基于多源地理空间数据的体力活动机会评估研究

武漢大學
WUHAN UNIVERSITY

第九届青年地学论坛

遥感与地理信息·社会地理计算

戴劭勍

2024年5月19日

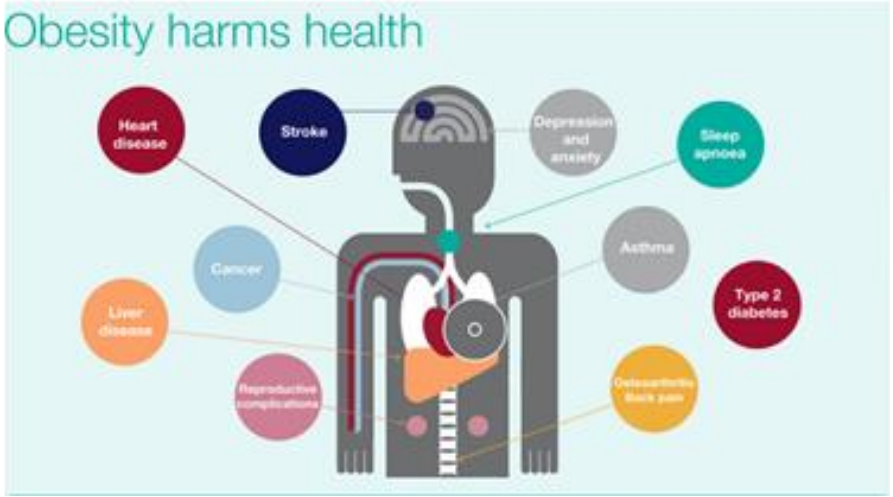
ISLE

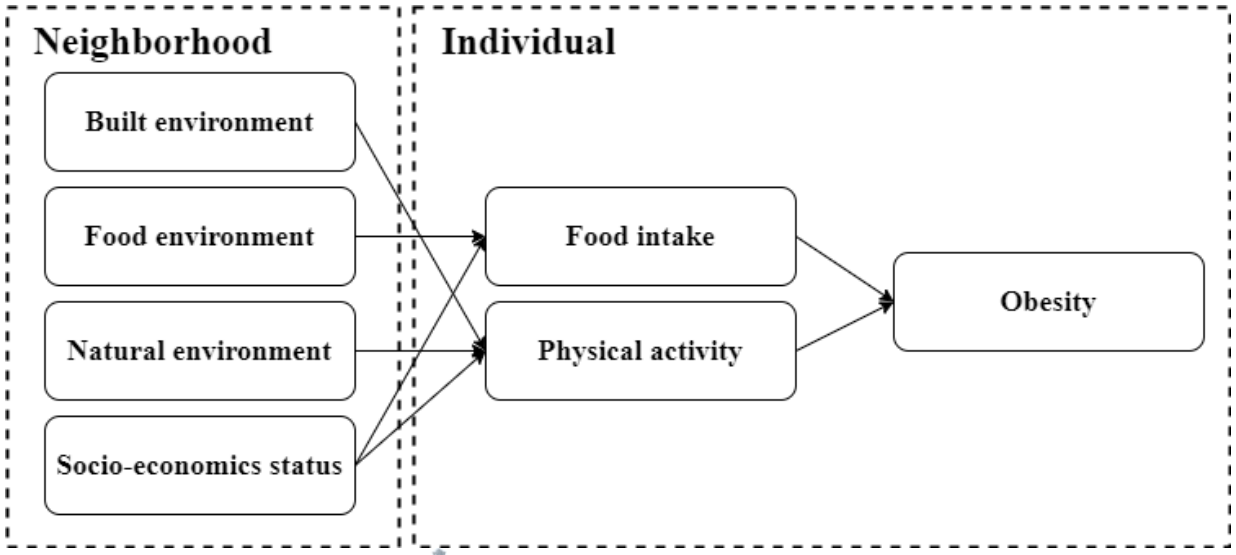
UNIVERSITY OF TWENTE. | ITC

目录

CONTENT

- 当前以**肥胖**为代表的**慢性病**已经成为全球影响人群健康的最大公共卫生挑战
- **环境**通过**体力活动**影响**个人肥胖**





Dai, S., Qiu, G., Li, Y., Yang, S., Yang, S., & Jia, P. (2024) State of the Art of Lifecourse Cohort Establishment. *China CDC Weekly*, 6(14), 300. (**IF=4.7**)

