

The role of transport in the strategic development in KSA – Building a world freight network model using SOFIA-T

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1. Objective

2. Reasoning

3. Approach

4. The role of transport in the strategic development in KSA

Objective

- Build a world freight network model by estimating freight transport flows.
- Better understand the energy in transportation in certain regions including Saudi Arabia, India, and China.
- Results:
 - The energy in fuel consumption
 - CO2 and other emissions
 - Understanding trade trends including
 - Average distance and speed, Tonnes, and Tkm
- Create analysis and tools for policymakers

What is SOFIA-T:

A Simple Open Framework for Informed Assessments in Transportation (SOFIA-T). It is KAPSARC's **open network modelling framework** for **analyzing transportation policy** and its **implications** on **energy consumption** in cities/regions/countries world-wide.

- Global data source
- Open data
- Easy to process

- How we do it:
 - Derive indicators of human and economic activity; urban form and infrastructures from satellite images and other Volunteered Geographic Information (VGI) sources;
 - Compliment with other open sources (Google, OSM, AIS, COMTRADE)
 - Use these indicators to estimate transport flows and land use patterns (in this particular case commercial sq. metering and freight related infrastructure);

Reasoning

- Fill data gaps
- Understanding transport networks and their attributes
- Use open source and freely available data
- Create something replicable on a city, region, and world-wide scale

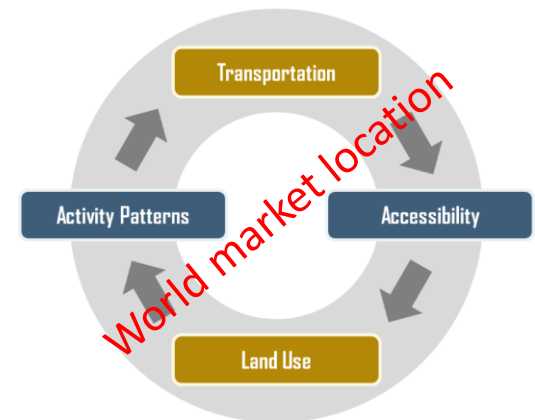
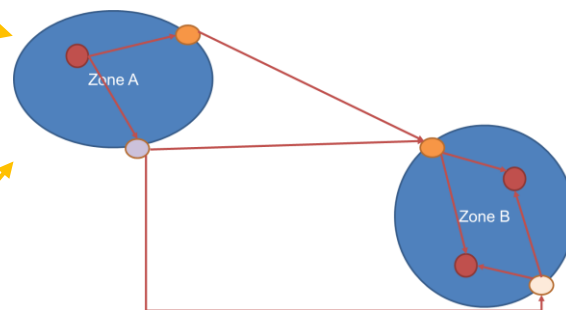
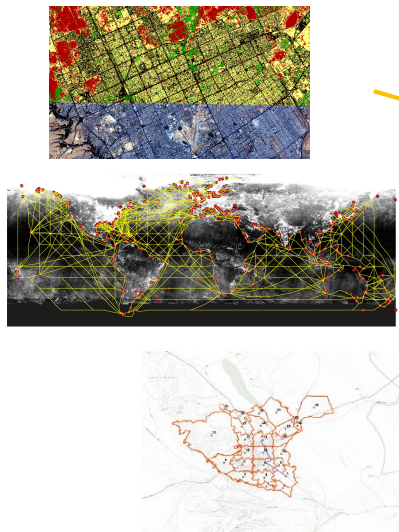
What have we achieved?

- We have completed a 'Version 1' of the **world freight network model**
- Calculated fuel consumption and CO2/CH4 emissions.
- Creating freely available maritime shipping data the include distances and routes between 1400 ports.
- Open-source and global data sources applicable to **any city/region/country** on the planet;

