



# CirCle 2019

## Challenges for the Islands in the era of the Circular Economy

*Mobility Analysis and Morphologies: The case of  
Cypriot Major Cities*

*Loukas Dimitriou and Andreas Savvides*

*University of Cyprus*

Under the auspices of



# SMile 2019

## 6th Sustainable Mobility & Intelligent Transport conference





## **Introduction**

### **Urban Morphologies**

Types of urban structures, based on the road network morphology

Challenges/opportunities for each type of structure

### **Analytical-Methodological framework**

GIS data

Openstreetmaps

### **Statistics on networks**

### **Overview of Cypriot cities**

### **General maps – General characteristics**

### **Data collection for the case of Cypriot cities (Nicosia, Limasol, Larnaca, Paphos)**

Statistical analysis (1): Network Density

Statistical analysis (3): Orientation of road networks

Challenges for modelling

### **Urban Morphologies: towards transit oriented development**

### **Conclusions**



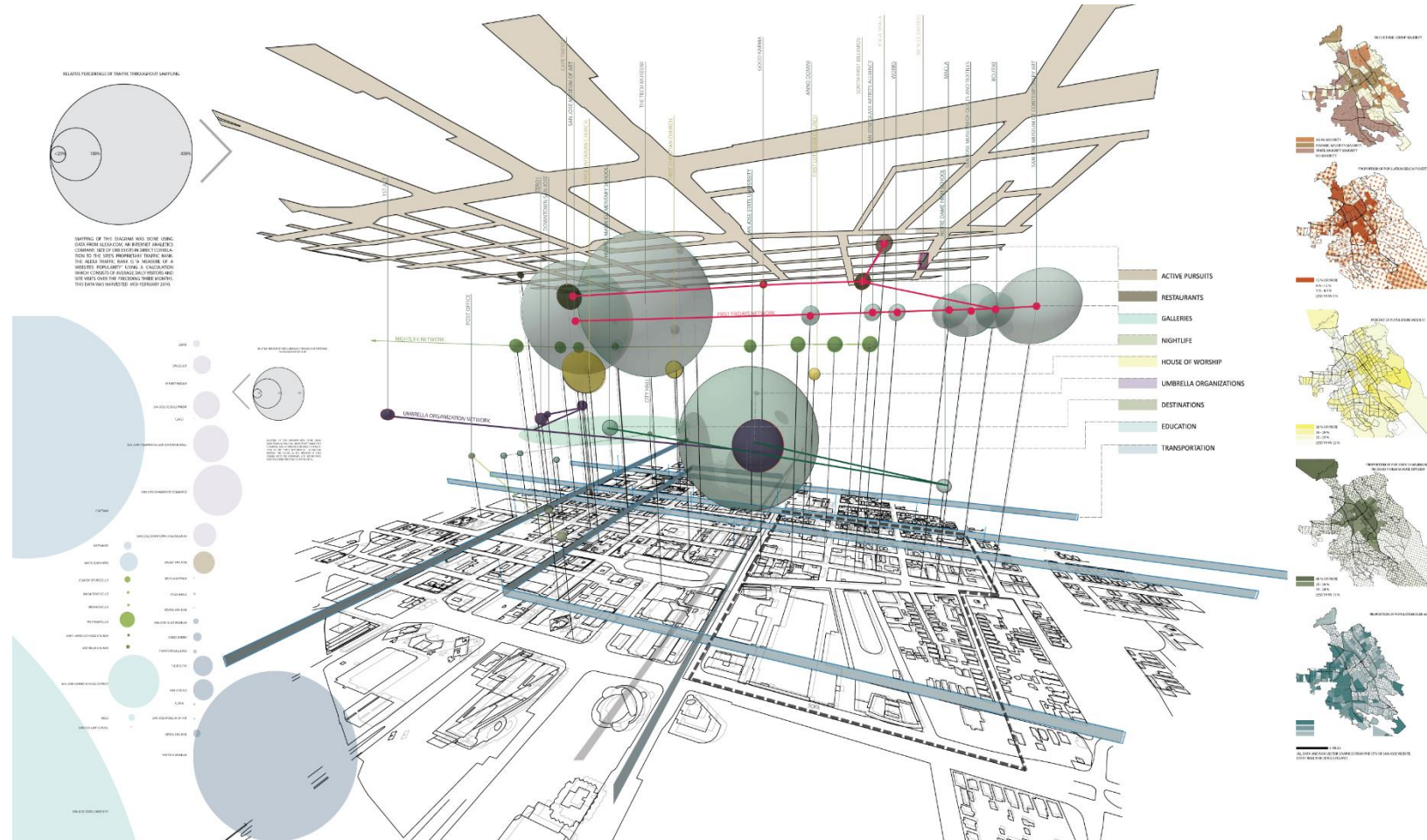
The **analysis of urban structure** aim to understand the **spatial structure** and character of a city. Elements of value are:

1. **The town plan**
2. **Pattern of building forms**
3. **Pattern of land use**

The town plan in turn contains three complexes of plan element:

1. **Streets and their arrangement** into a street-system
2. **Plots (or lots) and their aggregation** into street-blocks
3. **Buildings**, in the form of the block-plans.

In this presentation, the urban form will be based on the urban shape as this is captured by the road network.



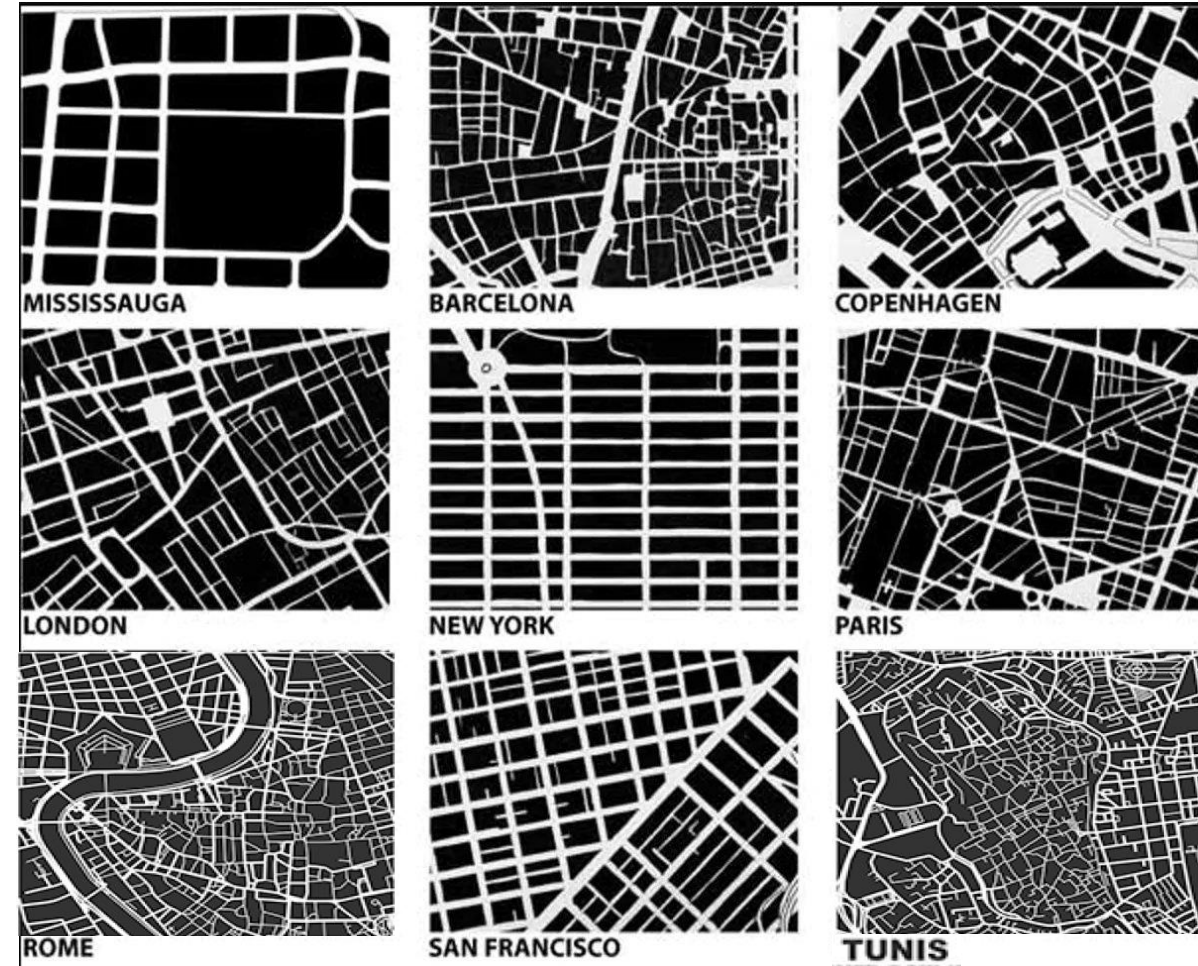


The urban form corresponds to Cities' important features, related to their **cultural values**, the **evolutionary process**, the **citizens' habits**, the **opportunities**, **constraints** and **threats**, **topography**, **land ownership structures**. *The form, may be the message.*

There are typical urban morphologies, distinguished by 'canonical' to '**organic**' structures (and the between), '**evolved**' or '**designed**', '**old**' or '**new**'.

**Different urban structures** may call for **different urban planning** and management strategies.

In this presentation results from a fundamental analysis of the **4 larger Cypriot Cities** urban form will be offered, while some remarks will be given with respect to future mobility development plans.

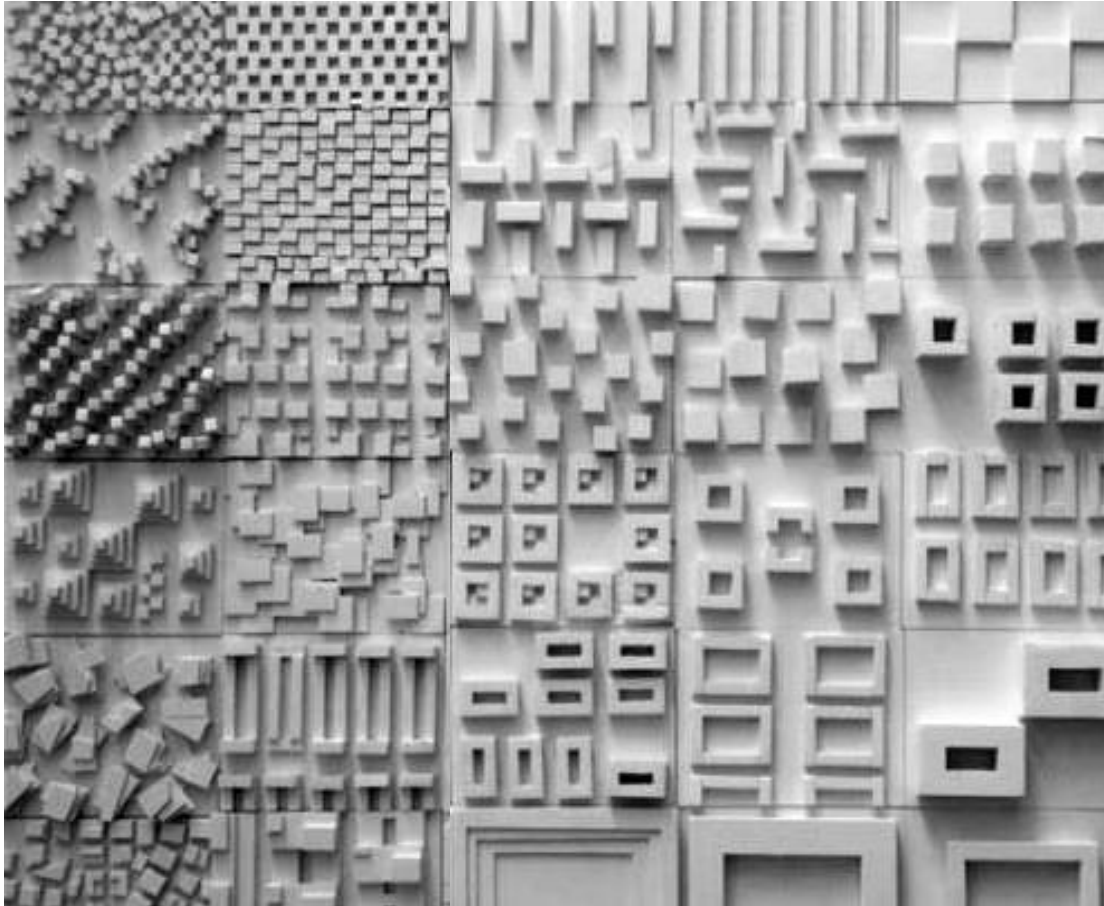


Two standard urban metrics will be used:

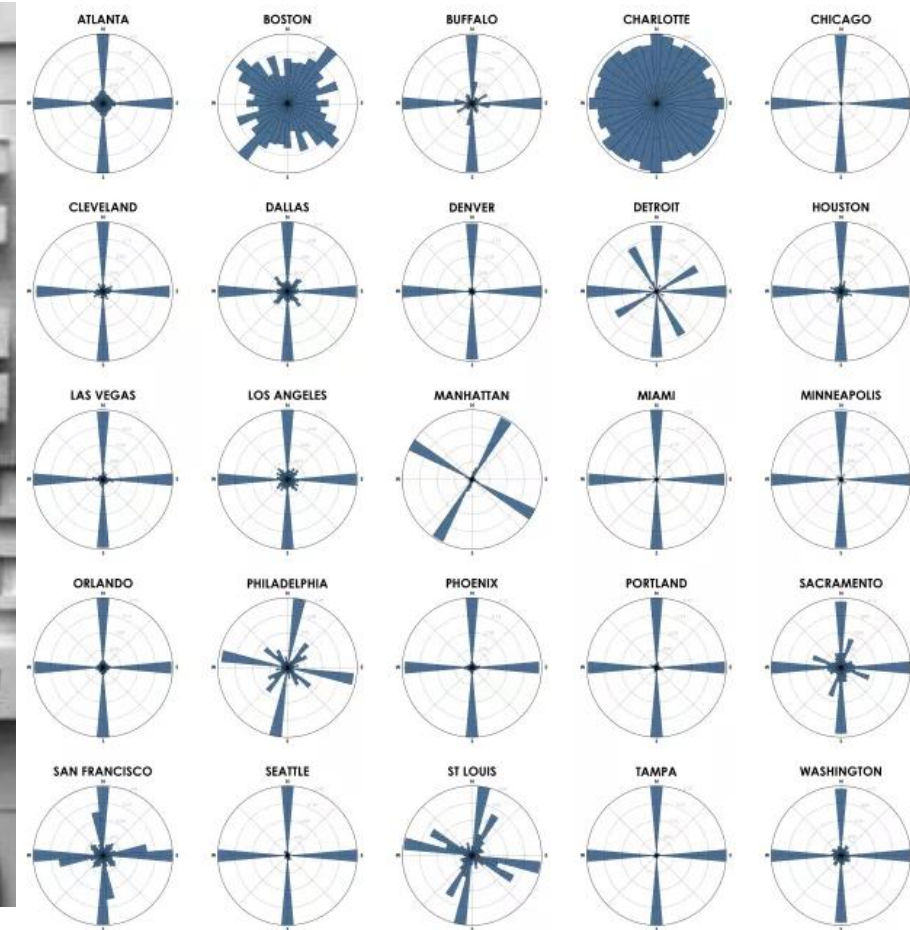
1. Urban Density, and
2. Urban orientation

These straightforward elements reflects the opportunities and challenges for development of the existing urban form.