Part 1 致胖环境与肥胖的关联研究

- **致胖环境**指会促进人群肥胖的环境因素
- **体力活动机会**指促进人群去进行体力活动的复合环境因素（如可骑行性）

2016年，共享单车在中国及全球范围呈现爆发式增长；

2017年，单车投放量达到 2300 万辆，运营城市 200 多个城市；

2019年末，单车的投放量回落至 1950 万辆 ，但是运营城市长至 360 个城市；

2020年疫情期间，城市公共交通一度暂停，共享单车的“大流行” 。

Dai, S., Qiu, G., Li, Y., Yang, S., Yang, S., & Jia, P. (2024) State of the Art of Lifecourse Cohort Establishment. *China CDC Weekly*, 6(14), 300. (**IF=4.7**)

Part 1 致胖环境与肥胖的关联研究

环境	因子	与体重相关行为	与体重相关的结局变量
建成环境	街道连通性	+	*
	居住密度	+	*
	道路限速	–	x
	土地利用混合	+	x
	城市蔓延	x	x
	绿色空间	+	x
	公共交通	+	x
	自行车道	*	x
	人行道	+	–
	美观程度	x	x
食品环境	便利店	–	x
	果蔬市场	x	x
	杂货店	x	x
	全服务饭店	x	x
	快餐店	x	x
	超市	x	x
复合环境	自然环境	x	x
	可步行性	x	x
	交通环境	x	+

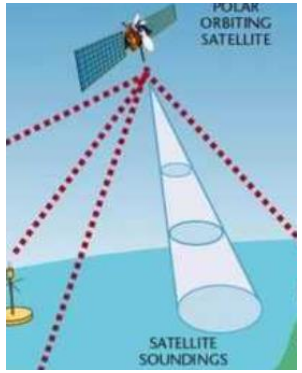
[+] 正向关联, [-] 负向关联, [*] 混杂关联, [x] 不明确的关联. 与体重相关行为为体力活动，结局变量为BMI

Obesogenic Environment and Childhood Obesity. (2021) *Obesity Reviews*. (**IF=8.9**)

Jia, P., Shi, Y., Jiang, Q., **Dai, S.**, Yu, B., Yang, S., ... & Yang, S. (2023) Environmental determinants of childhood

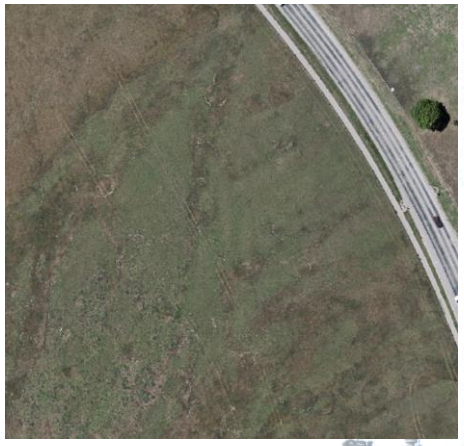
- **地理大数据**：对地观测→**人本观测**

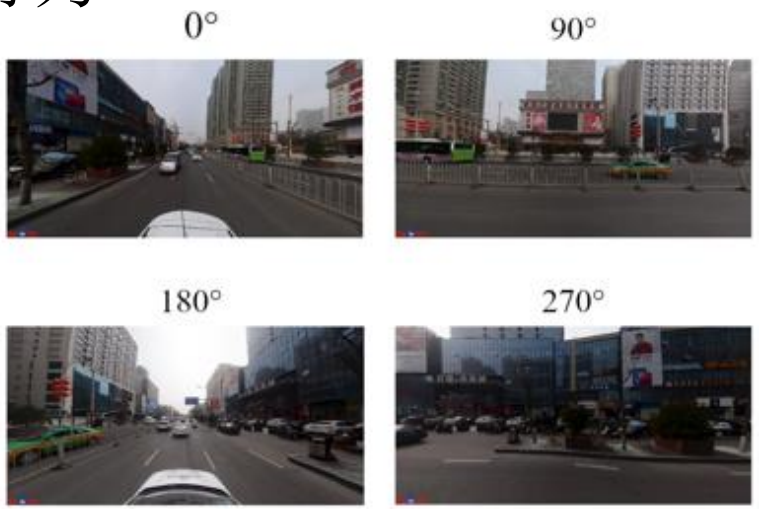
The performance of GIS-based and self-reported environment measures in explaining weight status outcomes was more complex. The most obvious finding was that almost all self-reported environment variables were significantly related to weight status, compared with very few significant associations for GIS-measured environment variables. The only common finding was that multicomponent index variables were significant for the relation of both GIS-based and self-reported environment variables with overweight/obesity, reinforcing the importance of multivariable conceptualization and measurement of environments. The limited findings with GIS-based variables were partly explained by the sex-specific associations with weight status reported in the original paper (22).