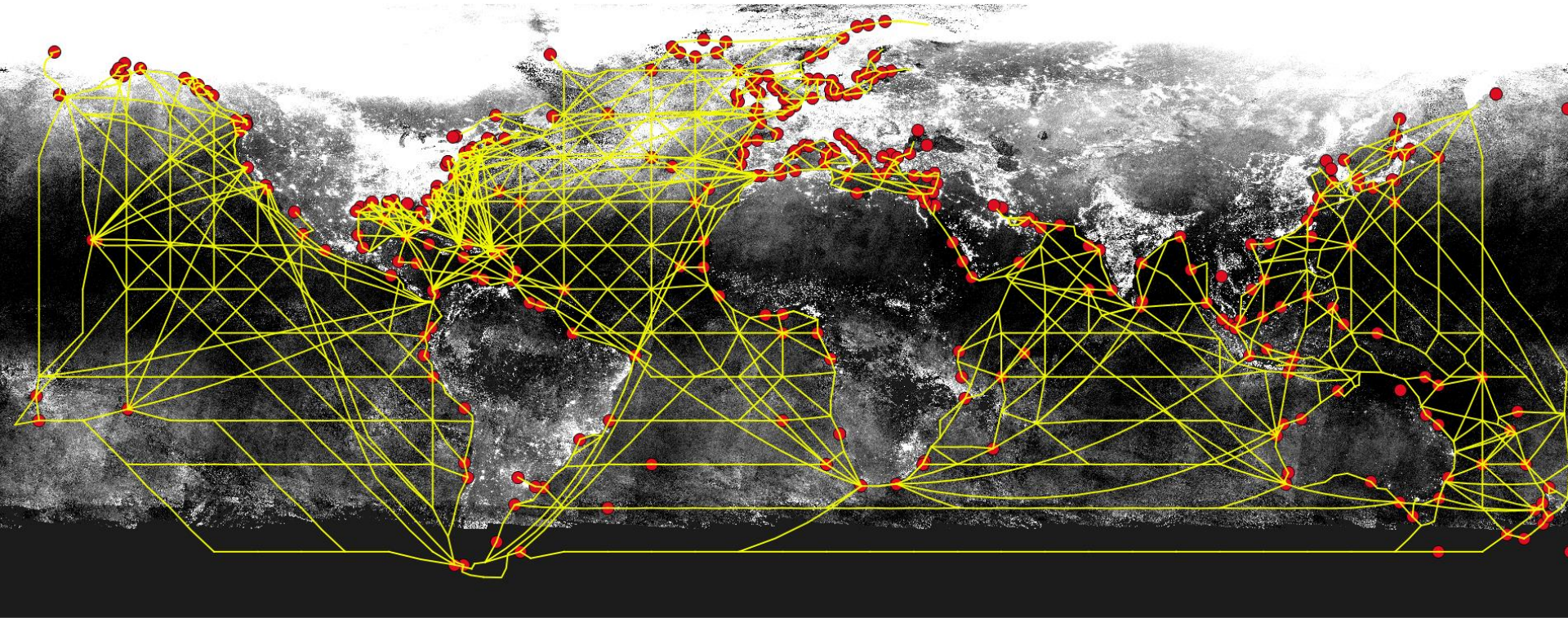
Open data from NASA;
ESA; OSM; Google API

