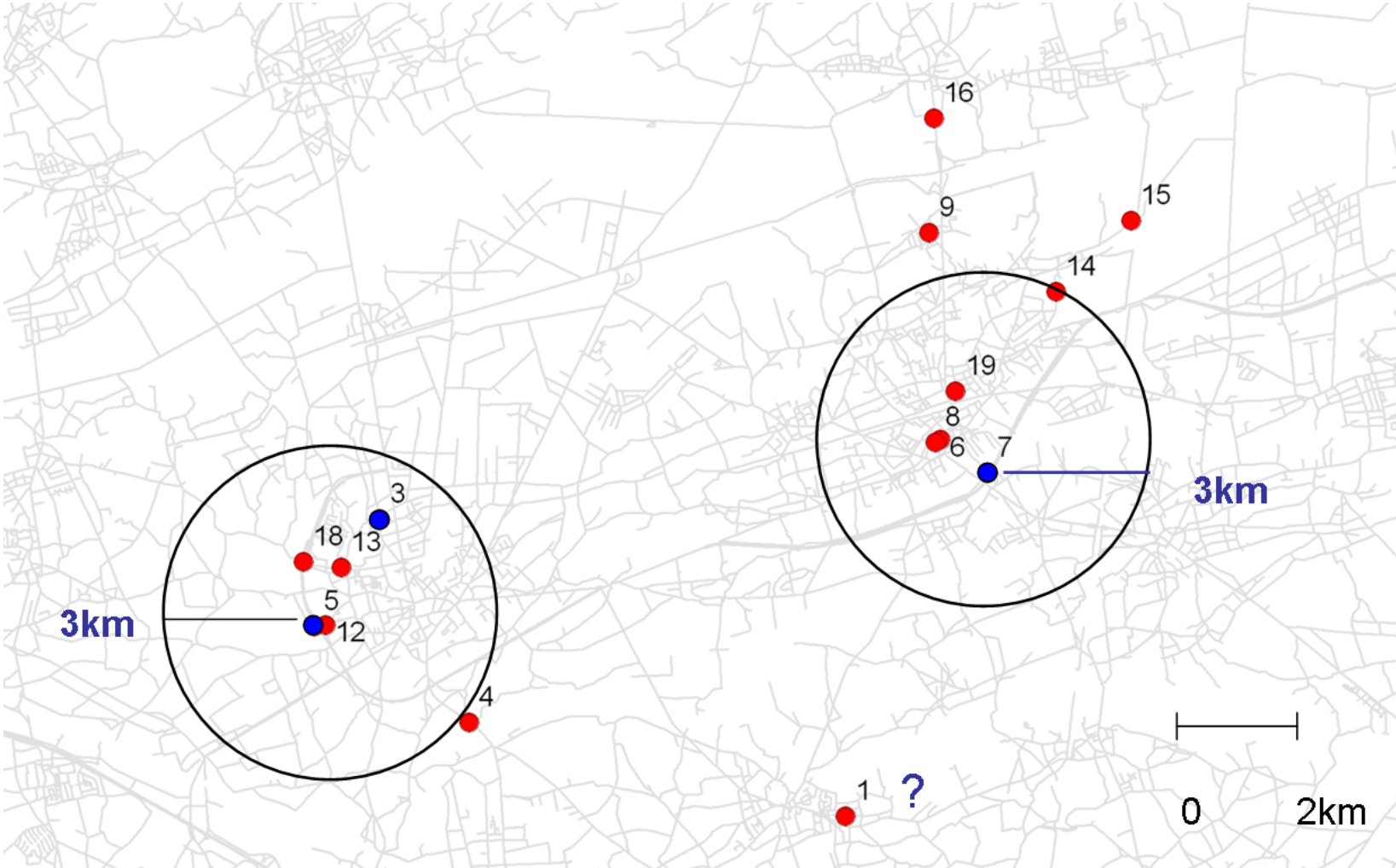
Crime type	DNA or ballistic traces
Offender's properties	Consistency in modus operandi
Spatio-temporal aspects	Proximity in time and space of crimes