GIS客观测度与人感知的差异

可达性≠真实行为





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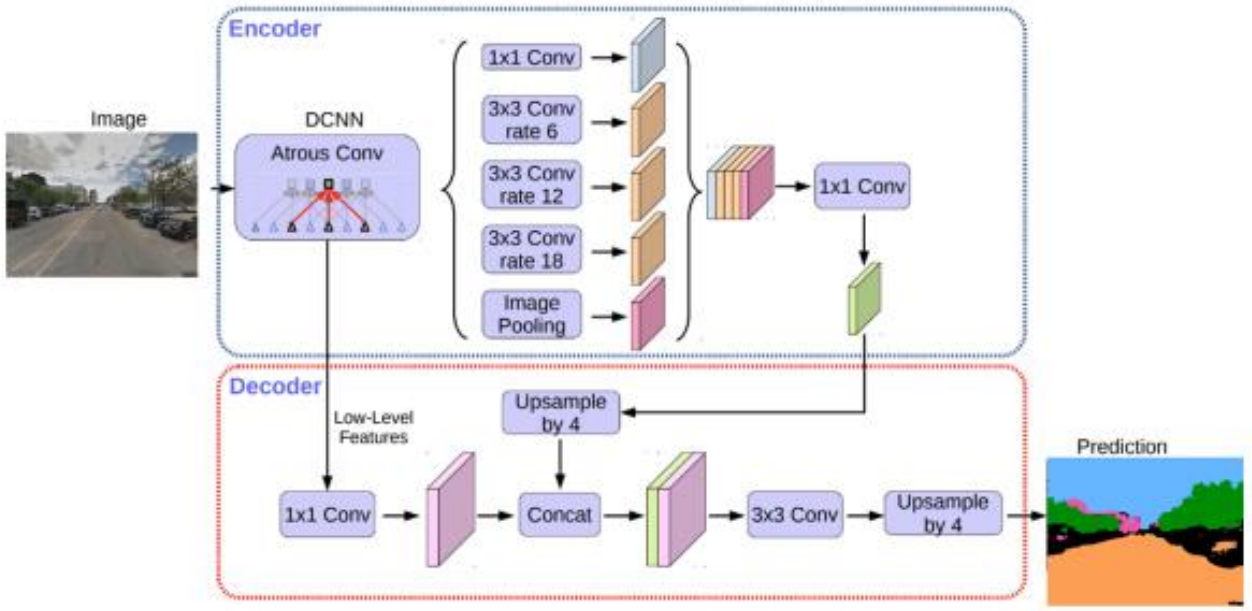
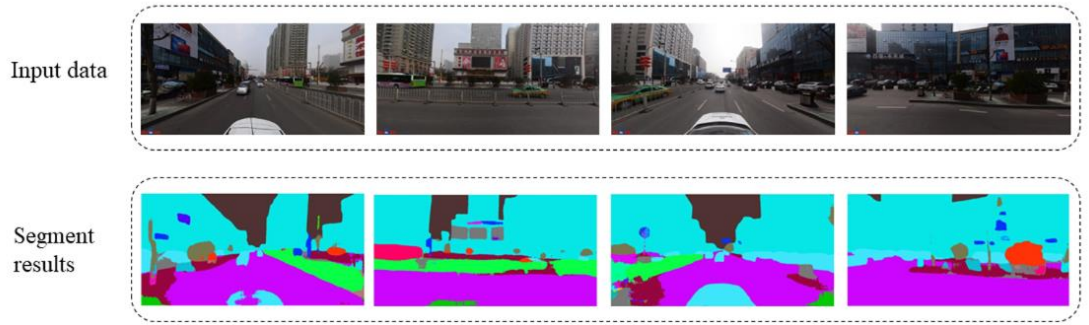
Sallis, J. F., Cerin, E., Kerr, J., Adams, M. A., Sugiyama, T., Christiansen, L. B., ... & Owen, N. (2020) Built environment, physical activity, and obesity: findings from the international physical activity and environment network (IPEN) adult study. *Annual review of public health*, 41, 119-139. (**IF=20.8**)