Feeding an open source
world freight network
model framework

To analyze transport and
land use policy questions

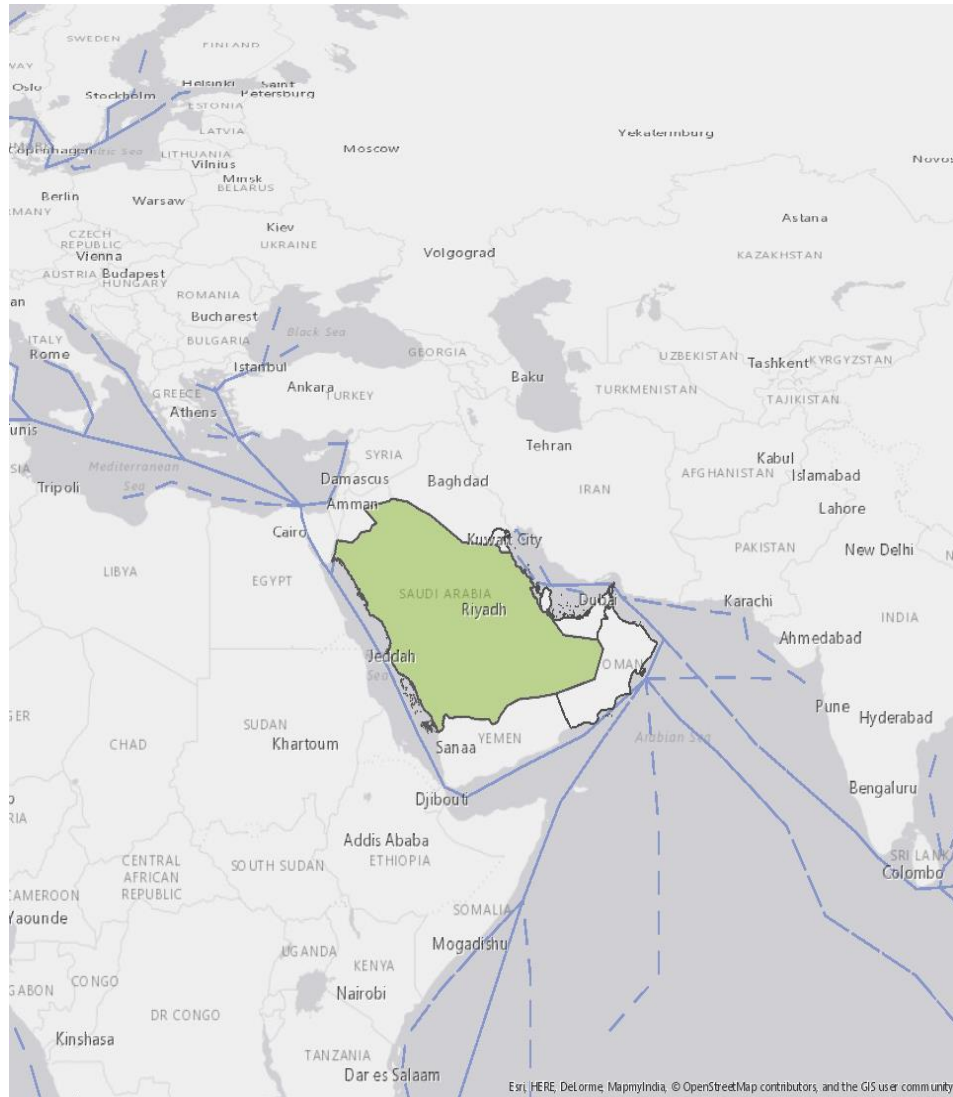


Example: Indian far ocean data

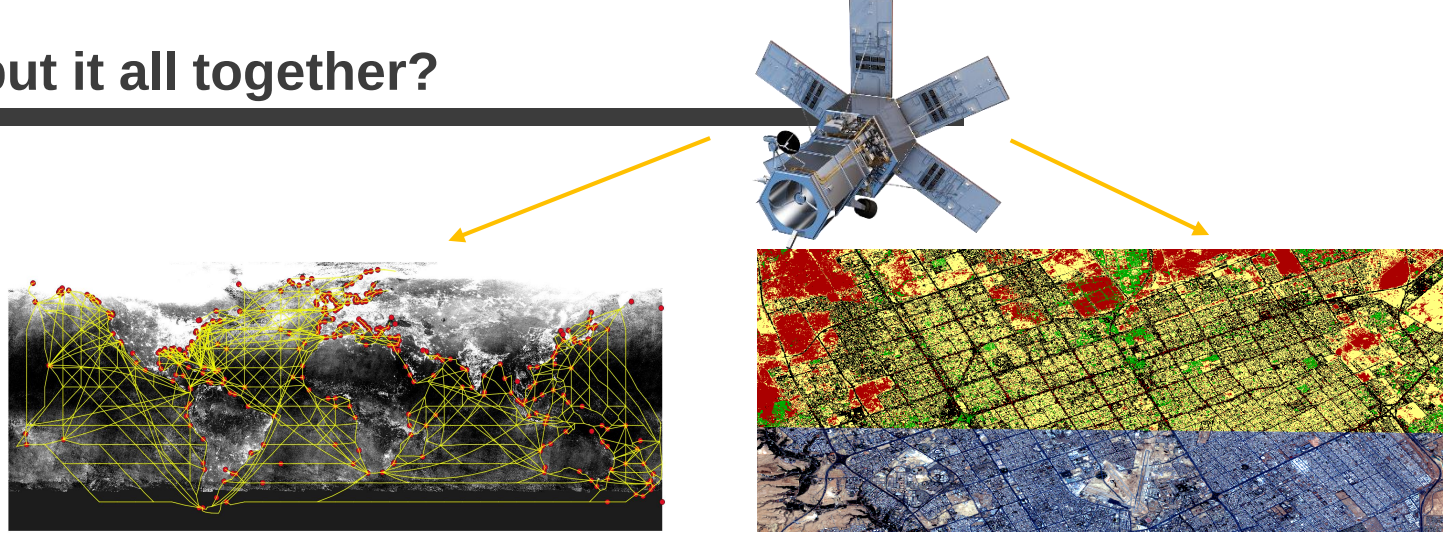


The role of transport in the strategic development in KSA

- Advantages for KSA
 - Geography
 - Oil
 - Building up refining capacity
- Our approach for this:
 - Utilize World maritime freight network model to connect KSA
 - Add hinterland information on KSA
- Key Questions:
 - How can KSA leverage its geographic location to influence its positioning in the global freight logistics?
 - What role does developing KSA as a logistical hub play in the diversification of KSA's economy?
 - Will the development of ports and refineries in KSA be a game changer with regards to transporting goods?



How do we put it all together?



	Freight transport	Land use
What we model	-Logistic/Activity nodes -Worldwide routes/links -Modal shares	-Firm locations -Commercial sq. meters -Transport infrastructure
What we evaluate	-Modal shift potential -System optimization -Energy consumption	-Urban form scenarios & urban freight energy consumption -Last mile delivery -Alt. Energy potential
What policy questions do we answer?	<u>Urban logistics vs. energy consumption</u> <u>Integrated land use - Transportation policy paths</u> <u>Role of transport in the strategic development in KSA</u>	



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Thank You!