I. Link - THe highest level of certainty is reached by DNA matching

3 facts present the same DNA profile

I. Link - Closeness in time and space is often the only way to link events to a series

In this case, two subpatterns are linked to the "DNA sites"



II. A local offender supposes first short distances to crime influenced by

Crime type	Crime against good or people Premeditation or Opportunity
Offender's properties	Age Socio-economic status Mode of transportation
Spatio-temporal aspects	Pattern of potential targets Attractiveness of places

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Spatio-temporal aspects	Pattern of potential targets **Attractiveness of places**

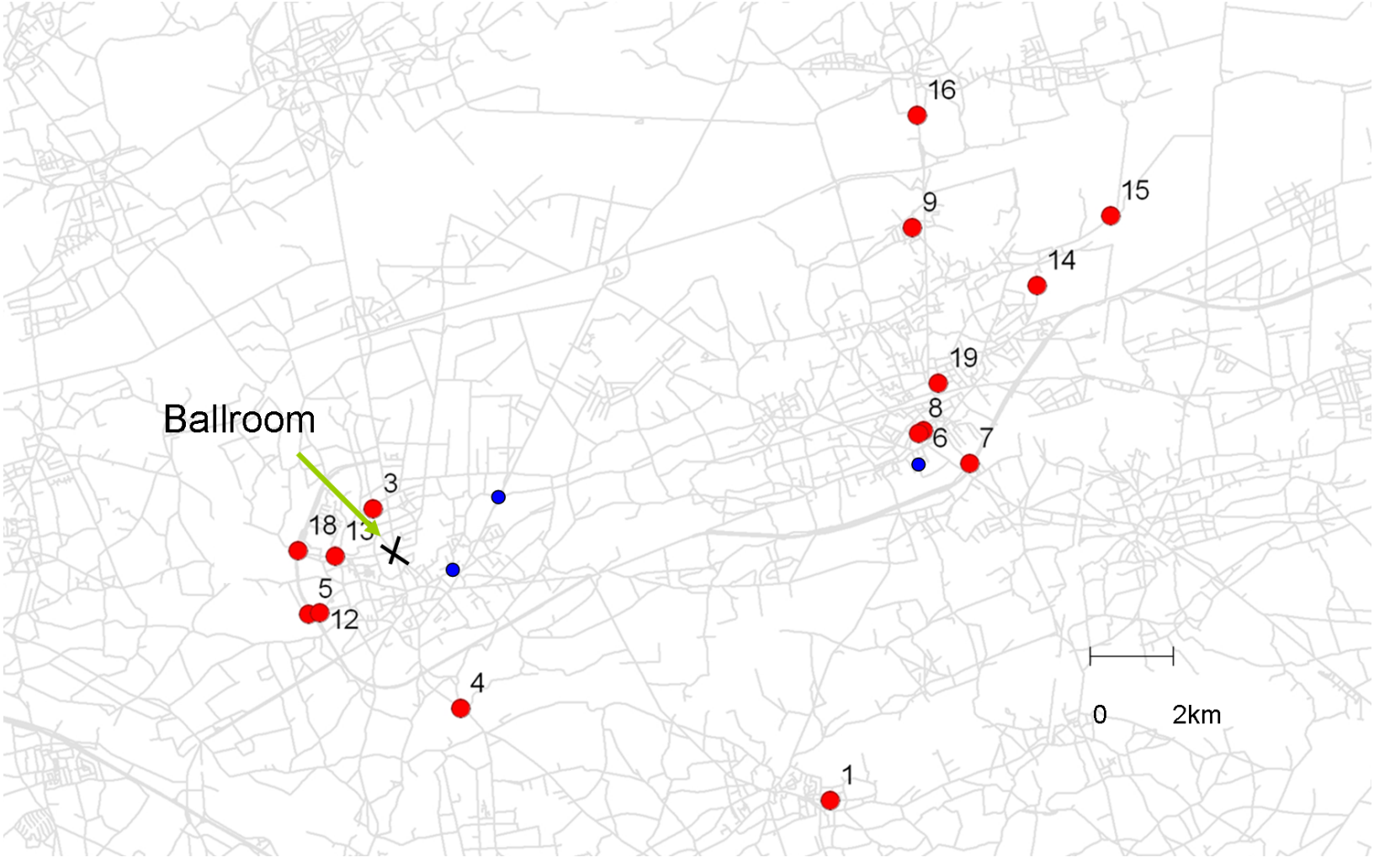
Place attractiveness varies with spatial scale and time