Urban Density



City Street Network Orientation



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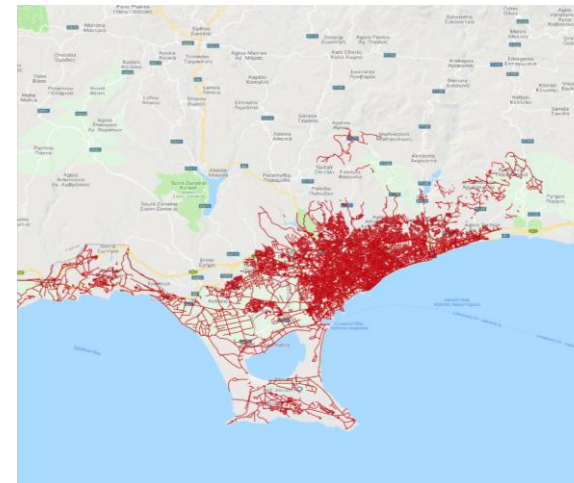
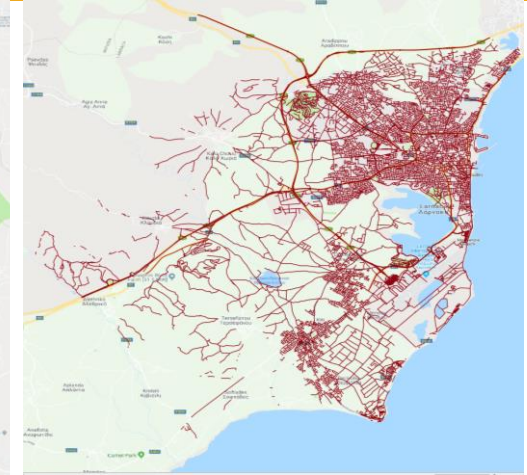
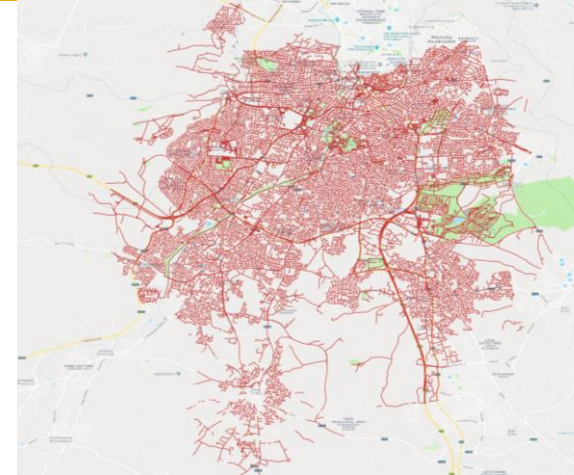




The main characteristics of the 4 major Cypriot cities are that they are developed in an **'organic'** structure, reflecting their long historic and cultural development process.

Typically, they are having a **radial structure**, with major and minor epicentres and poles.

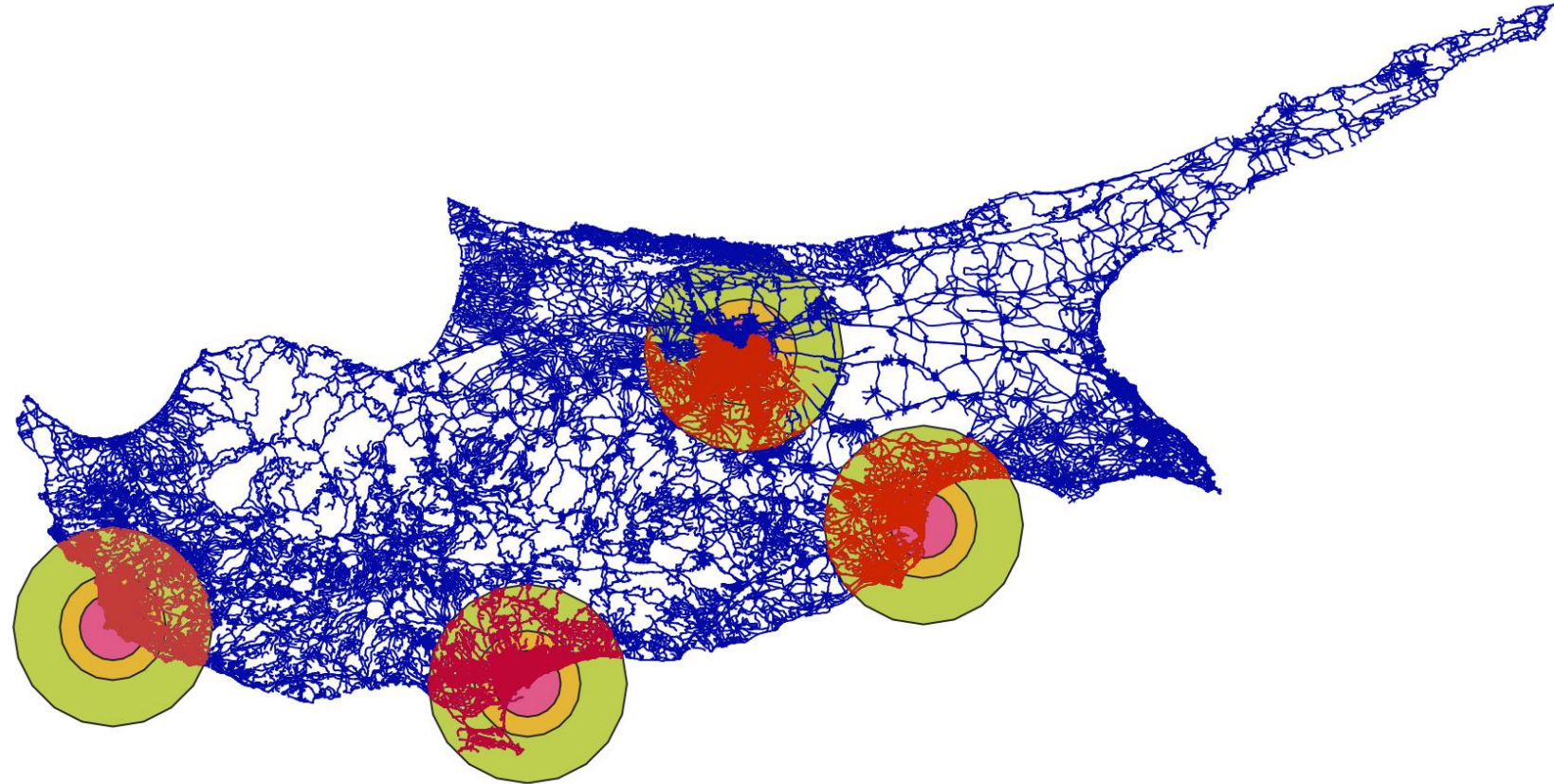
Their **nucleolus are their ports**, with the exemption of Nicosia, where the '63 division resulted in a emergence of **two separate cities**.



The data used in this analysis corresponds to the selection of the road network comprising the 4 major Cypriot cities in radial scales of **5Km, 8Km and 15 Km**, facilitating comparative purposes.

The data used were collected from **open access** platform, namely, Openstreetmaps.

Further analysis was performed in a network statistical analysis 'machine'.





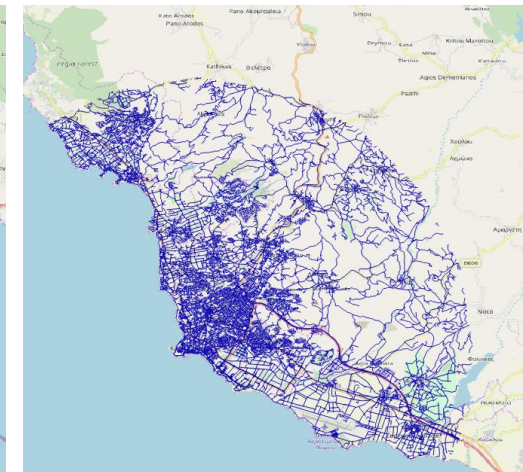
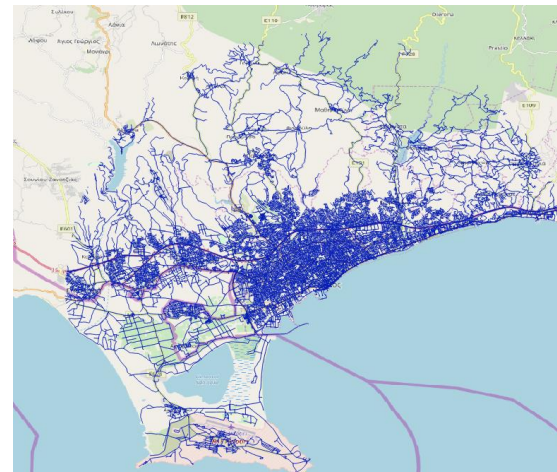
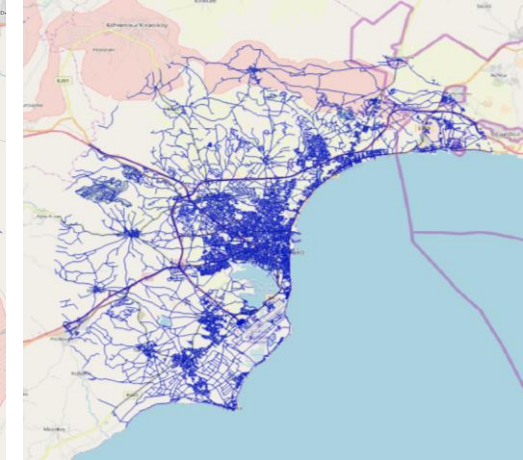
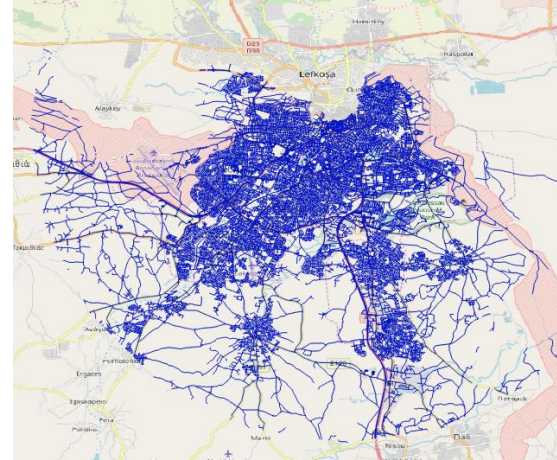


The resulted database can provide unbiased information on the urban form, especially the:

- Road **network density**, and
- Road **network orientation**.

Although the **general perception** is that the 4 cities are similar, **distinctive characteristics** can be identified.

Important features can be extracted especially with respect to the **development of the urban form**, as this is reflected to the road network.





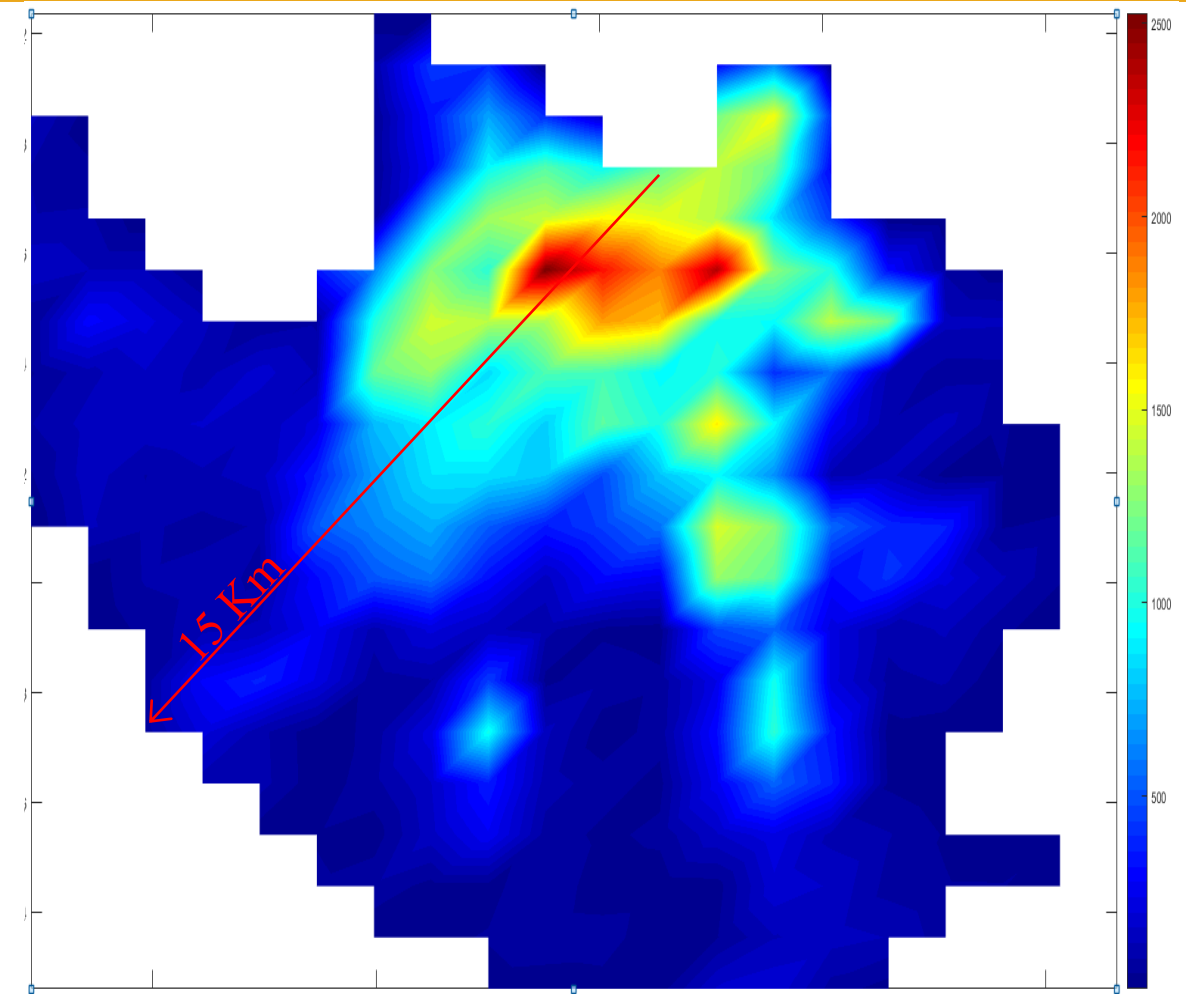
# Nicosia

Nicosia's form reflect the city's **radial expansion**, with the existence of a **widespread/extensive centre**.

The centre is **not exactly the old town**, but is rather moved **toward the new city**.

In terms of connectivity, the **Central Business District is Strovolos area** (around Metro rotary).

The city has expanded in a **radial pattern**, with a **dominant West-South direction**, reflecting the **commuting behaviour** of people visiting or working in Nicosia.