Appendix

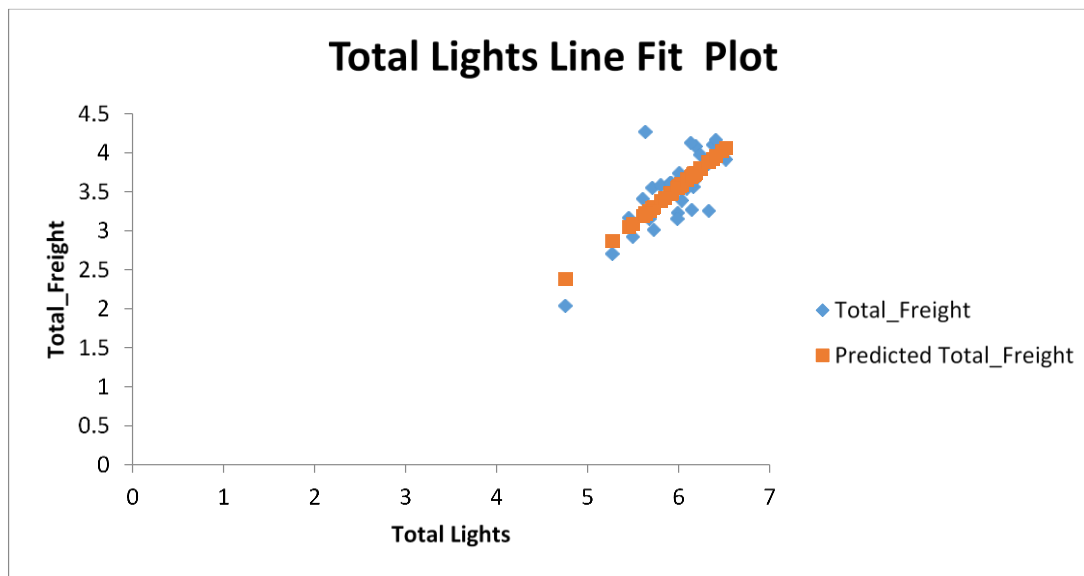
Methodology of Night lights/Satellites

- Nightlights measurements done using QGIS to carry out raster mosaicking and clipping of NASA night photograph by administrative boundaries for DMSP.
- Approach for calculating the night lights comes from Shi K et al (2014), Shi K et al (2015), and Tian, J (2014) where a relationship between the sum of radiance inside a defined polygon and total freight is stated.
- It is done in the functional form of Total Freight Traffic (TFT) as a function of the Total Night Light (TNL) observed:

$$\ln(TF) = w * \ln(TNL) + c$$

- A log transformation is applied to bound each variable. Total Freight (TF) and TNL are the sum inside the geographic unit of the level of radiance bounded to 255 in the case of NPP-VIIRS already transformed

Results China Province Level (31 Obs)



With Shanghai

Regression Statistics	
Multiple R	0.756862
R Square	0.572839
Adjusted R Square	0.55811
Standard Error	0.320369

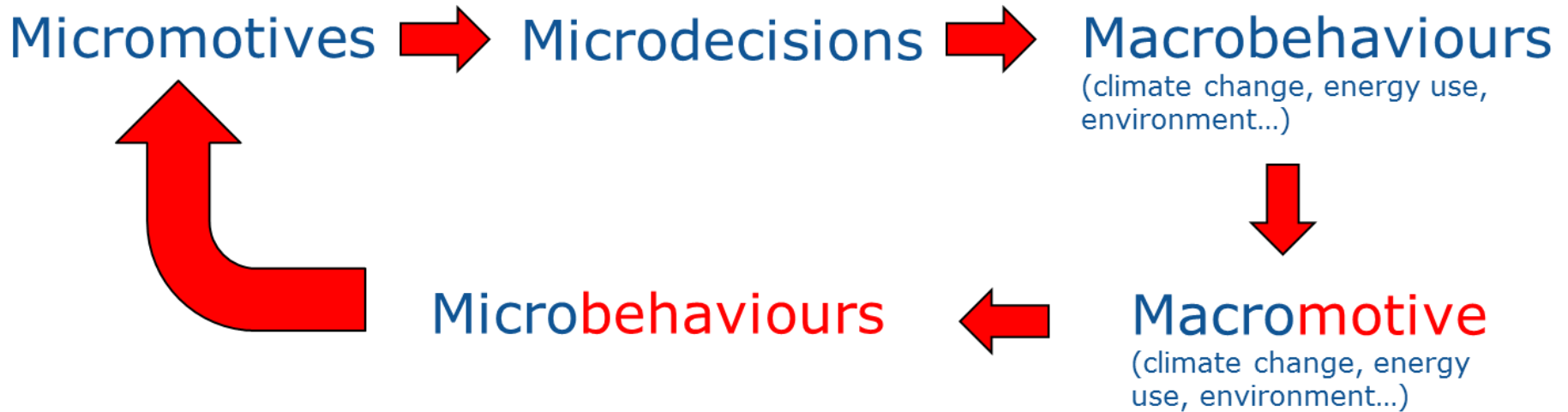
	Coefficients	Standard Error	t Stat	P-value
Intercept	-2.14233	0.910459	-2.35302	0.025616
Total Lights	0.952868	0.152796	6.236198	8.35E-07

Without Shanghai

Regression Statistics	
Multiple R	0.845994
R Square	0.715706
Adjusted R Square	0.705553
Standard Error	0.254769

	Coefficients	Standard Error	t Stat	P-value
Intercept	-2.65042	0.733944	-3.6112	0.001179
Total Lights	1.032302	0.122954	8.395818	3.93E-09