According to Branthingham, a distance decay is only observed for neutral places in terms of criminality

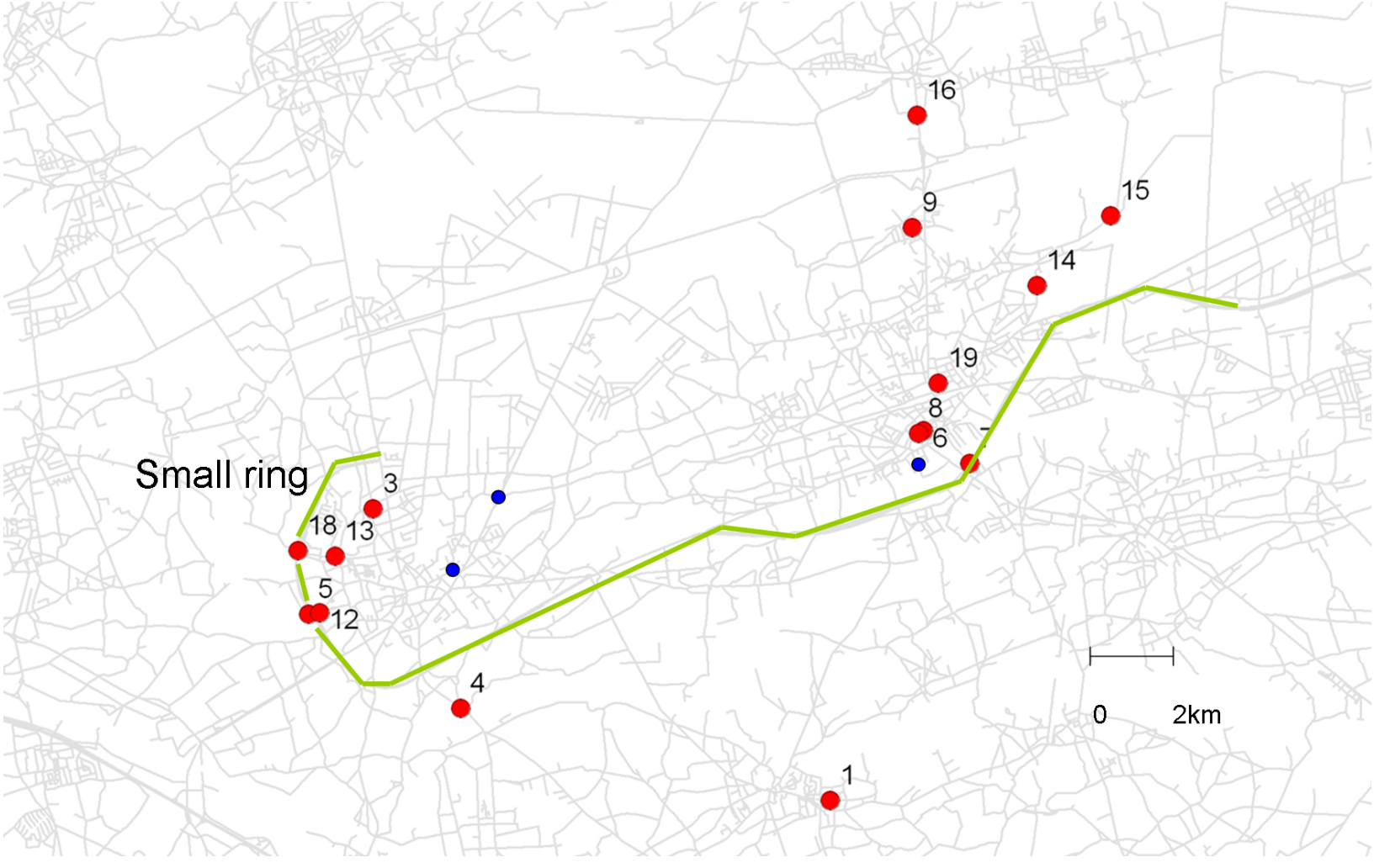
Attractiveness can be analysed from inter-city scale to neighbourood one