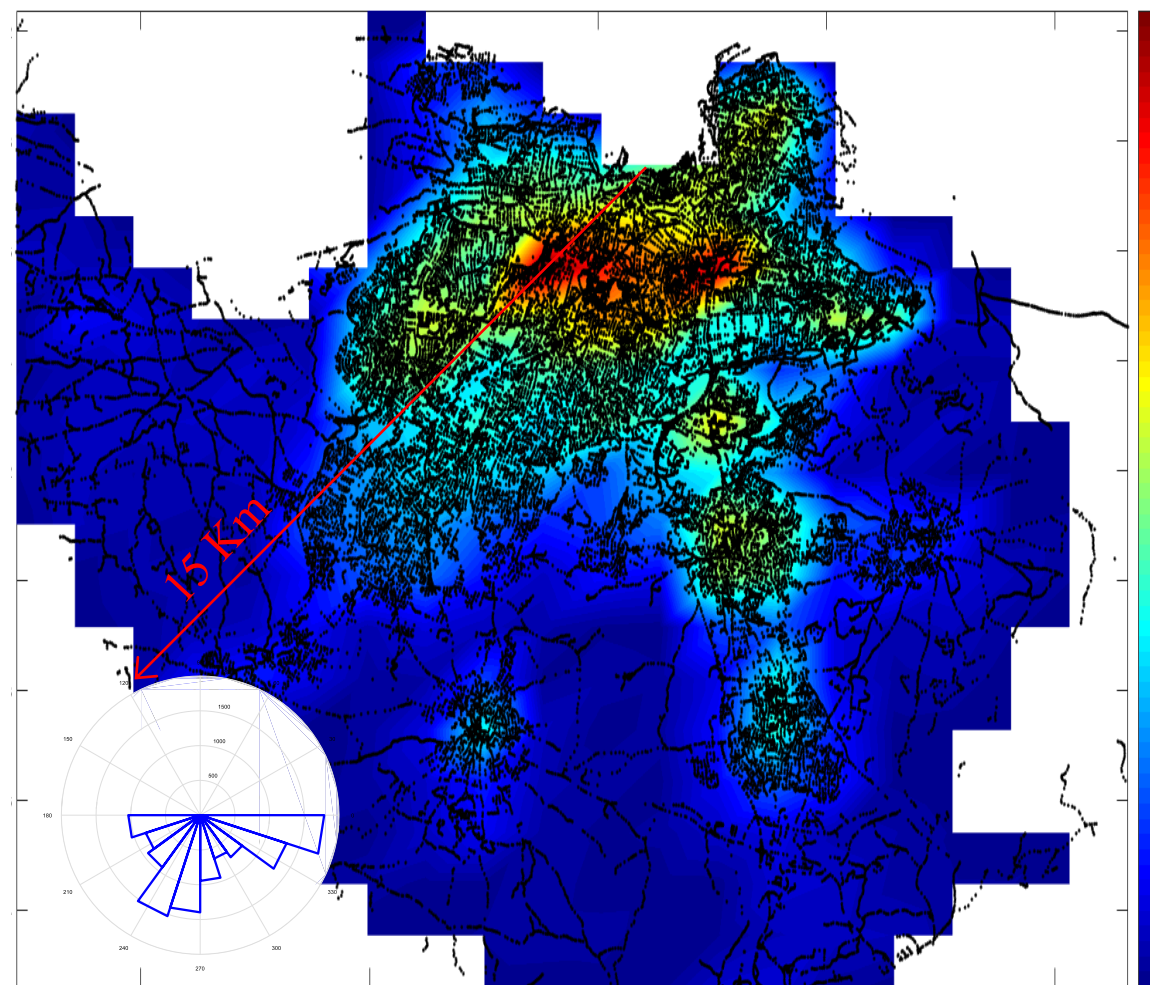


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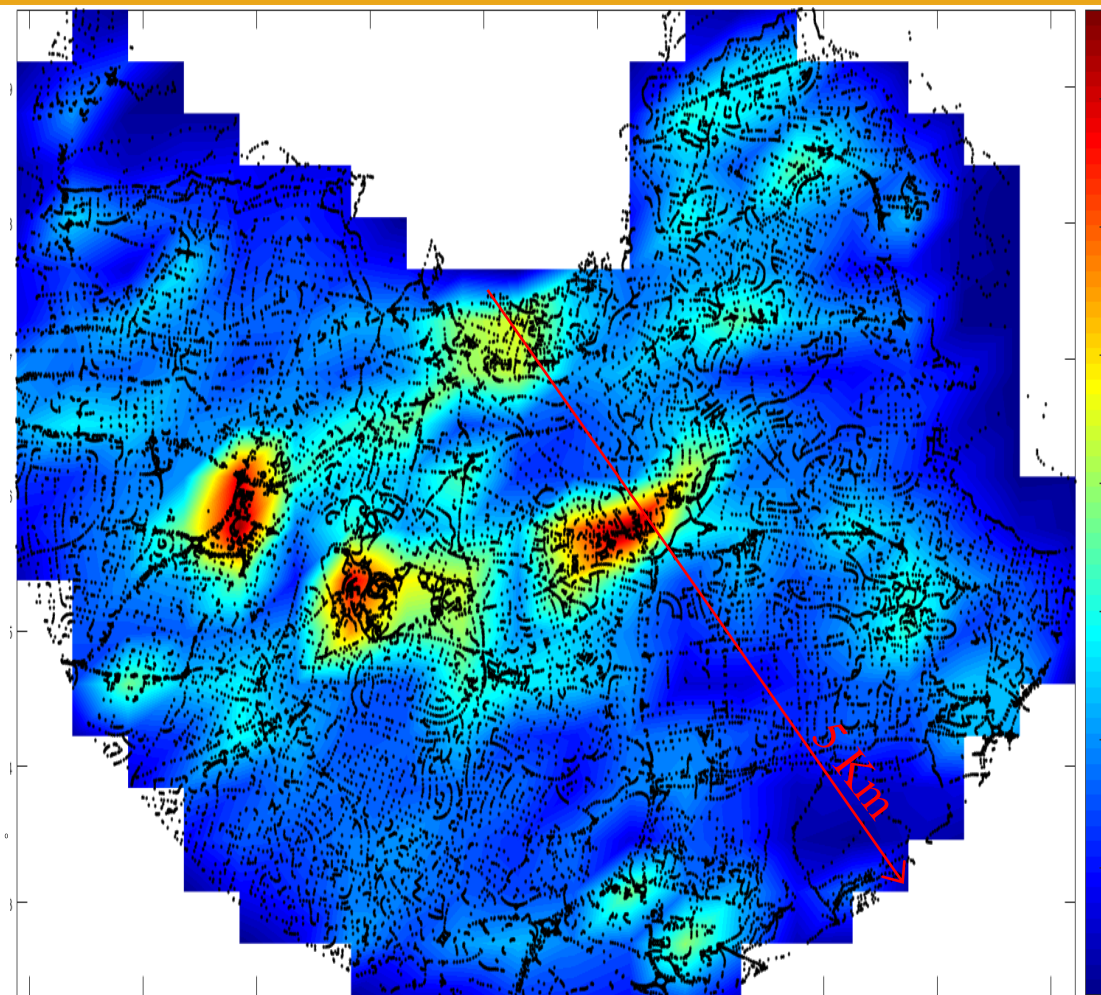
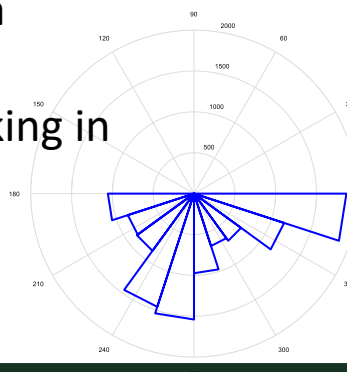


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# Larnaca

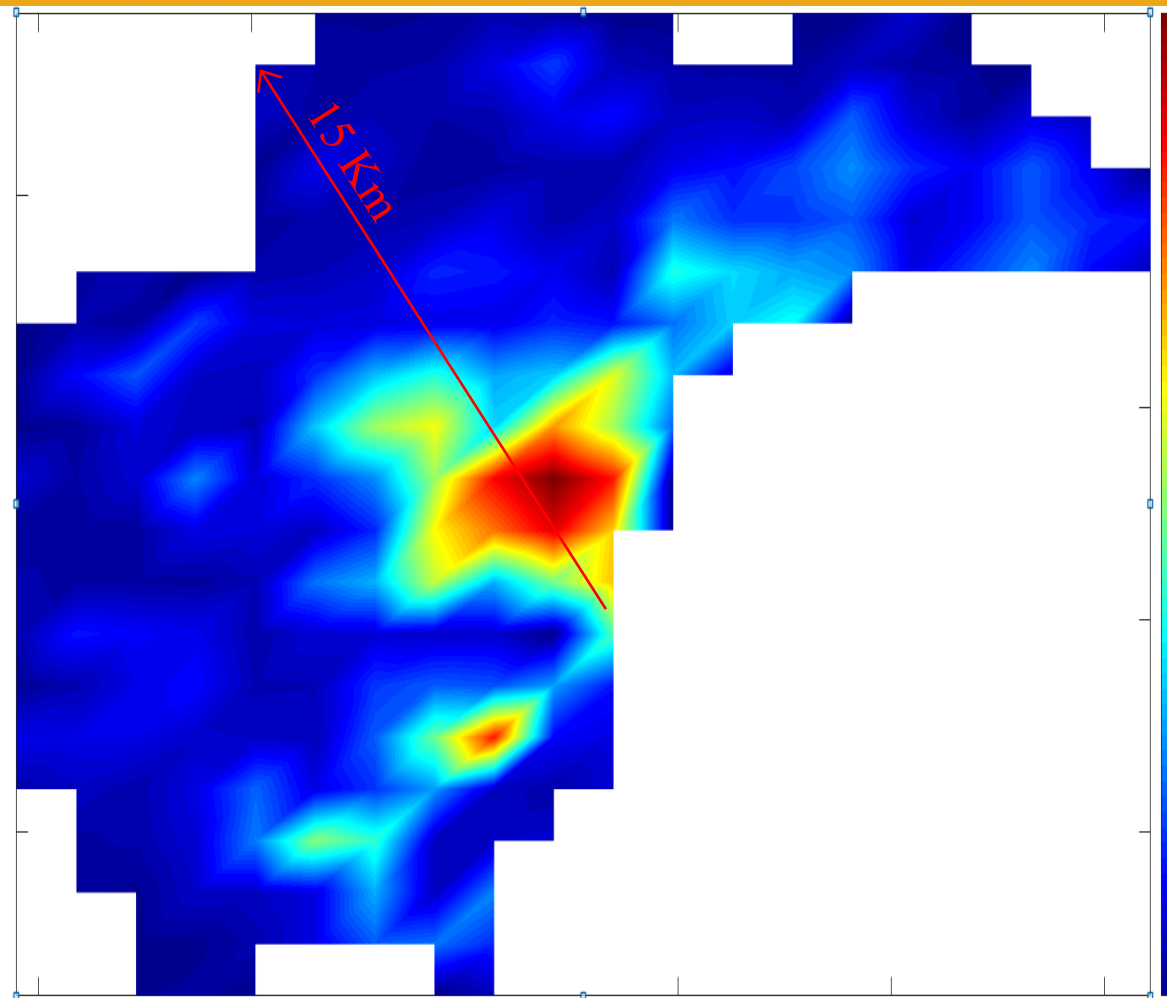


Larnaca is also developed in a (kind of) radial pattern.

The main epicentre is the **port and the airport** (two major poles).

The general orientation is mixed, though there is a **dominance** in the road network **reaching the coast** and the **parallel to coastline** axis.

The interesting fact about Larnaca is that there is an **evolving competition** between the further strengthening of the **historical entrance** to the city (from Rizoelia towards the port's area) and new **territorial expansions along the coast** to the north and south and further offsets inland.