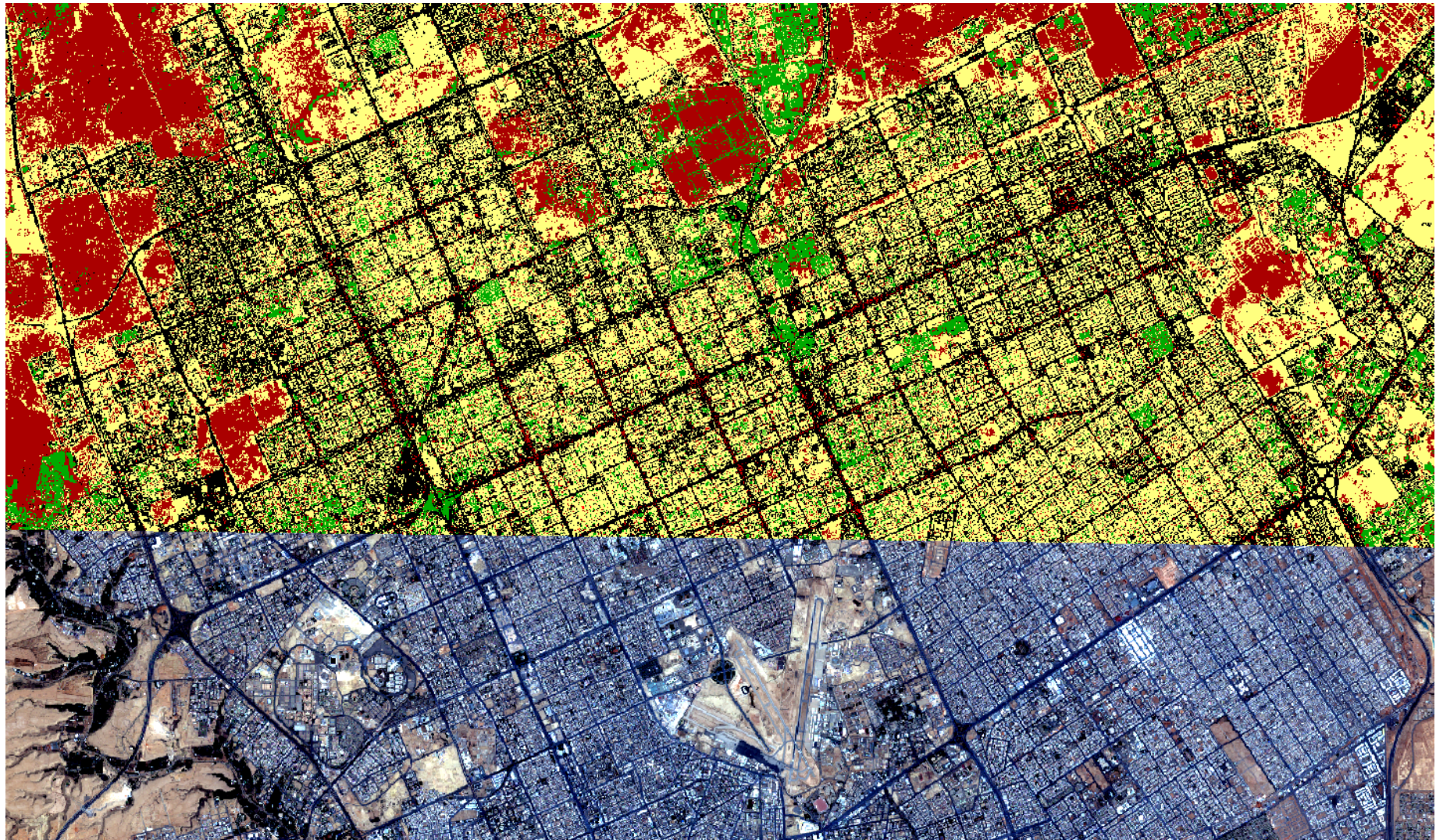
In which context?