Opening hours of shops, bars influence place attractiveness

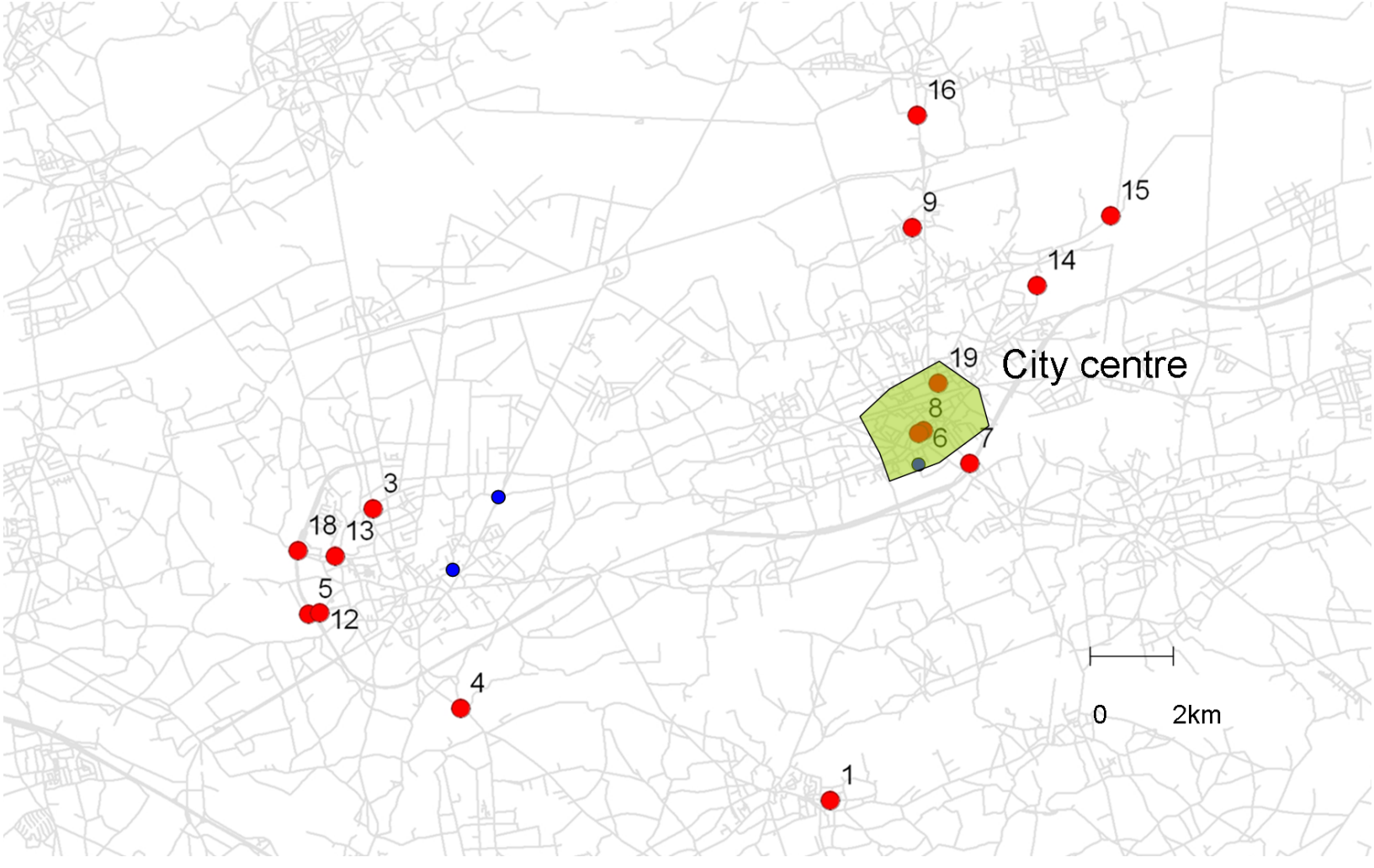
II. Local Offender - Attractors can be point primitive