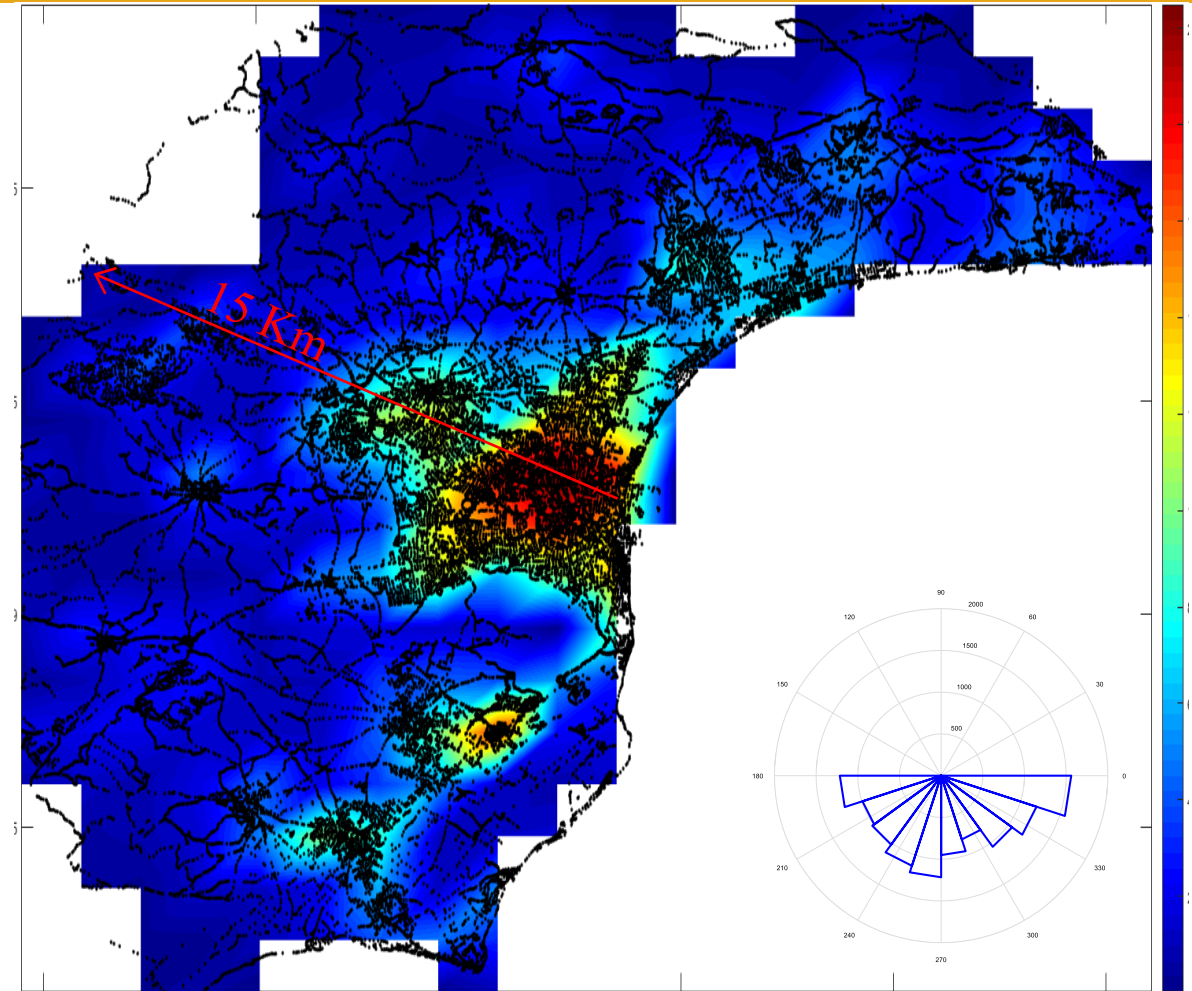


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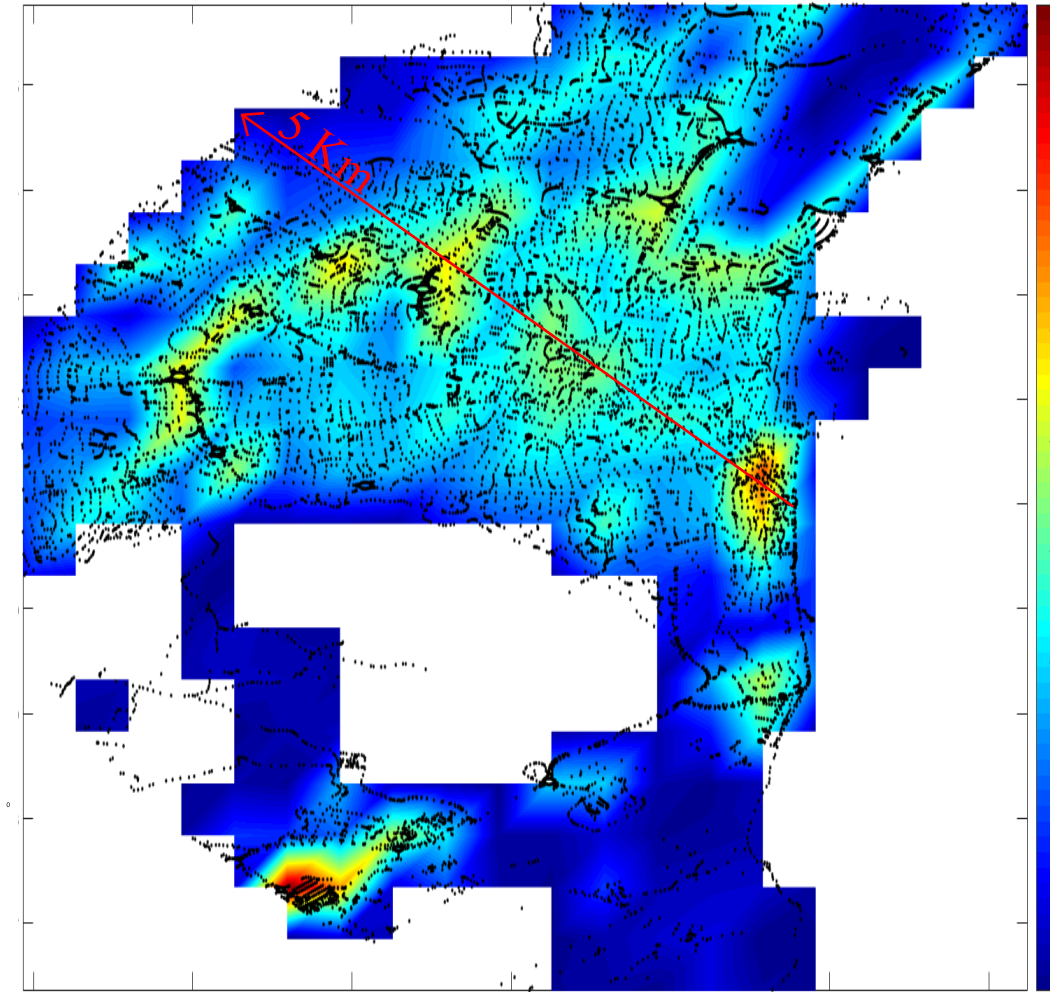
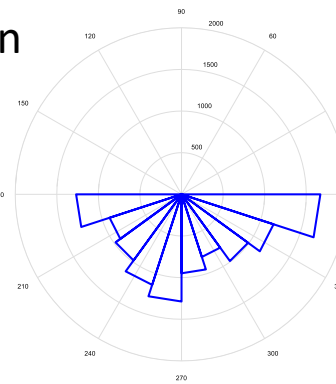


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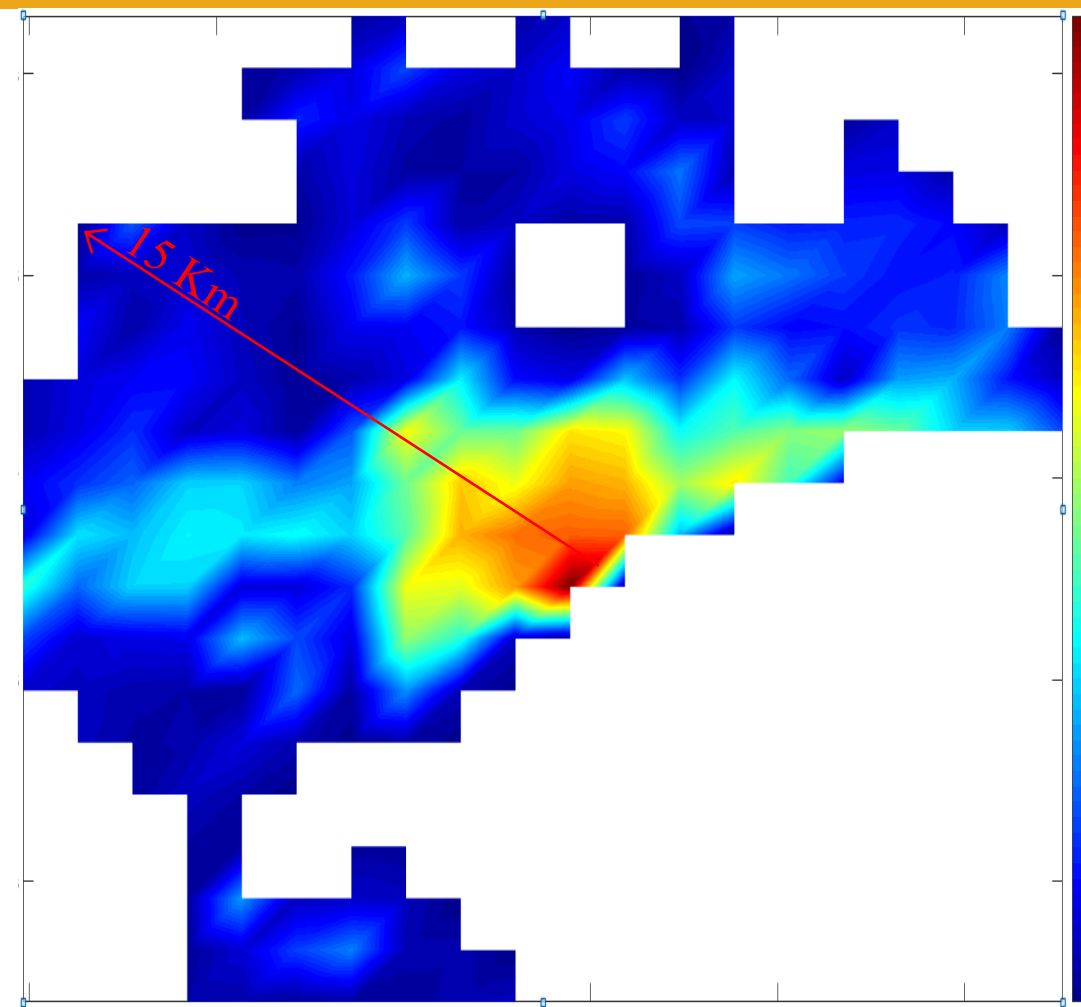
# Limassol



Limassol is **quite different** because in the evolution of the city's urban morphology, the **historic epicentre was replaced** in dominance by a **approximate grid pattern**, triggered by the **six major interchanges** (highway entry/exits) perpendicularly to the waterfront demarcation line/boundary.

Limassol has a quite **'regular' orthogonal grid**, clearly manifested by the propagation of rights of way from the 6 nodal (highway) interchanges perpendicularly to the costal front.

Interestingly enough, the **new developments** follow the locations of the **6 highway interchanges**, and the accessibility opportunities, toward the adjacent areas.

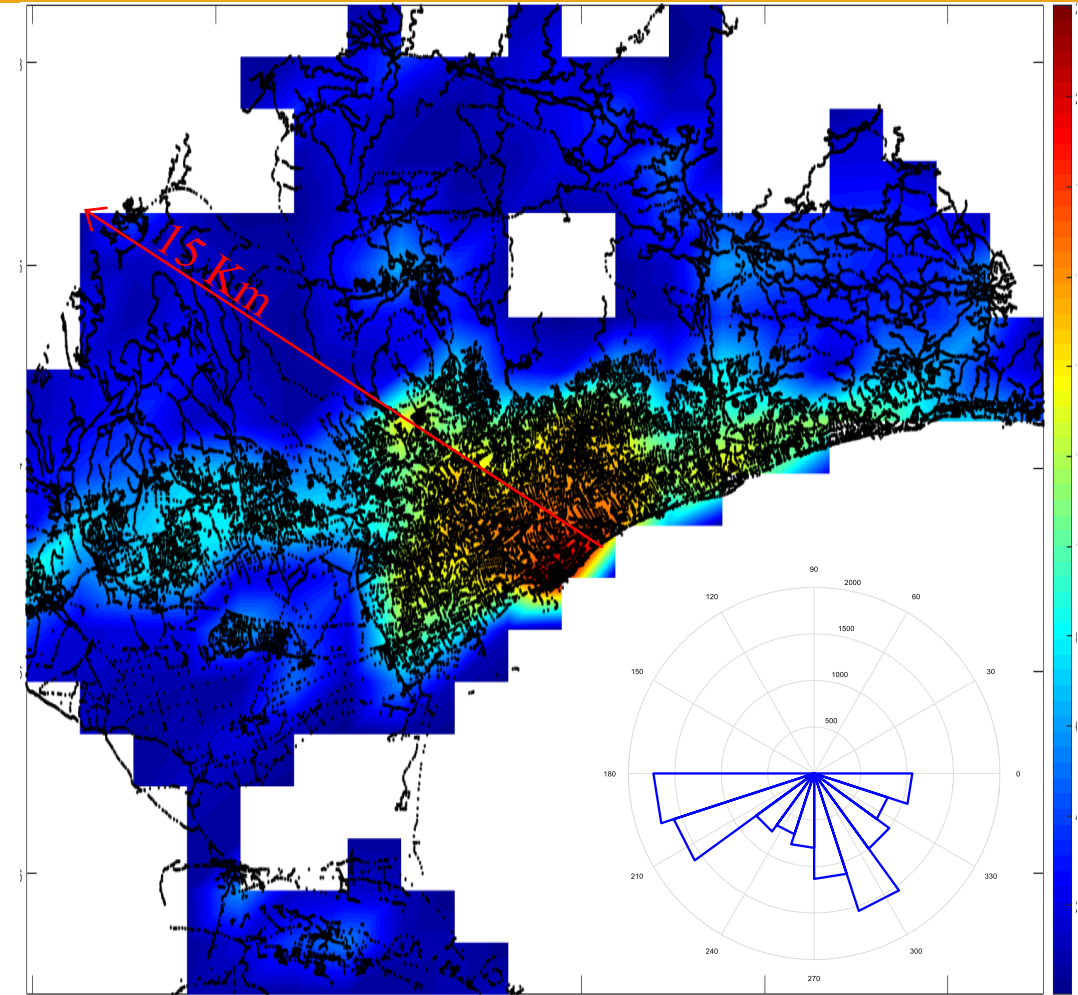




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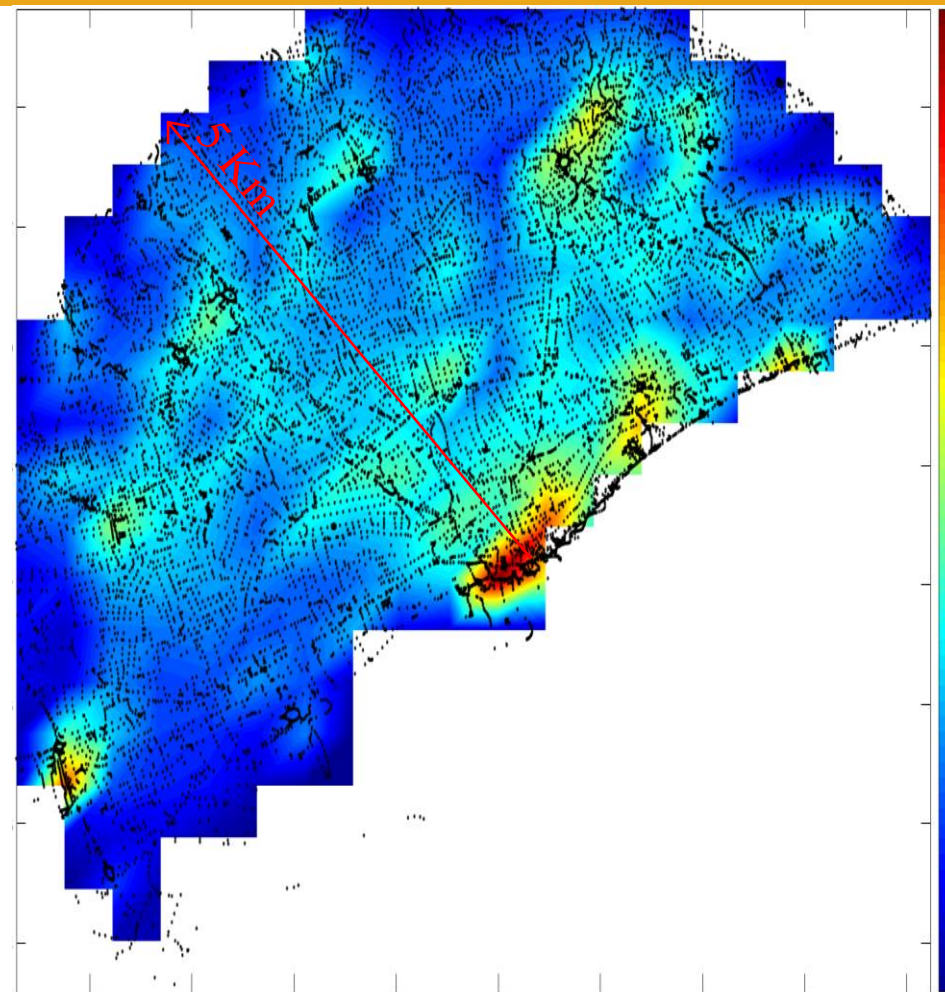
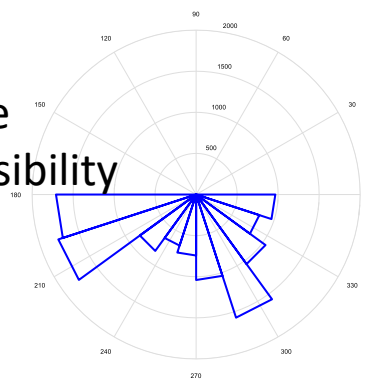




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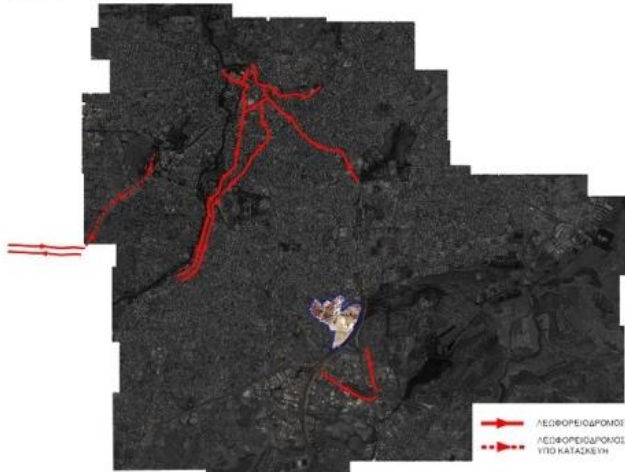


Στη συνέχεια, προχωρήσαμε στην σύγκριση του υφιστάμενου δικτύου με τα μελλοντικά σχέδια δικτύων ποδηλατοδρόμων, λεωφορειολαρίδων και του τραμ, καθώς και στην εξακρίβωση στο πώς επηρεάζουν ιδιαίτερα την περιοχή μελέτης μας. Παρατηρήσαμε ότι άμεσα αντικτύπο θα έχει η γραμμή του Τραμ Νο 15 η οποία θα περνά διαμέσου του site.