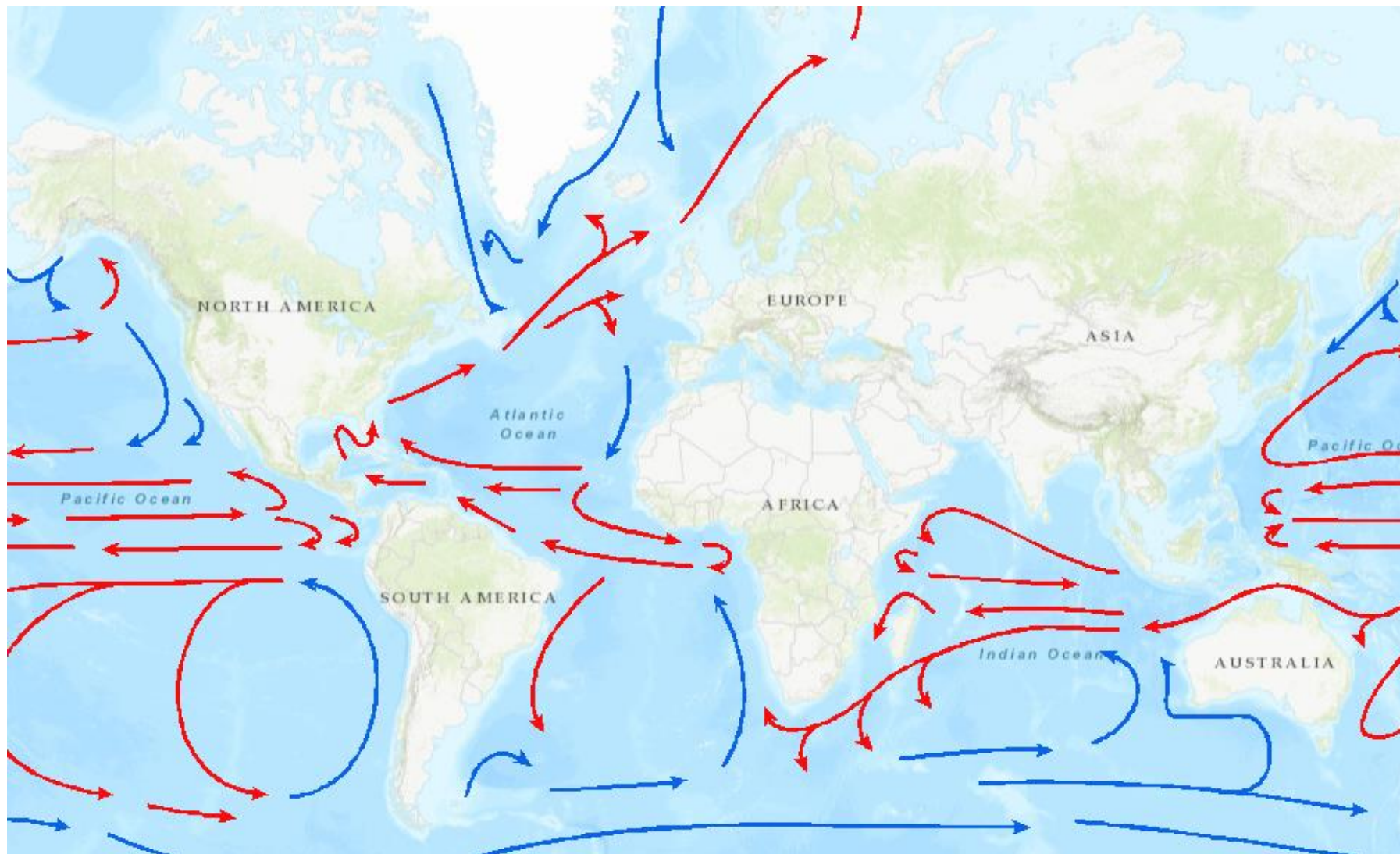


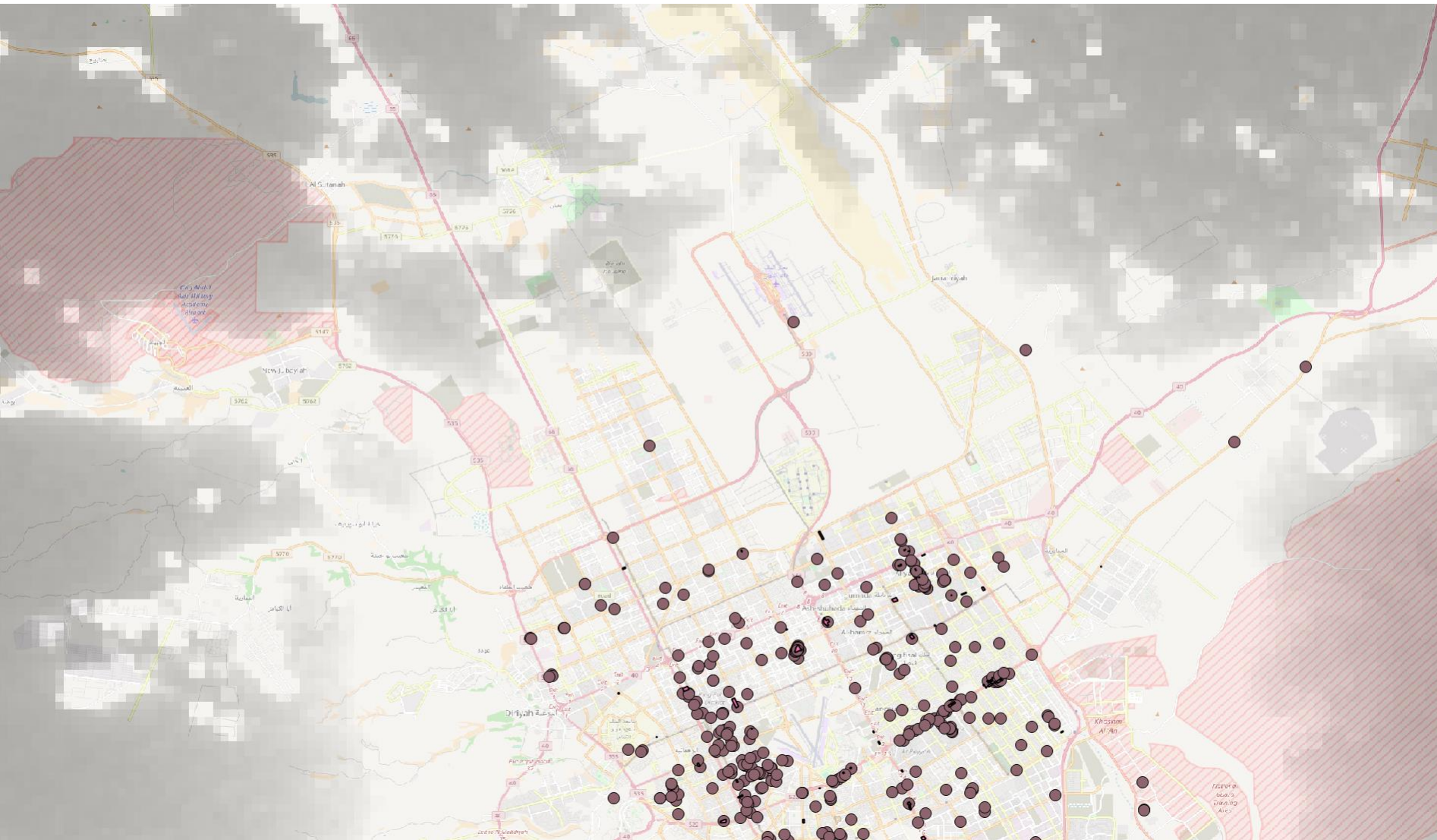
SHELLING (1985); CROZET & LOPEZ-RUIZ (2013)