II. Local Offender - Attractors can be segment primitive



II. Local Offender - Attractors can be area primitive



II. A local offender is often associated with a uniform distribution of crimes around an anchor point

Offender's properties

- Mode of transportation

Spatio-temporal aspects

- Spatial organisation of the city
  - Grid network vs disorganised network
  - New vs old cities
  - Orientation of physical barriers

From the observations, classical methodologies appear to be inappropriated for the series

Influence of the road network on the journeys-to-crime

Only one neutral place from which a distance decay could be applied

A crime distribution around two entities

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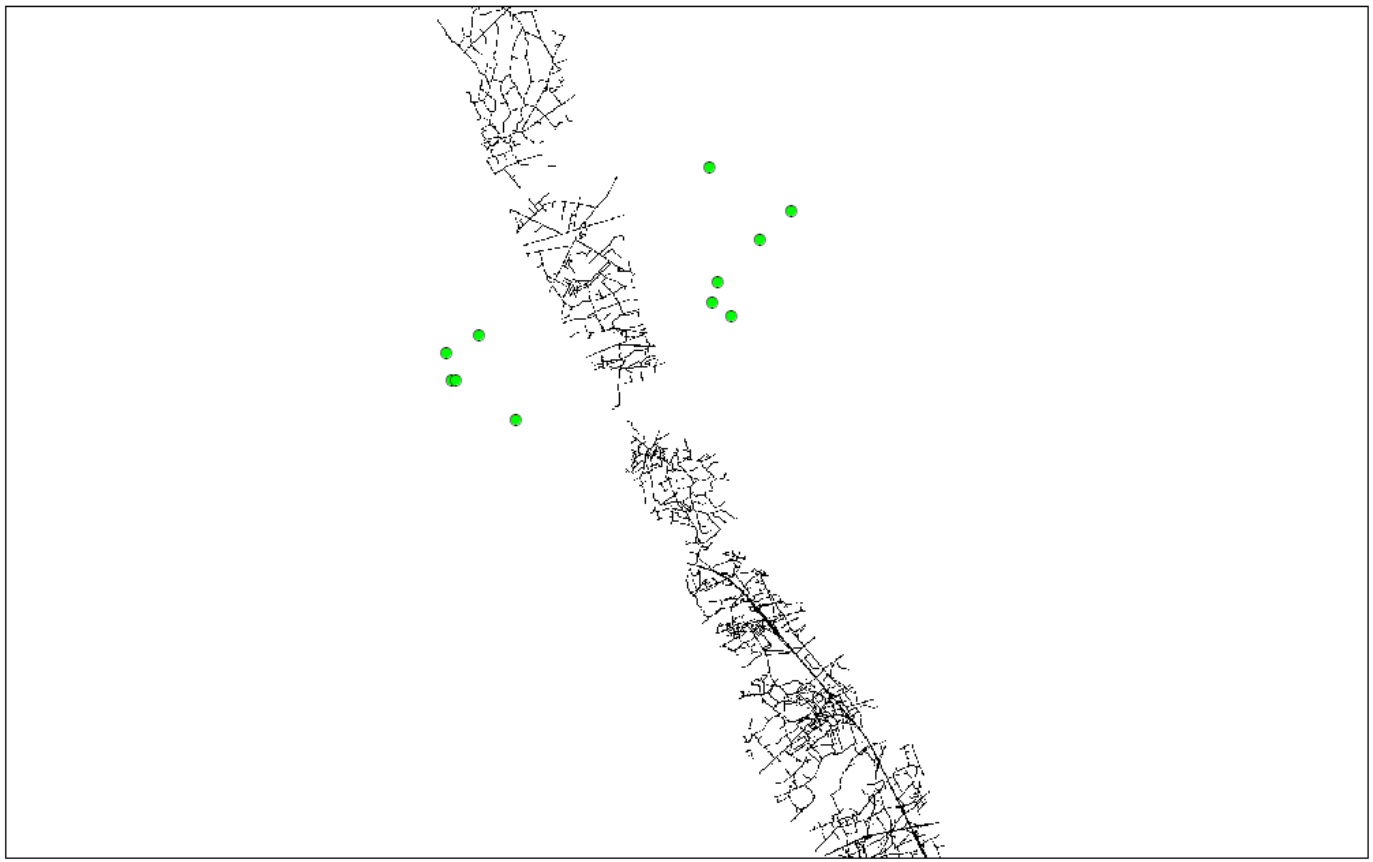
Case study : development of another spatial hypothesis for the offender's behaviour