- **城市视觉智能与社会地理计算**





Statistical results

Wall	0.004	Wall	0.000	Wall	0.000	Wall	0.000
Building	0.352	Building	0.432	Building	0.400	Building	0.484
Sky	0.136	Sky	0.056	Sky	0.103	Sky	0.011
Floor	0.001	Floor	0.001	Floor	0.001	Floor	0
Tree	0.030	Tree	0.006	Tree	0.015	Tree	0.014
Road	0.253	Road	0.285	Road	0.226	Road	0.315
Sidewalk	0.062	Sidewalk	0.036	Sidewalk	0.048	Sidewalk	0.047
Window	0	Window	0	Window	0	Window	0
Grass	0	Grass	0	Grass	0.008	Grass	0

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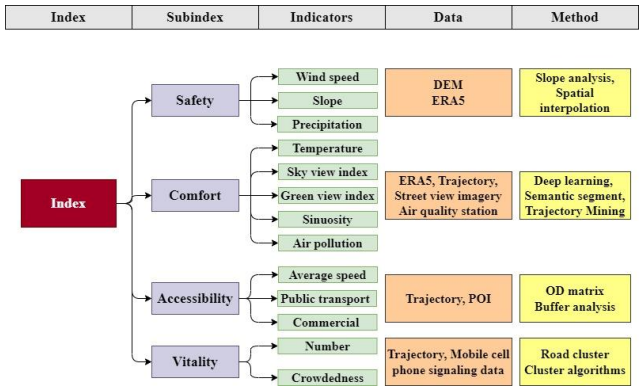
Part 3 多指标的全面评估框架