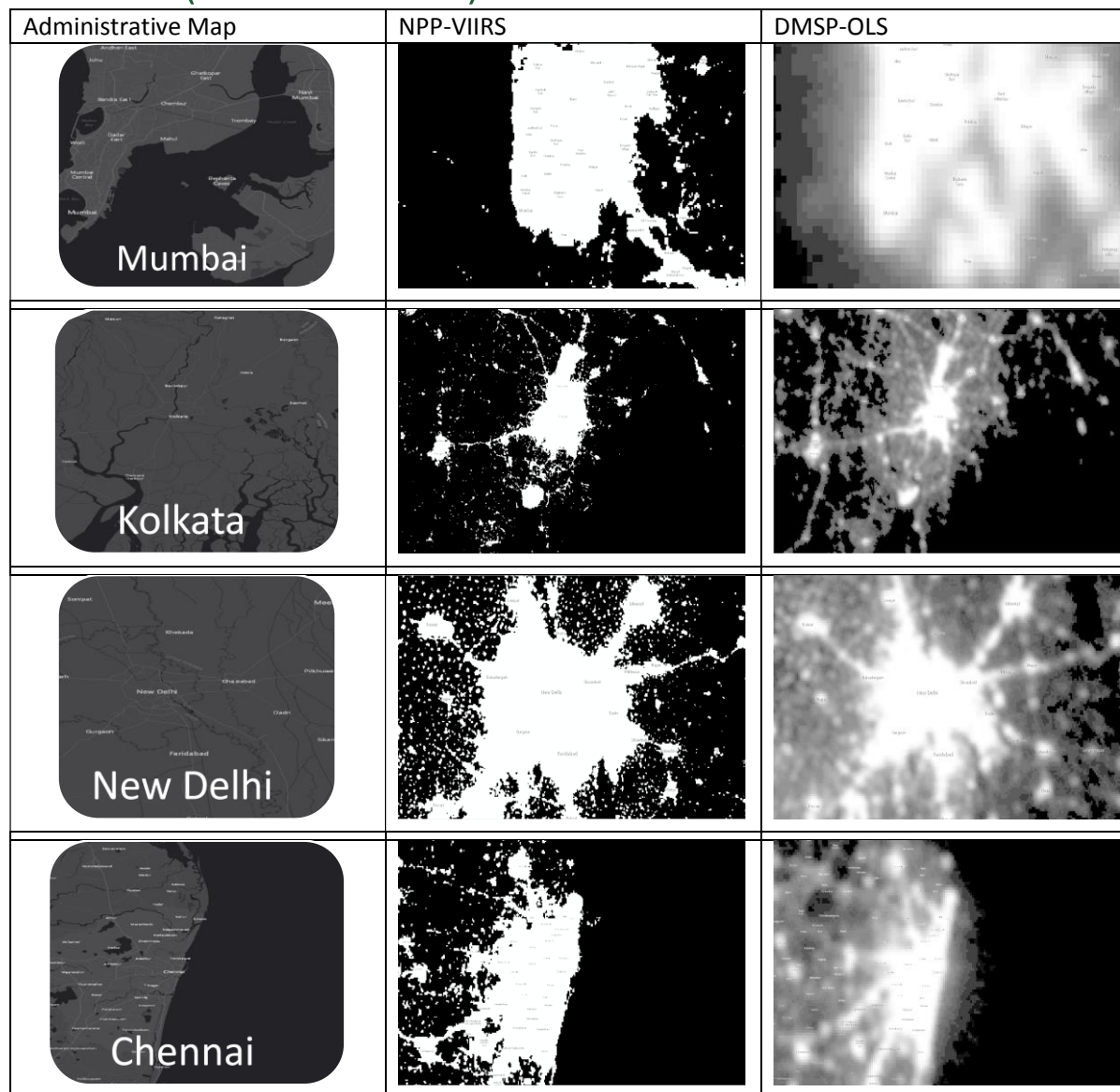
Phronetic approach to policy analysis in transportation.