A new spatial hypothesis was proposed to explain the pattern

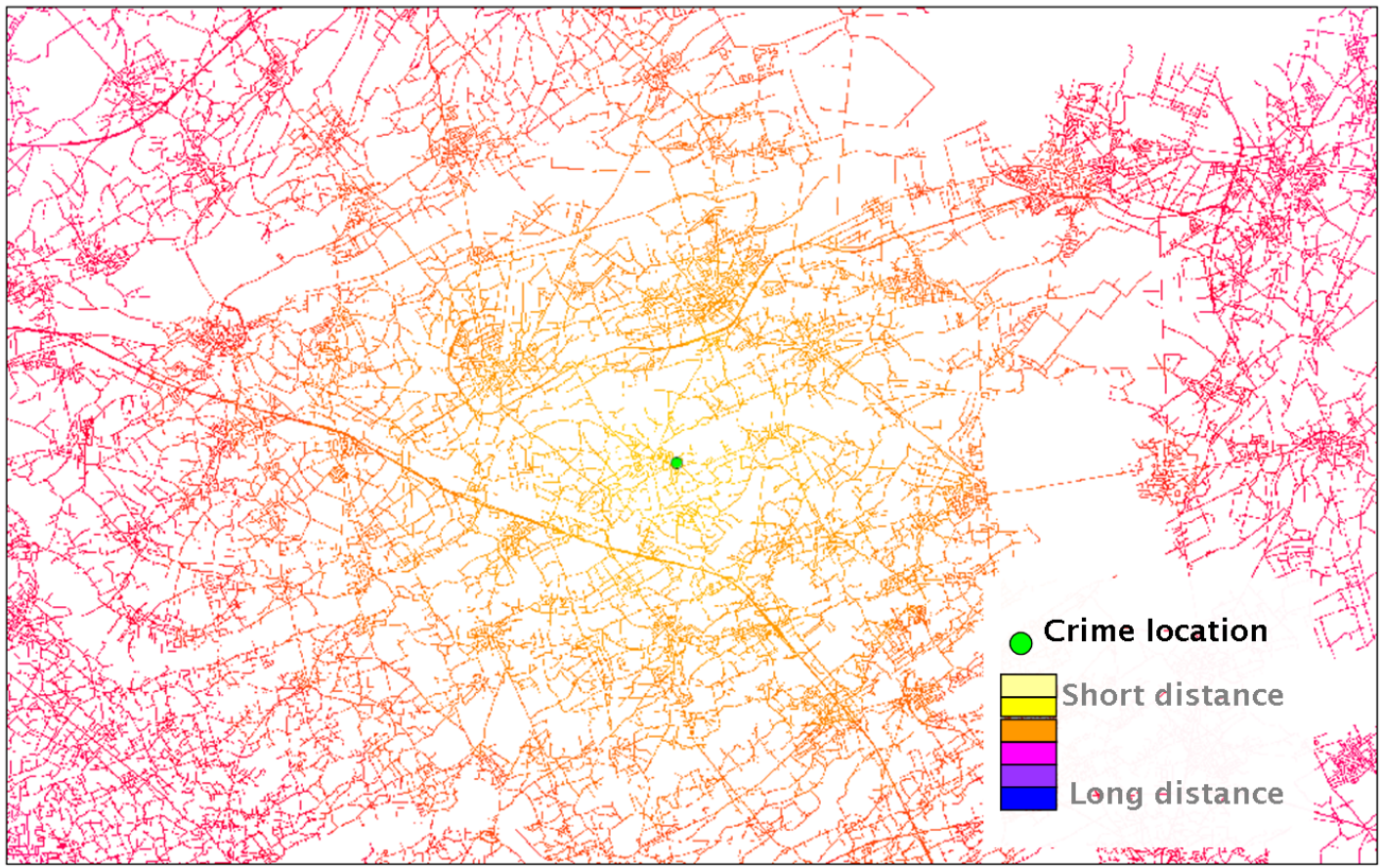
A distance decay for the only place with less a-priori attractiveness