设计指标，获取原始数据

研究案例总体设计

统一数据基础

体力活动机会评估体系建立



指标综合

分级指标清洗与处理

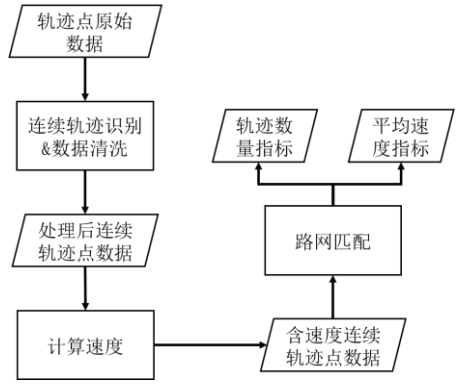
数据清洗

算法研究

技术实现

格式转换

路网匹配



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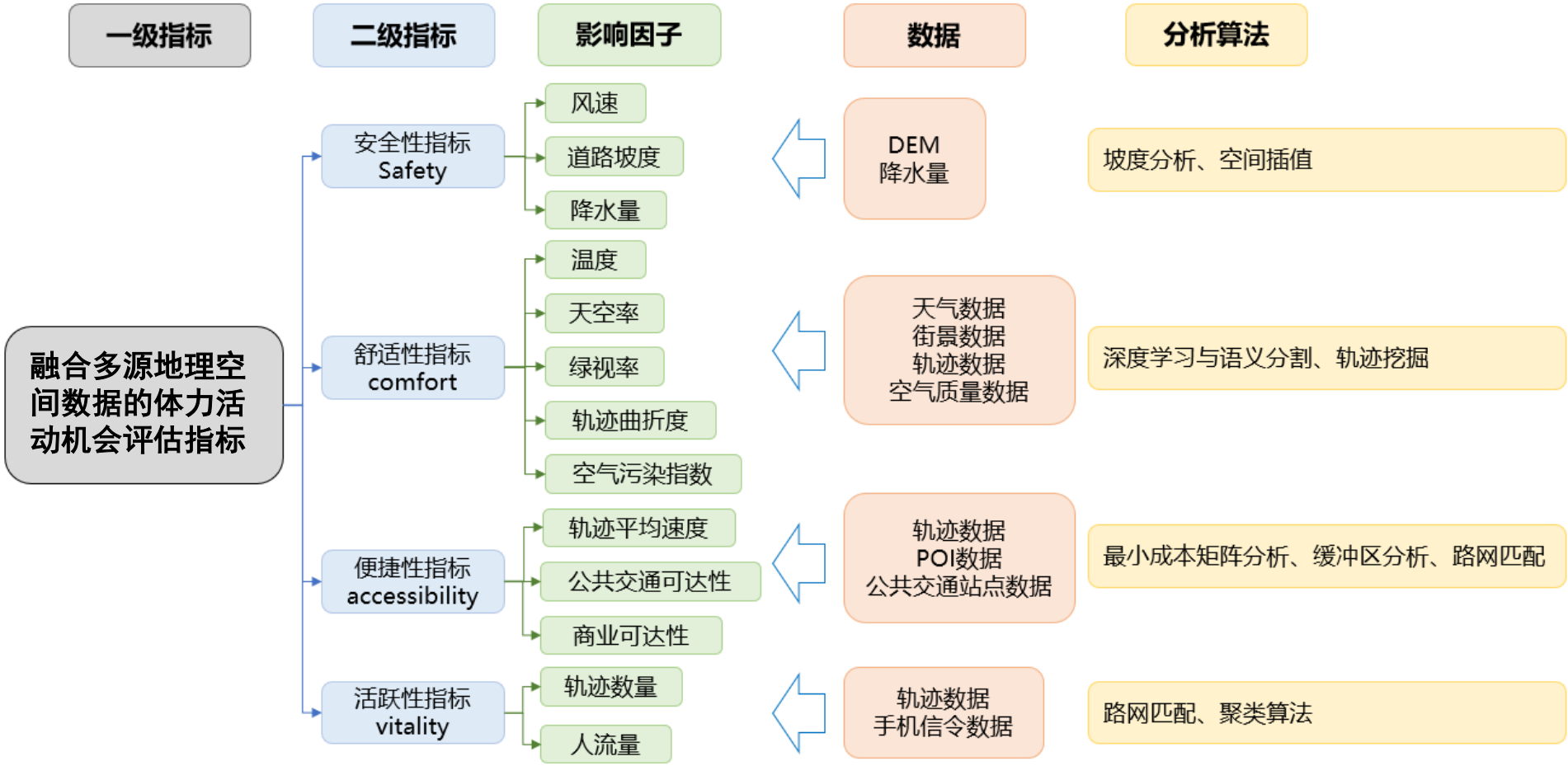

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Part 2 多指标的全面评估框架

- 关键亮点
  - 传统可骑行性评估的指标（设施密度，可达性）
  - 以人为本的**环境感知**指标（街景图像获取的相关指标）
  - 过去忽视的**自然环境**指标（降雨与空气污染）
  - 实际骑行行为的**轨迹**指标（共享单车轨迹数据与手机信令数据）