Οδικό Δίκτυο



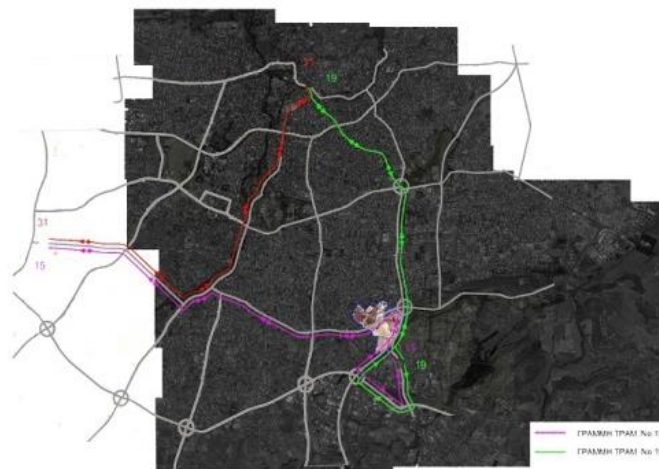
Προτεινόμενοι Λεωφορειοδρόμοι



Προτεινόμενο Δίκτυο Ποδηλατοδρόμων



Προτεινόμενες Γραμμές Τραμ



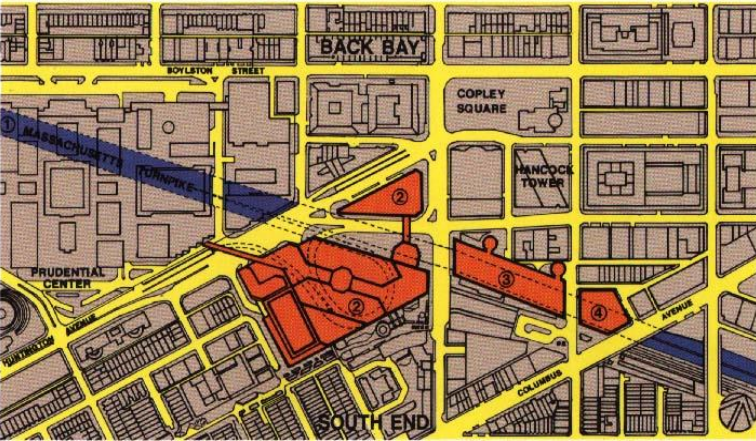
Grotiusplaats, in Den Haag (1999); masterplan and residential tower by Juan Busquets.



Possible urban planning concepts could involve the ‘stitching’ of the urban space (especially the new developments) by bridge-buildings.

Transit oriented planning cases may be justified.

A necessity of floor area ratios (FAR) control.





Focusing to Transit Oriented Development control/planning should result in distinctive areas, where opportunities for non-motorized transport are evident.

The key is floor area ratios (FAL) control.



# Paphos

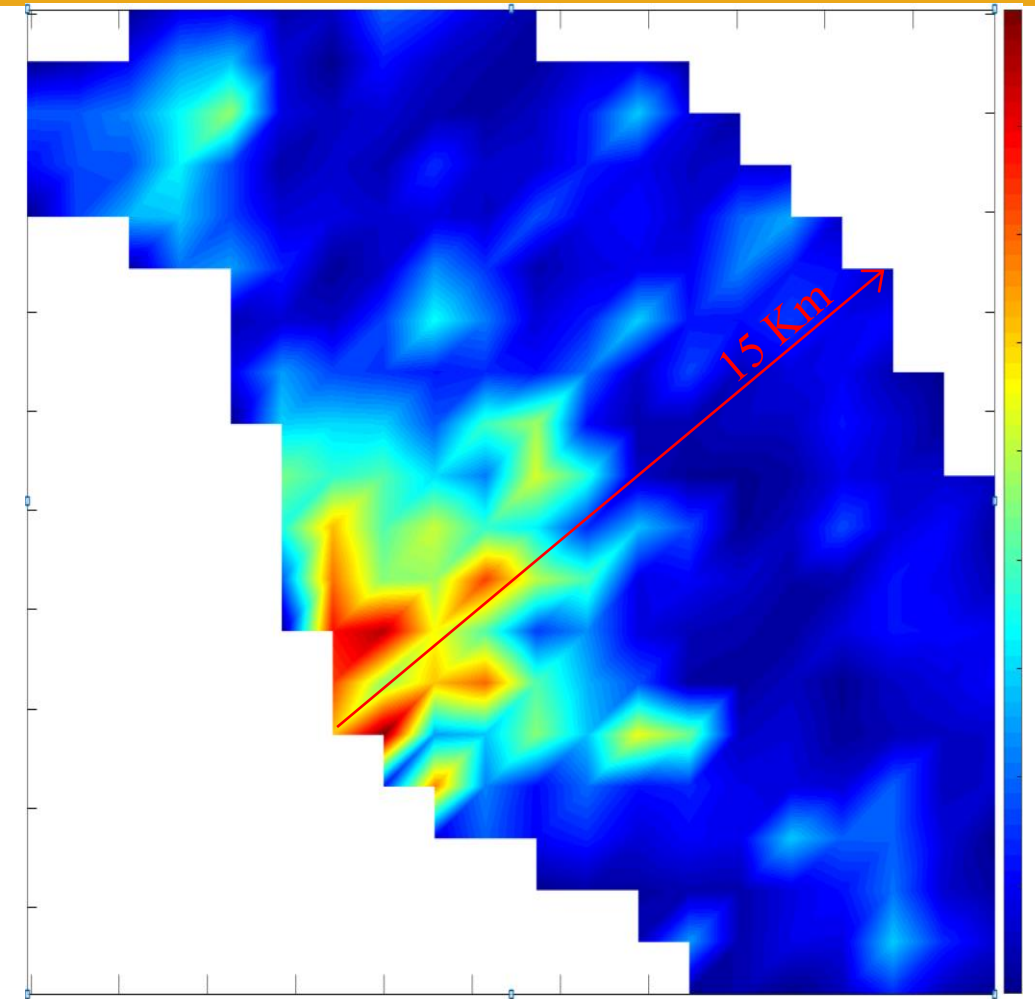
Paphos' evolution exhibits a **multi-centre situation**, with distinctive secondary 'nodes' **competing in importance** the traditional **historic centre**.

There is a typical bipolar (Ano Paphos/Acropolis-Kato Paphos/historic port area), which gradually has evolved into a multi-nodal urban structure.

These new nodes are:

1. Geroskipou/Airport area
2. Tourist area (south-western seafront)
3. The new commercial zone on the way to Polis Chrysochous
4. The western coastal/cultural front with evolving tourist area on the way to Coral Bay and Peyia

Paphos has a quite uniform (**or non-dominant, mixed**) urban structure.