A minimisation of variance for the others journeys in line with observation of offender's spatial consistency

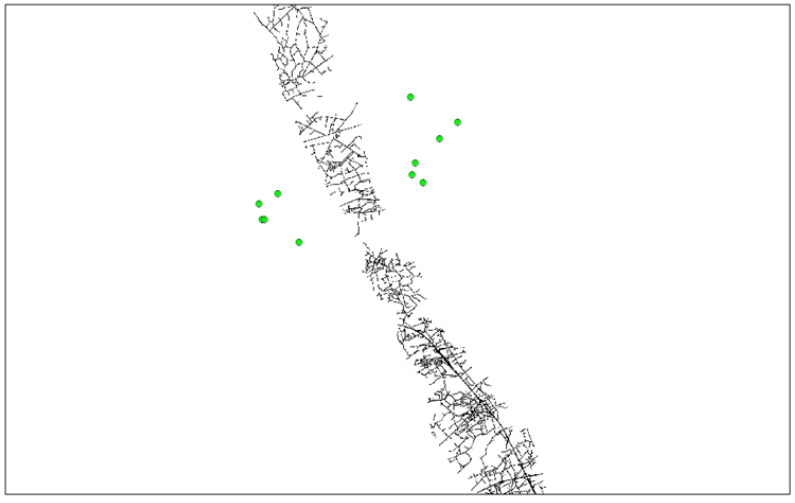
A corridor is highlithed by minimizing the variance for the lenght of JTC (threshold of 10%)