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Part 2 多指标的全面评估框架

数据

共享单车轨迹

街景数据（百度地图）

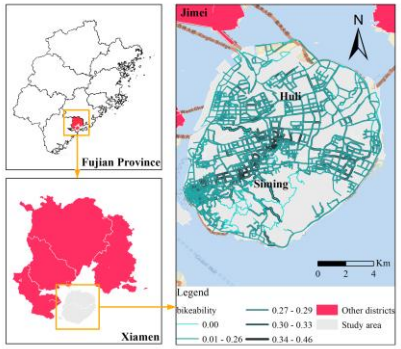
手机信令数据（联通）

POI（百度地图）

空气质量数据（网络开源大数据）

气象再分析数据（欧洲哥白尼气候数据平台）

数字高程模型（地理空间数据云）



方法

数据清洗工作流（属性与空间）

机器学习与深度学习

轨迹挖掘算法

时空冷热点分析

主成分分析法

平台

Python 3.8

R 4.03

ArcGIS Pro 2.7.2

百度地图API

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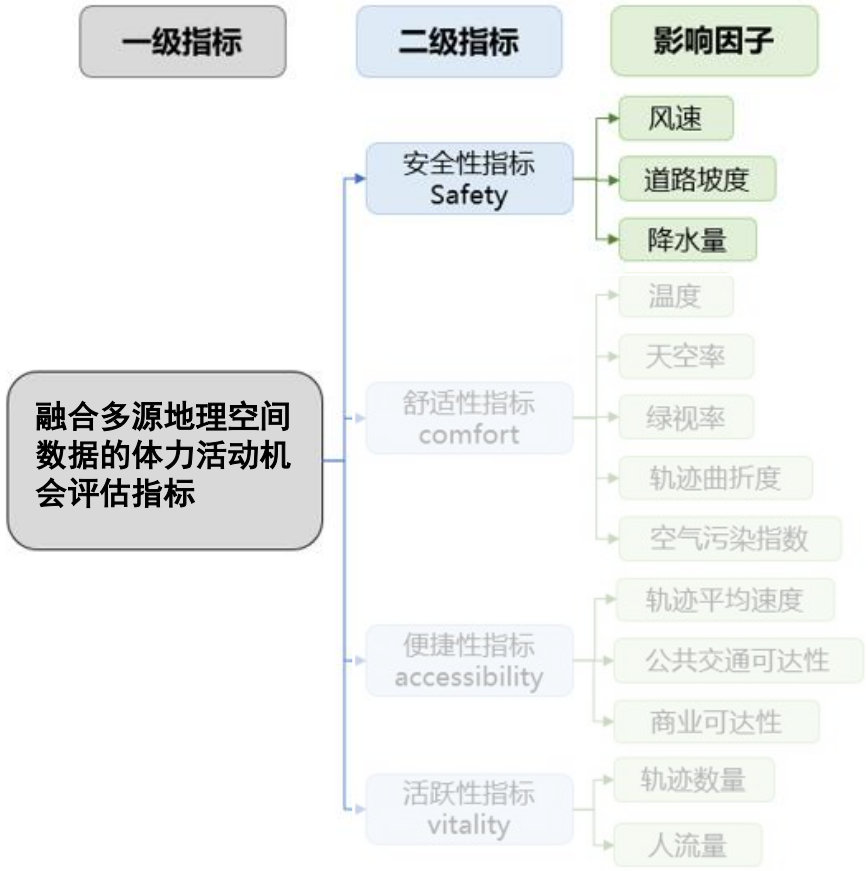
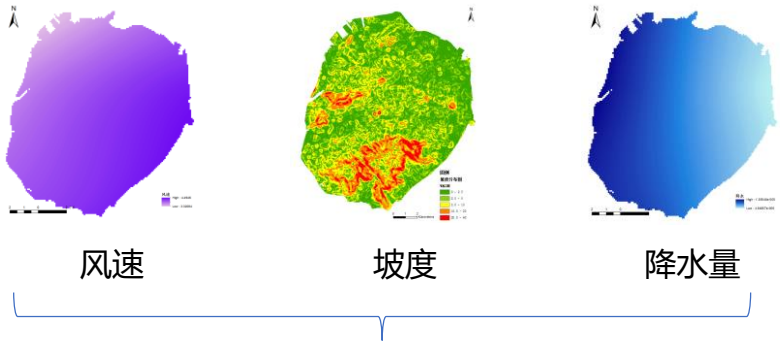
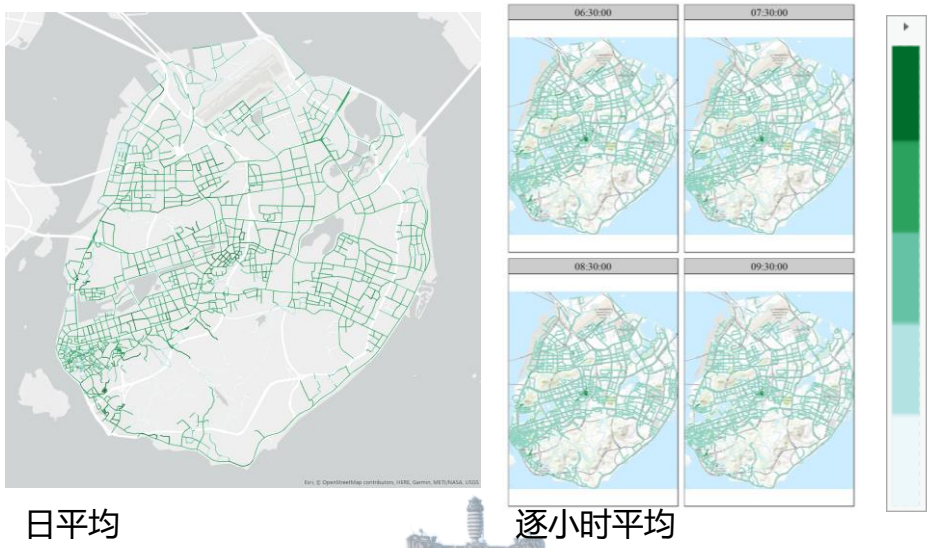
Part 3 地理大数据赋能体力活动机会评估