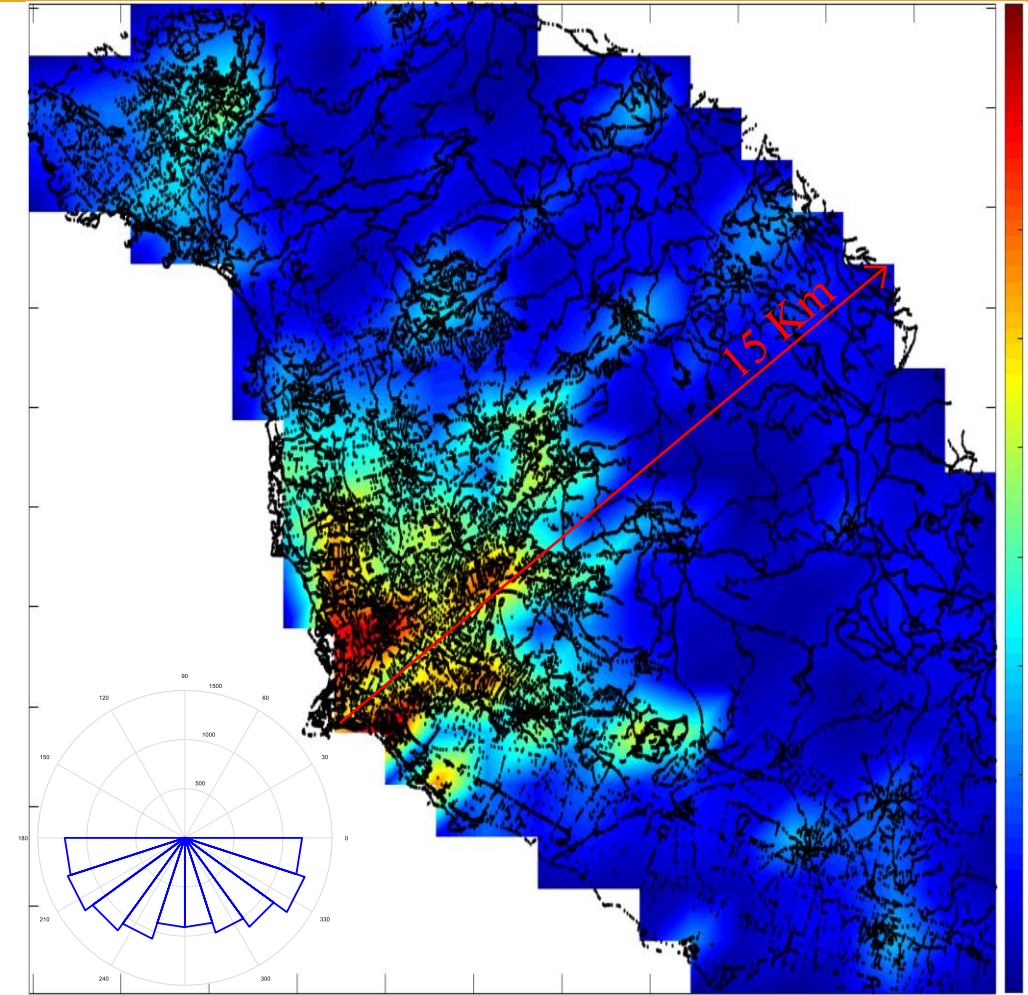
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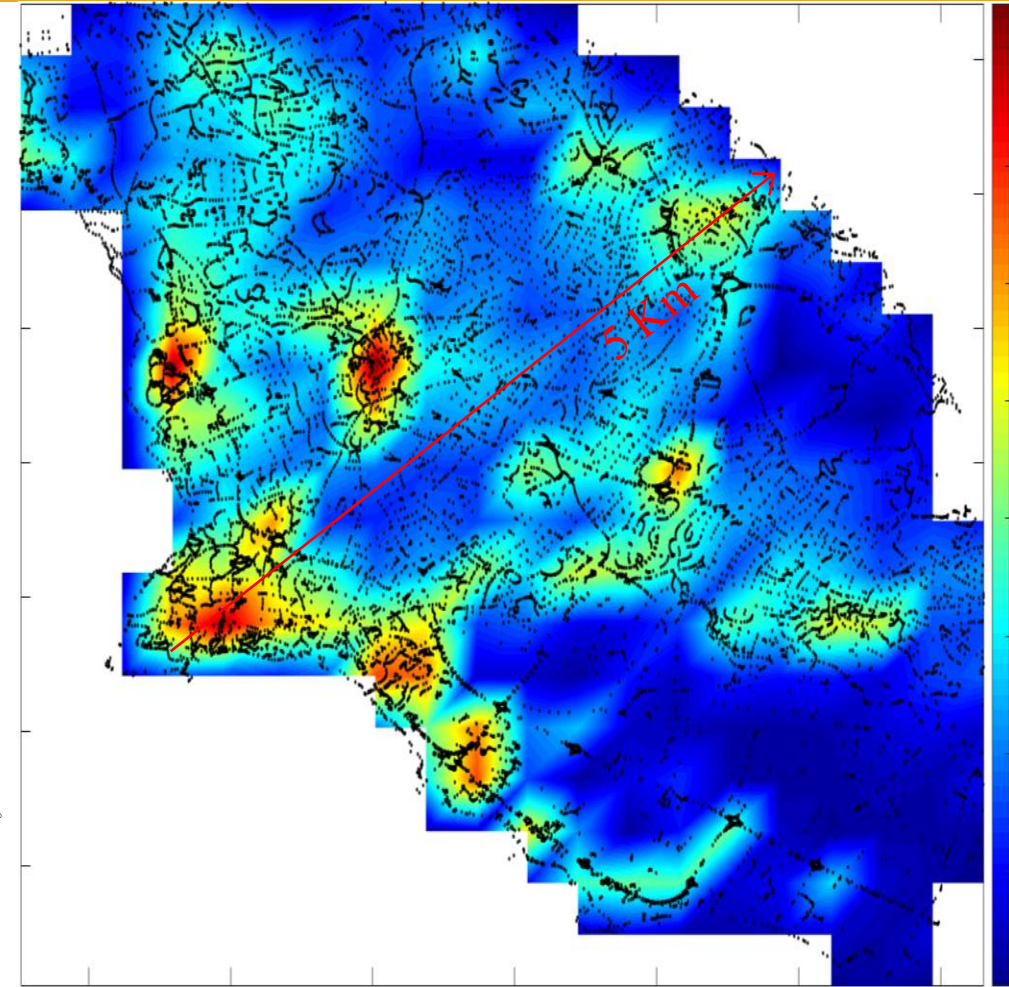
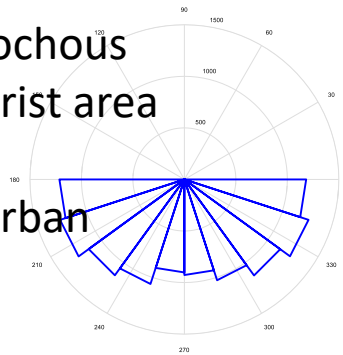
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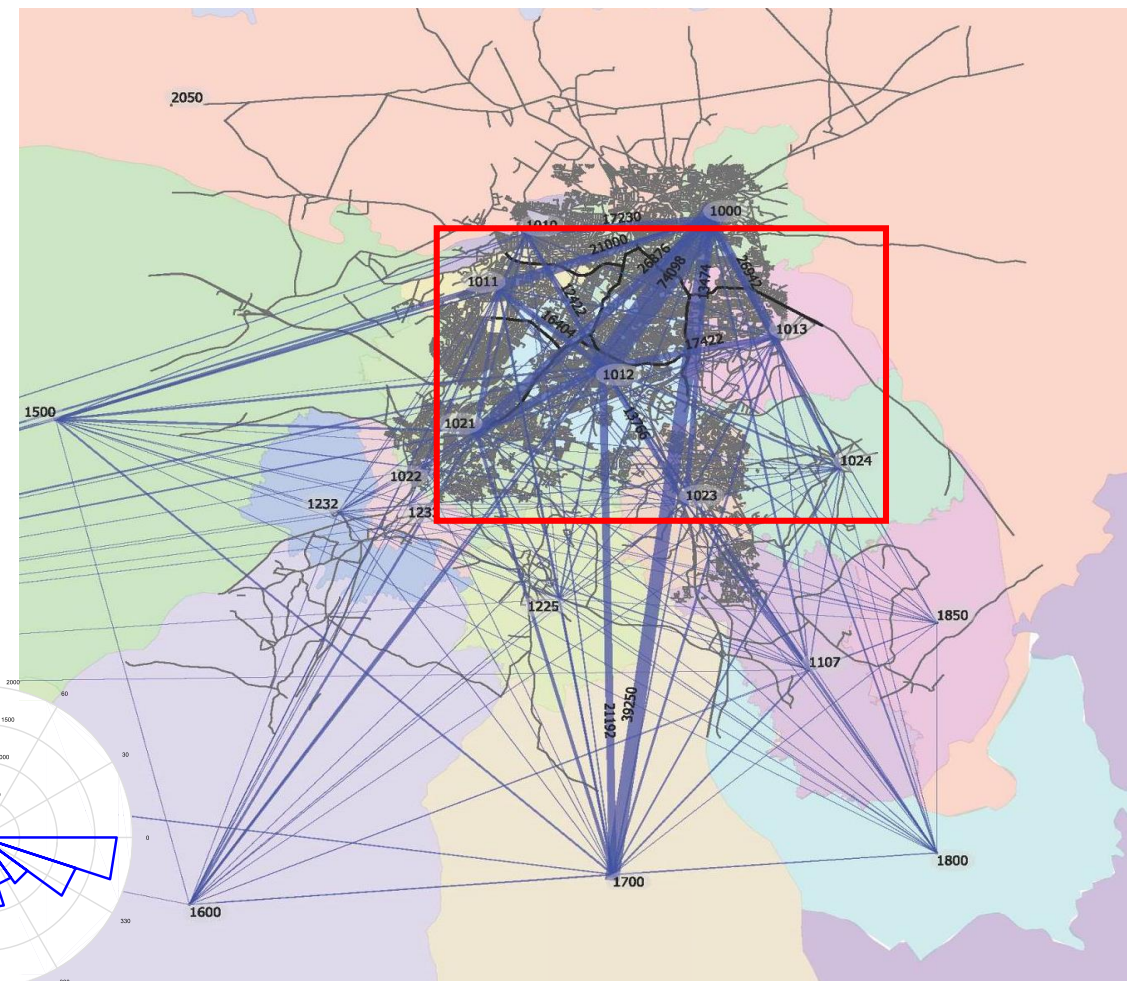
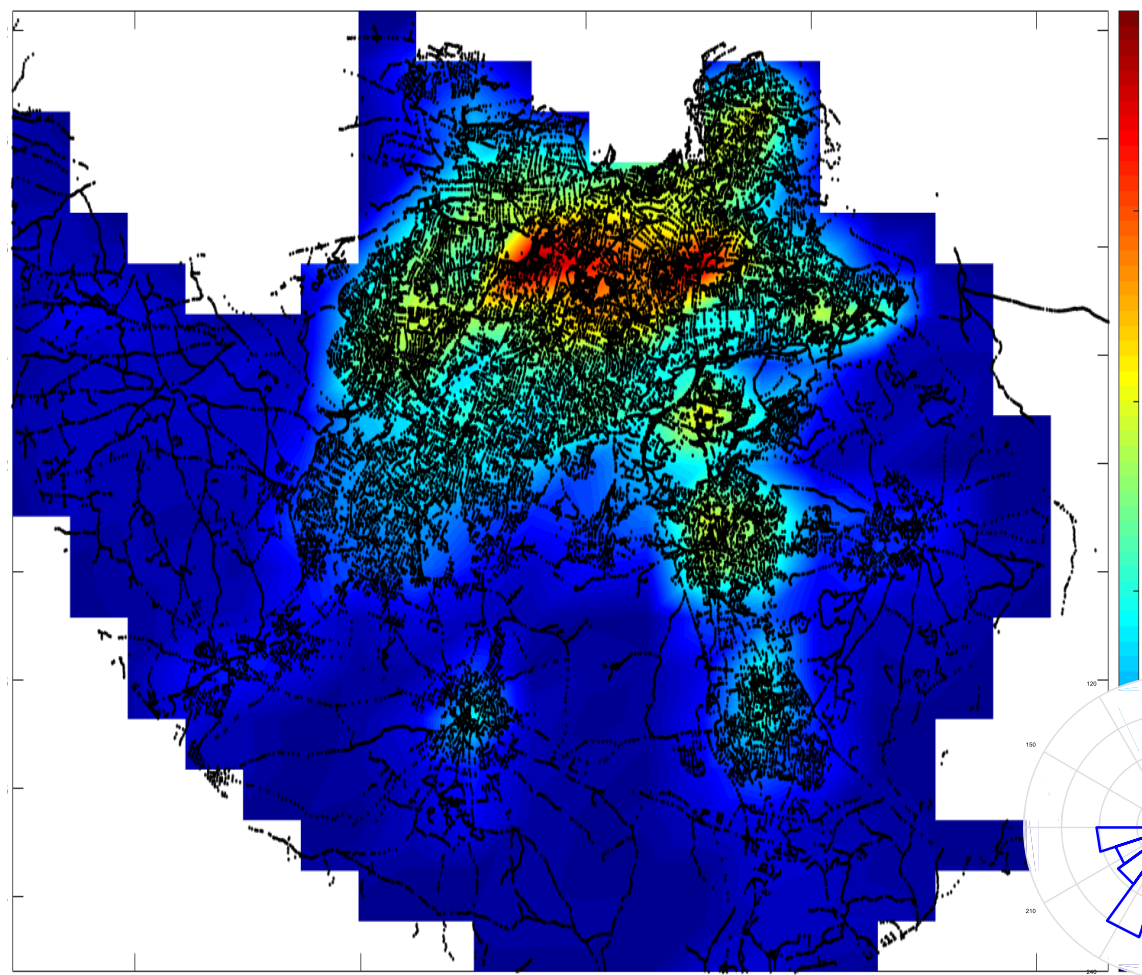
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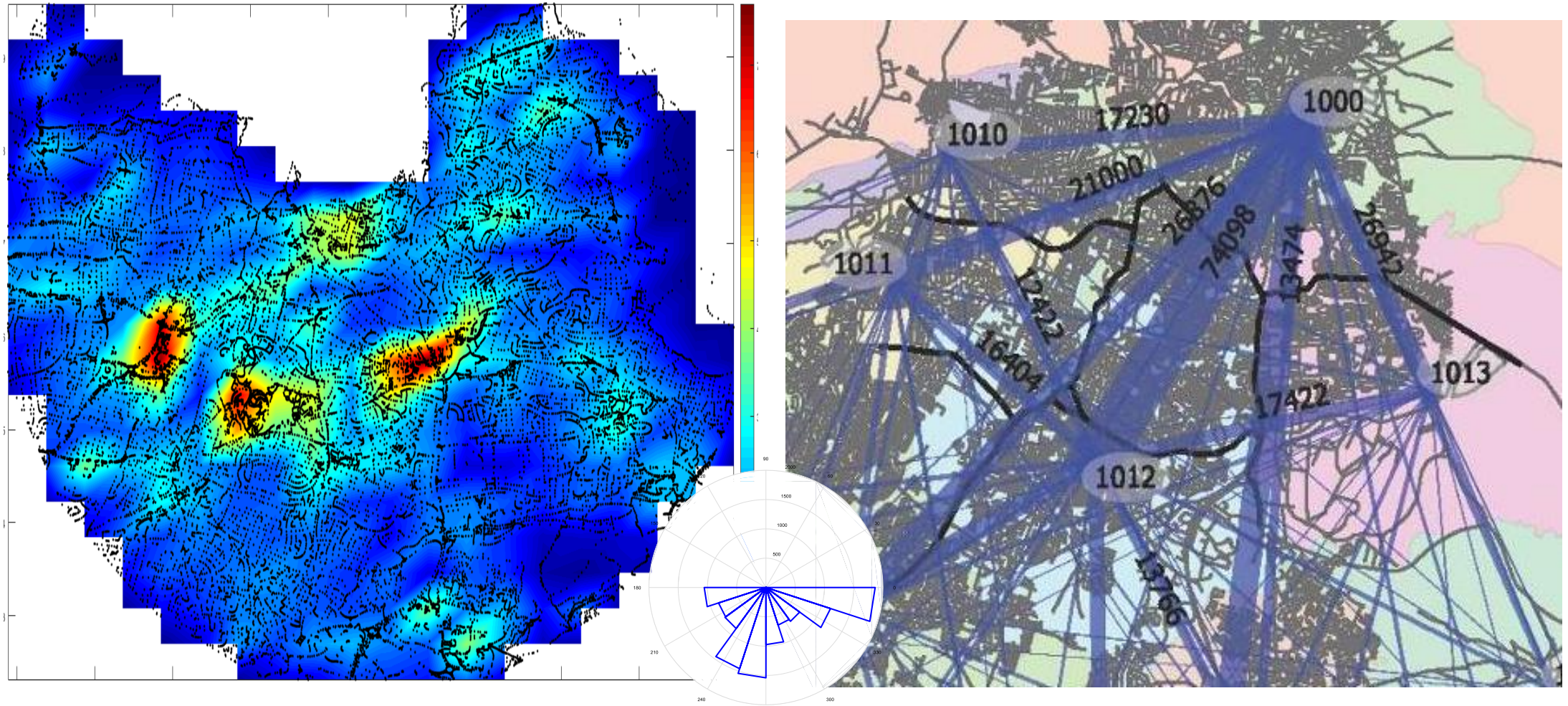


# Nicosia's Structure and Transit Oriented Development (..?)

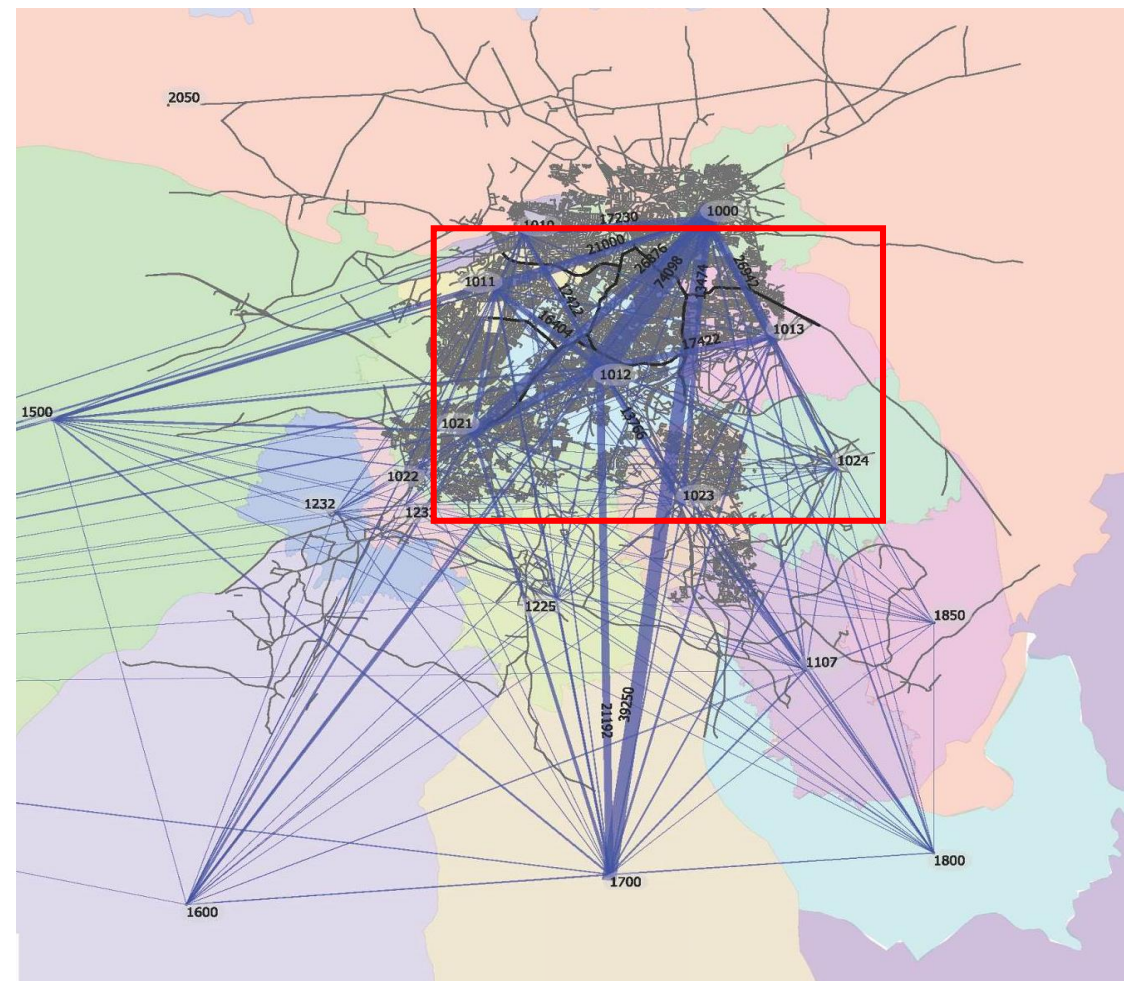
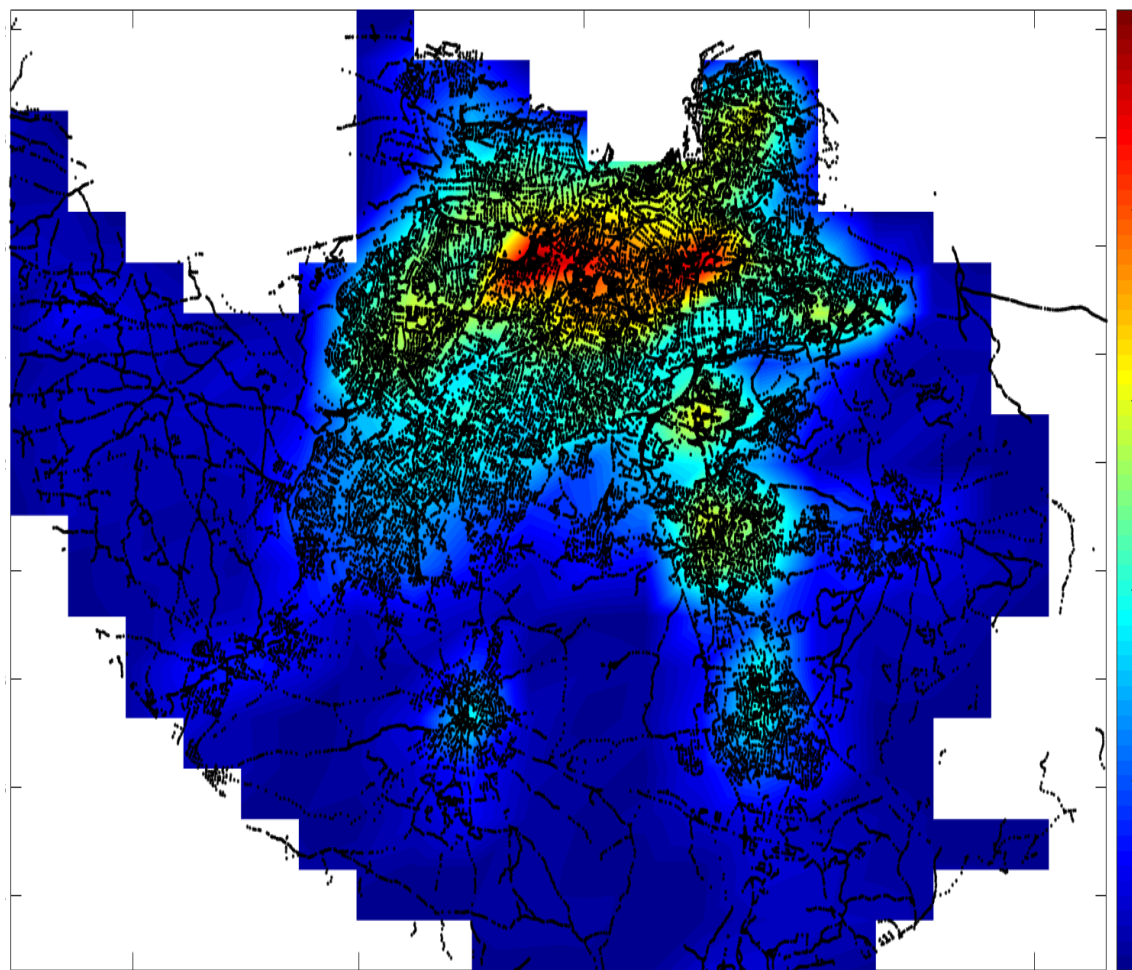