From the neutral place, a linear distance decay function is applied



The combination of both surfaces



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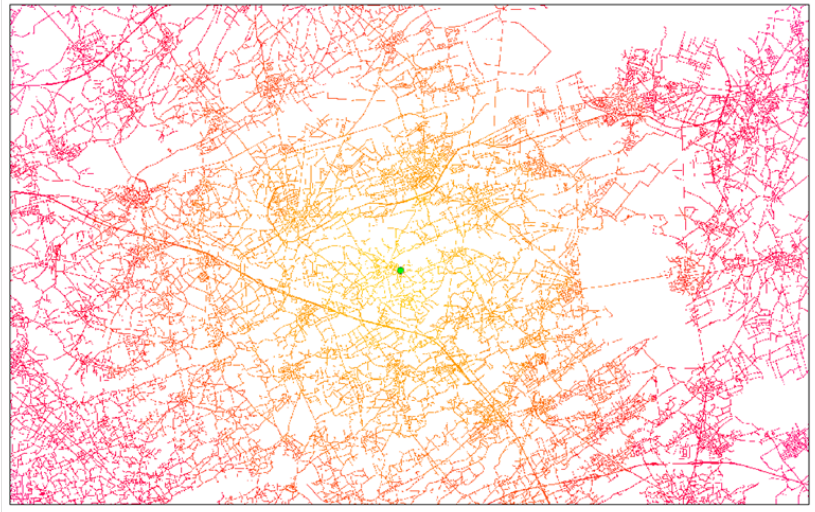
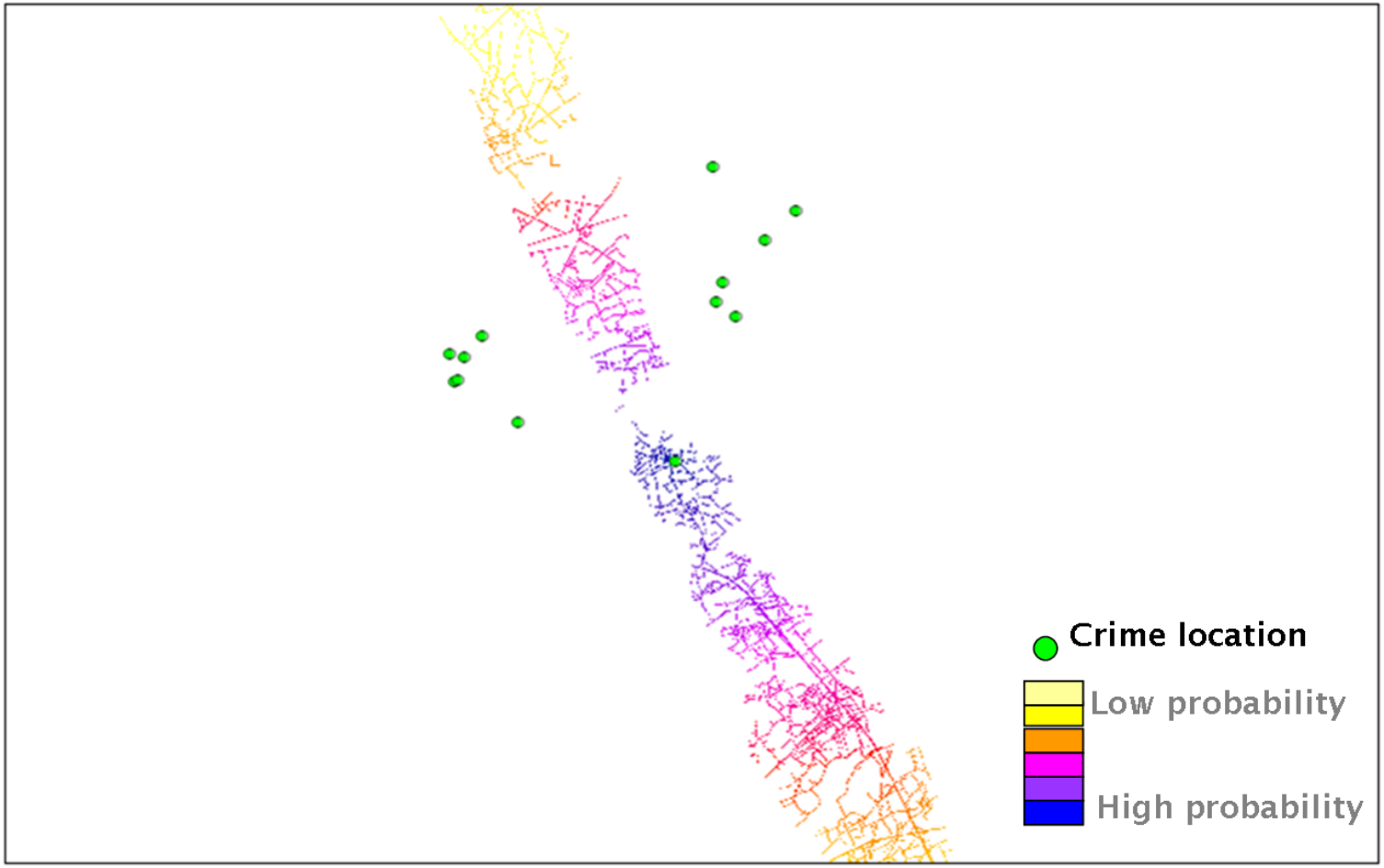


restricts the search area



The offender's residence was located near the highest probability

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Rossmo's assumptions can be estimated with crime elements among others spatio-temporal properties

Offender's spatial consistency is another spatial hypothesis that could be applied to places presenting the same level of attractiveness.

Geographical profiling
can really save time and money

Only a good comprehension of the spatio-temporal aspects of crimes allow to reduce the pool of suspects.

Still a lot to do to improve this comprehension !

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