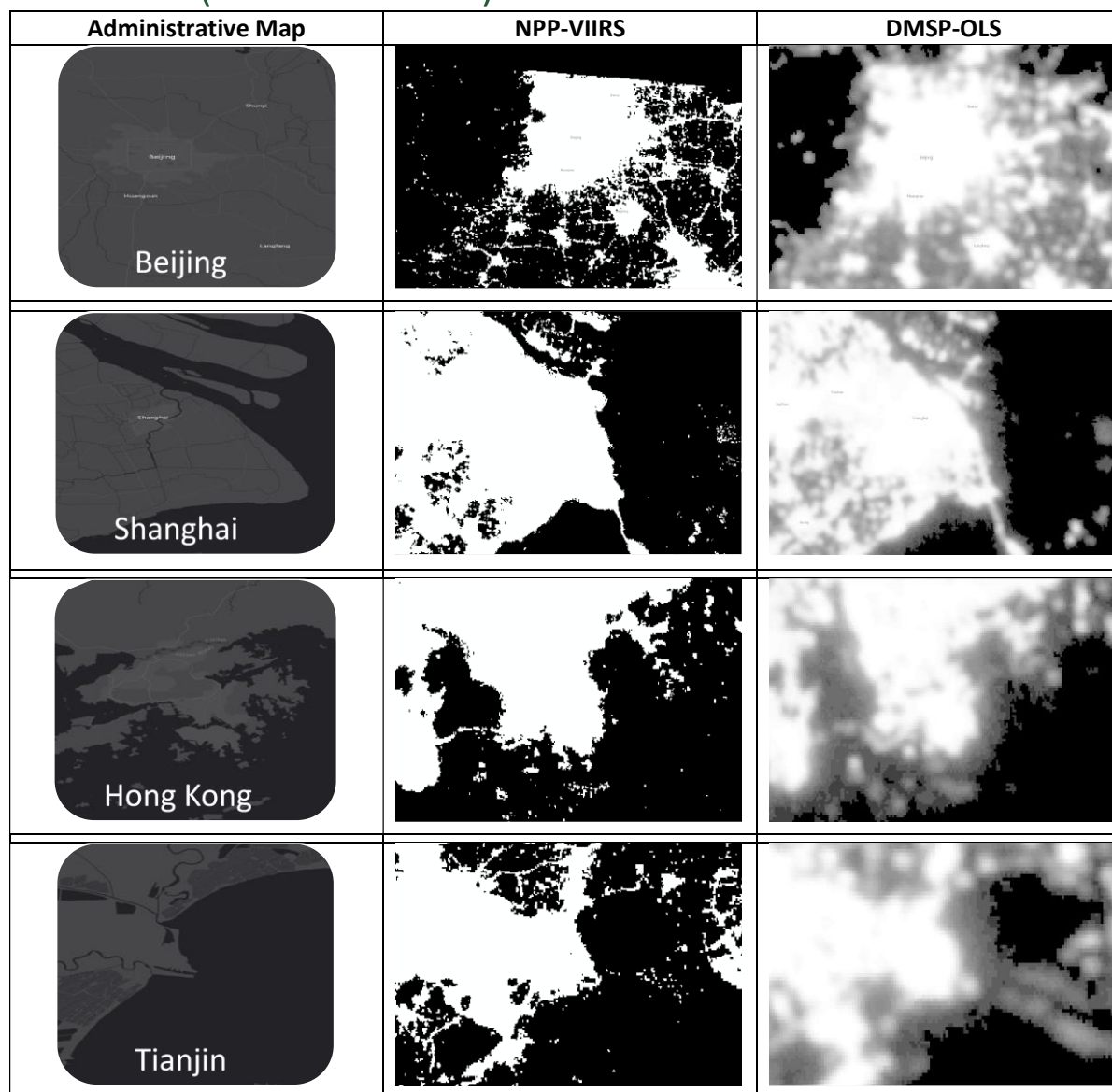
Accessibility to opportunities is very similar to the idea of HABITUS developed by P. BOURDIEU 1980 (based on ARISTOTLE): **a structured structure predisposed to function as a structuring structure!**











- Time Series – Deblurring

- Passenger and Freight Transportation ->LUTI

Deep understanding of the interaction between residential and commercial land-use with transportation activities

- Strategic plan for increased urban energy efficiency for major cities in Saudi Arabia.

Sustainable Urban Mobility Plans (SUMPS) dataset (quantified effects of urban policy measures in transportation)

+

Analysis on the possible efficiency gains in buildings.