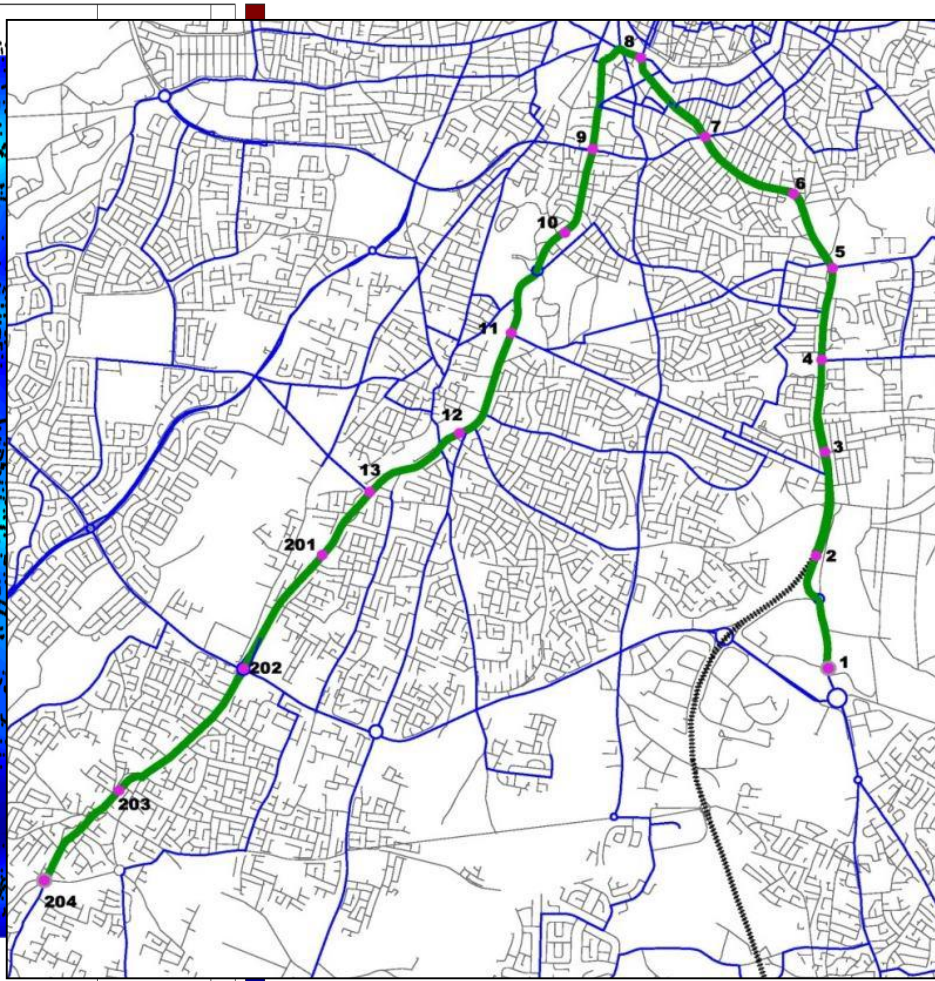
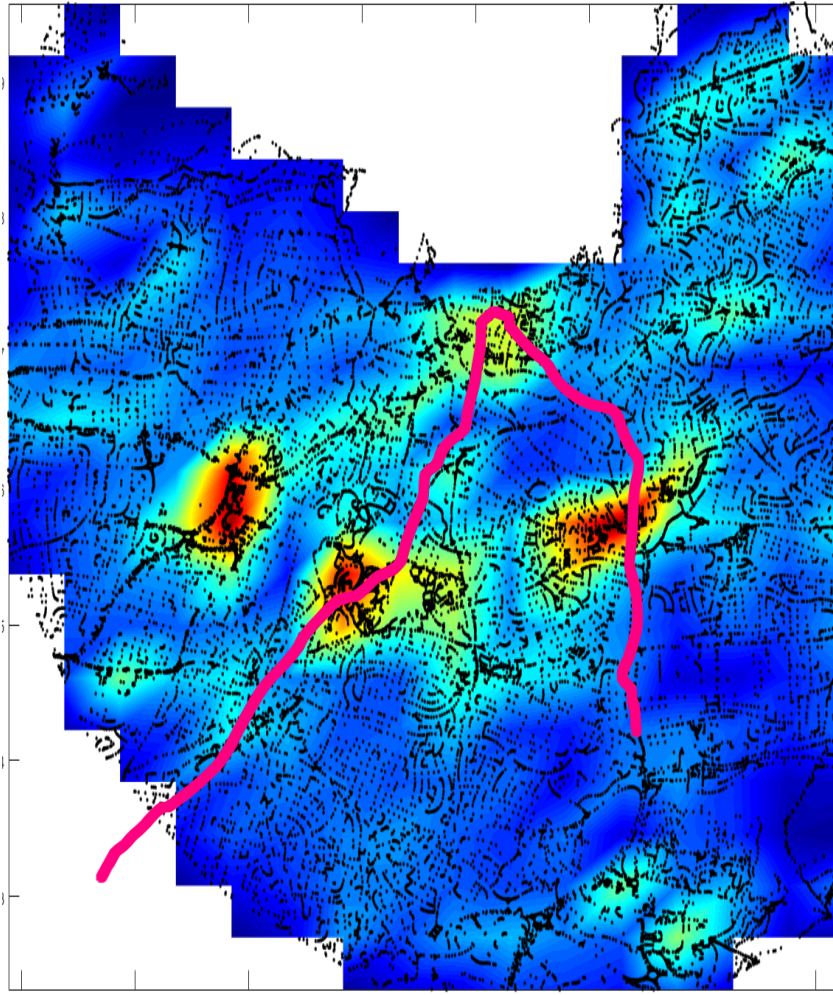
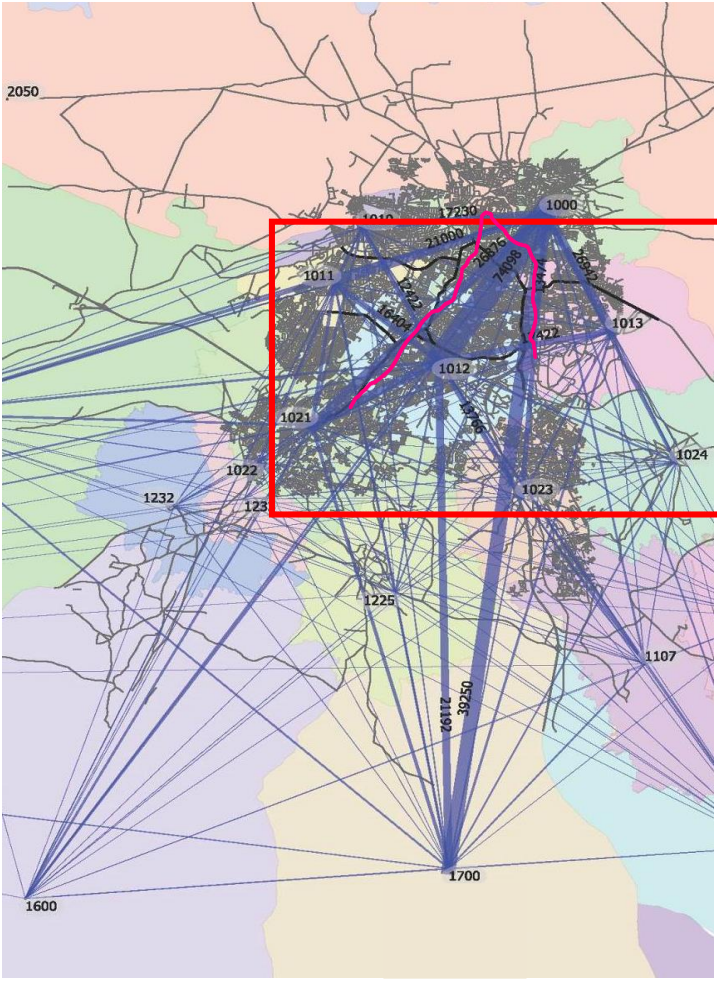












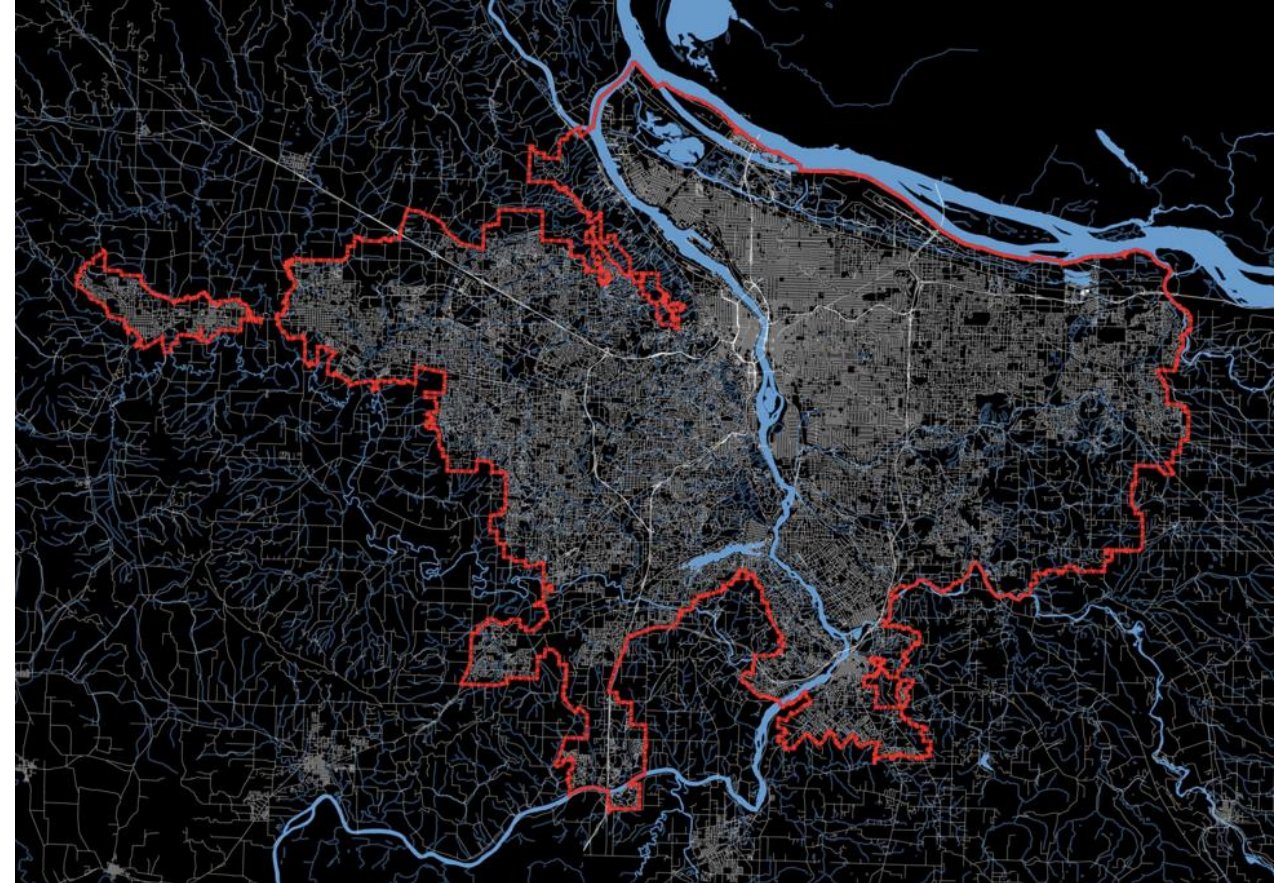


The concept design of Nicosia's Tram built on the **existing urban structure**, possibly exacerbating an existing challenge (or trapped in an existing problem), rather than leading to a more compact city form.

The **radial expansion leads to increased sprawl**, rather than a **circular tram line that could enhance Nicosia's compactness** by setting notional **development boundaries** (corralling people in).

A **comparable case study reference** is the development boundary supported by Public Transit infrastructure investments as exhibited by the city of Portland, Oregon.

There are many cases of cities development **'breaking' the city sprawl** toward compactness that should be considered.



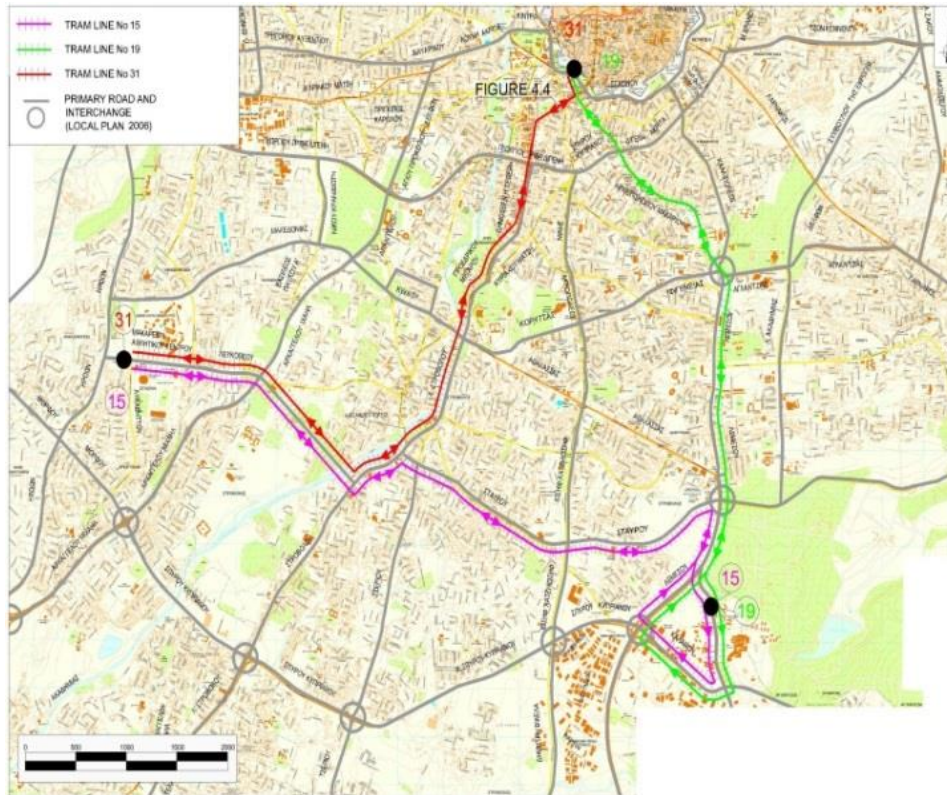
# The concept of re-stitching the urban space:



The case in Nicosia  
Tram:

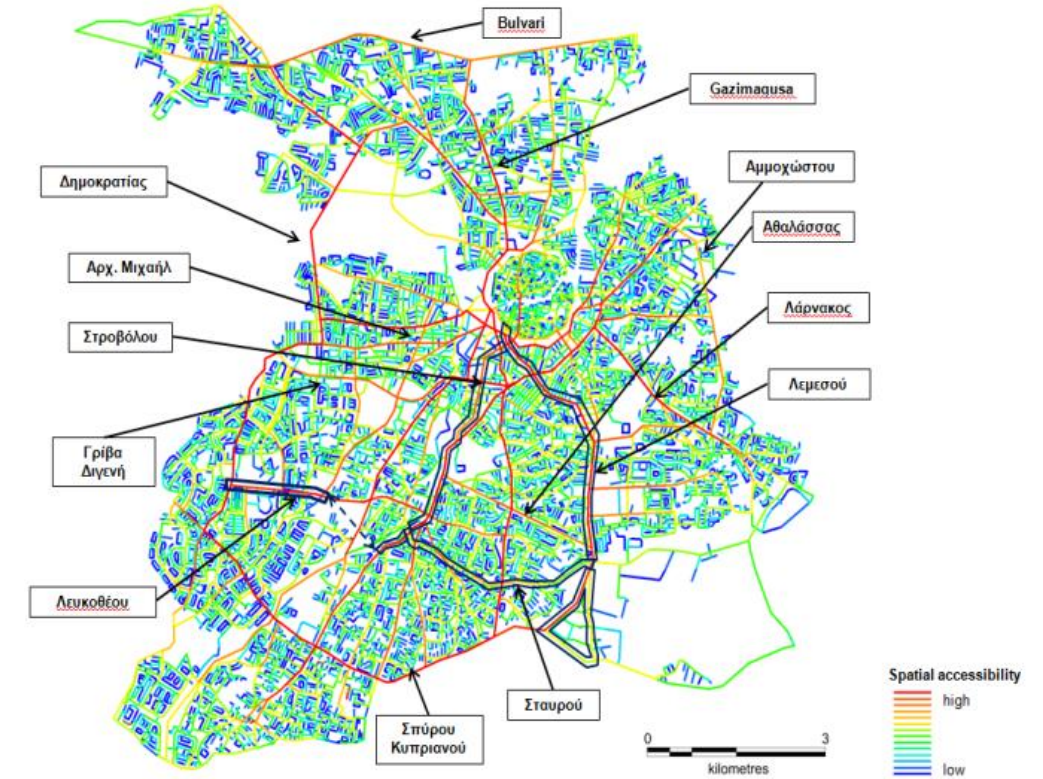
Important element is that  
the tram should not  
produce another  
division, but rather to  
bridge neighbourhoods.

The element of  
accessibility to the Tram-  
stops could produce  
new poles.



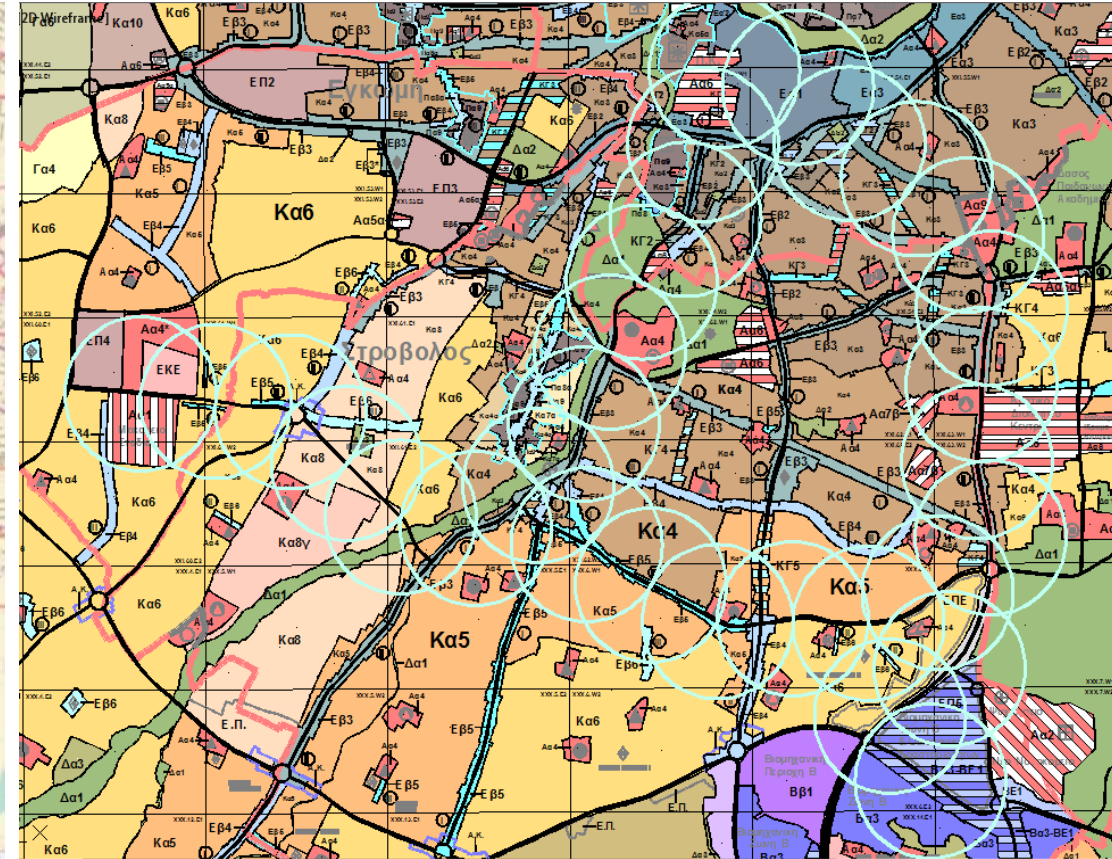
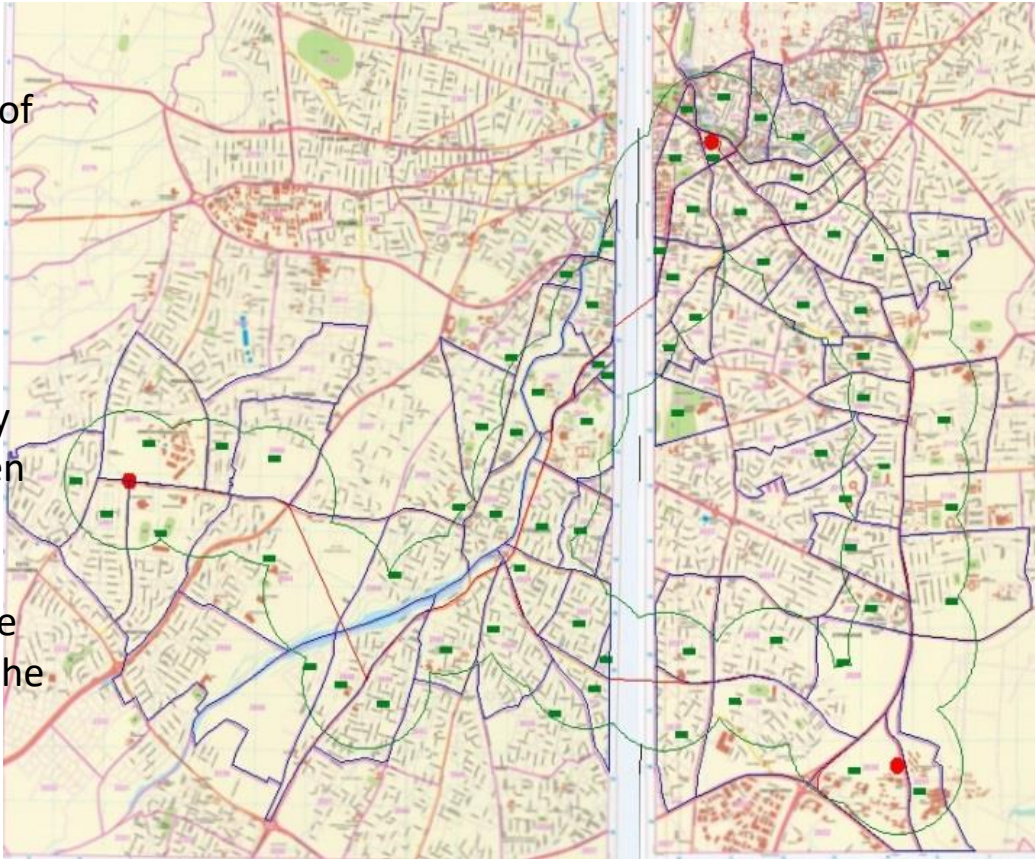
Proposed right-of-way for capital region tram (left) and demographic data subdivisions (right).

### Προσβασιμότητα οδικού δικτύου της Λευκωσίας- Κλίμακα πόλης



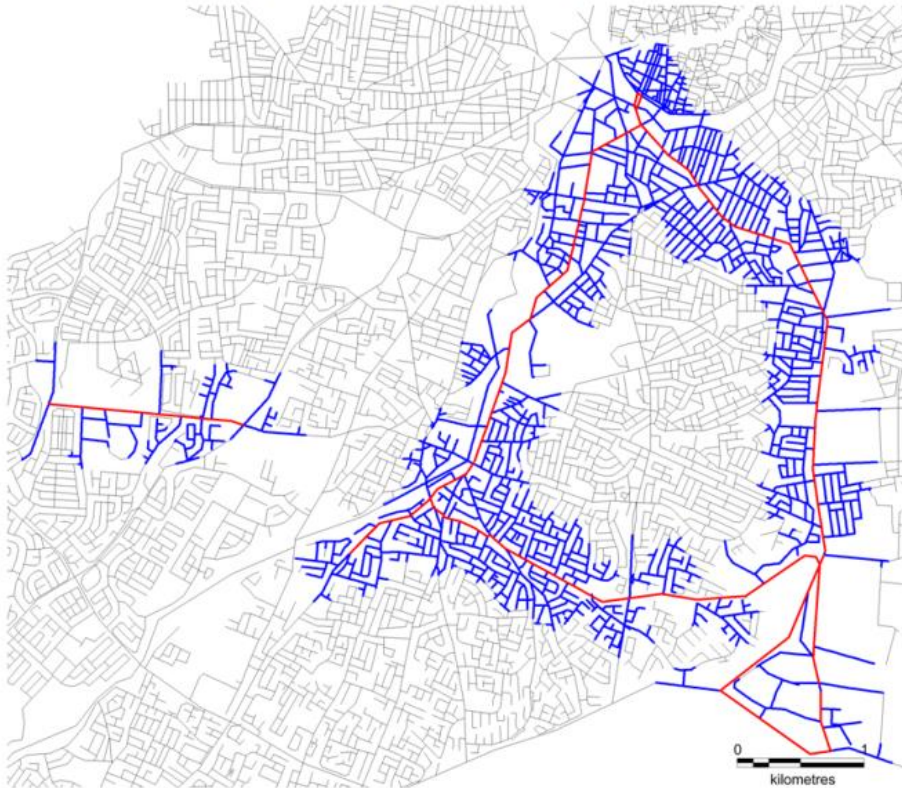


As a continuation of the previous investigation, complementary studies aimed at illustrating the urban connectivity that exists between the proposed locations of the Tram stops and the caption area and the adjacent communities they serve.



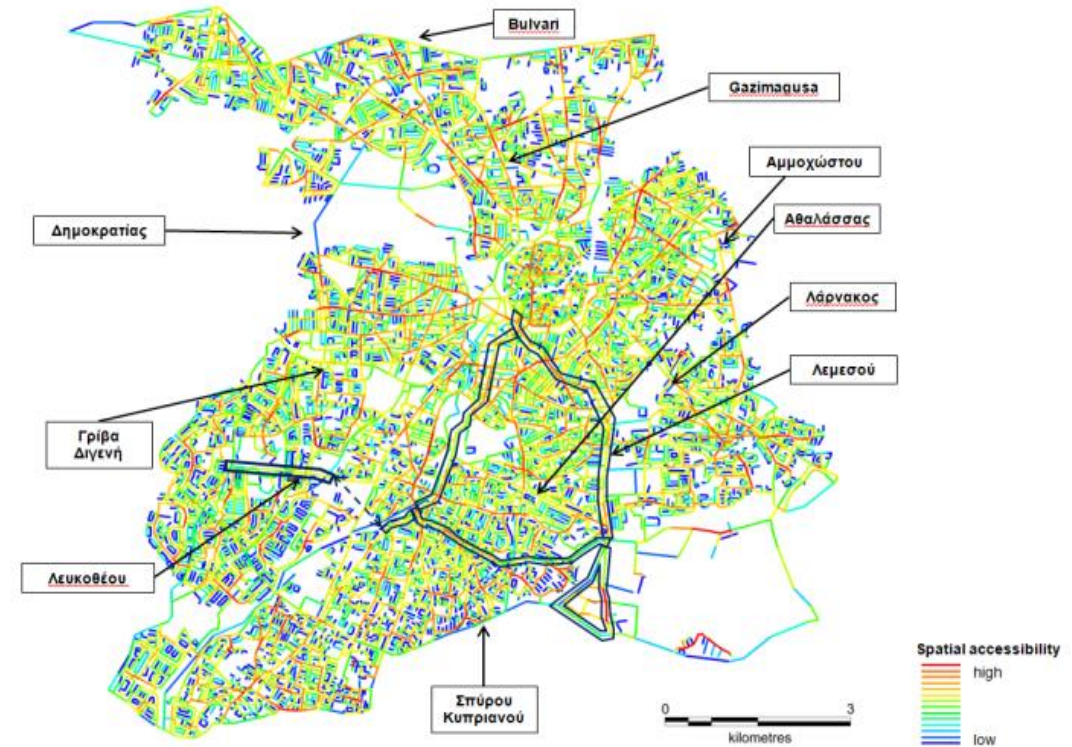


### Επιφάνεια περιοχής «συλλογής» μετακινούμενων



Route penetration and city's street geometry from tram right-of-way into existing neighborhoods.

### Προσβασιμότητα οδικού δικτύου Λευκωσίας- Τοπική κλίμακα

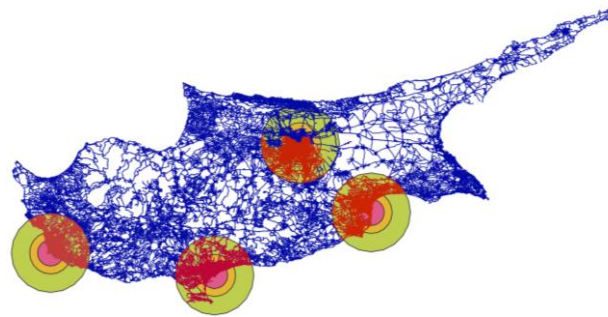


Calculation of density carrying capacity of parcels adjacent to tram right-of-way;





- The urban form of the 4 major Cypriot cities has been investigated, as this is reflected in the road network, providing quantitative information about their cardinal characteristics.
- Road network density and orientation is calculated and depicted in conjunction with the geographical information.
- Elements for the opportunities/challenges of future urban planning has been pointed out. 'Development for the Development' may recycle existing problems or produce new.
- Special focus is paid on the transit systems development and their incorporation into the urban structure but also on addressing current and future challenges.



# Thank you for your attention

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