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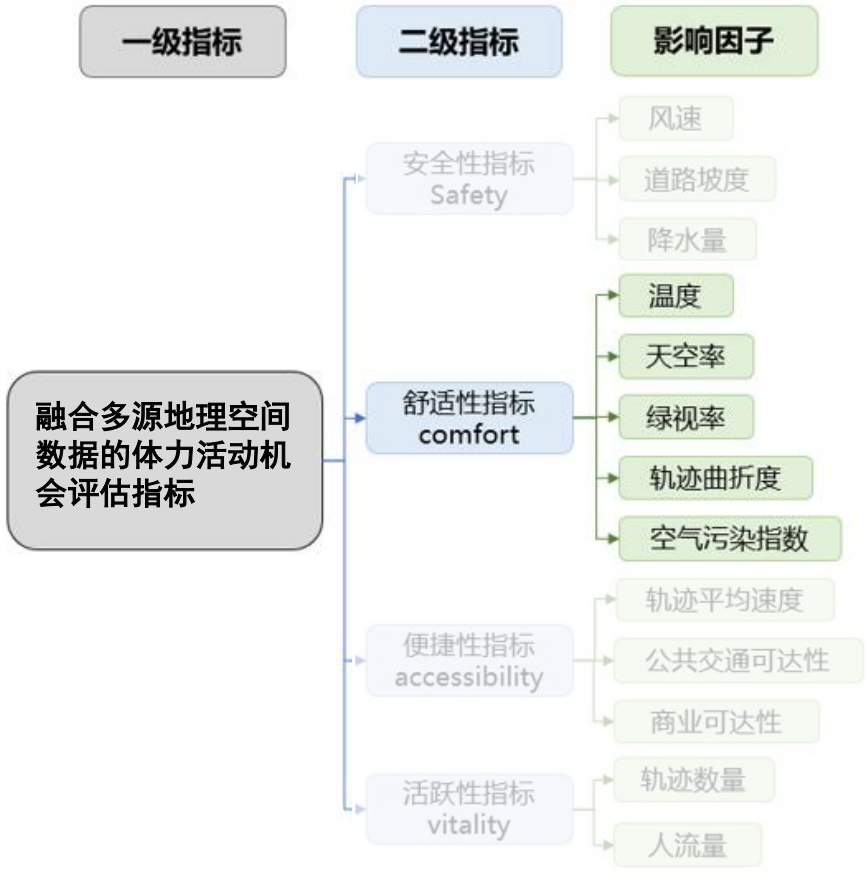

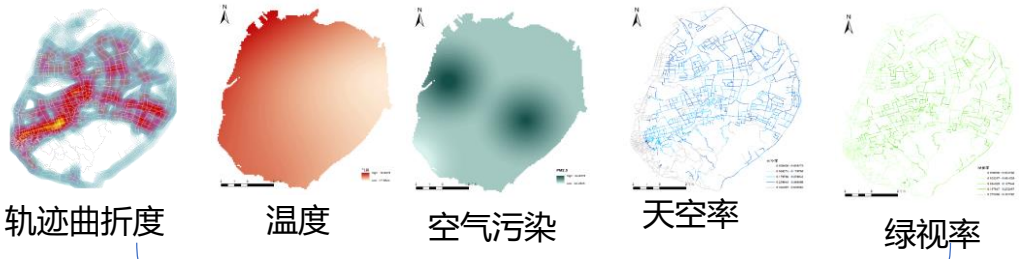

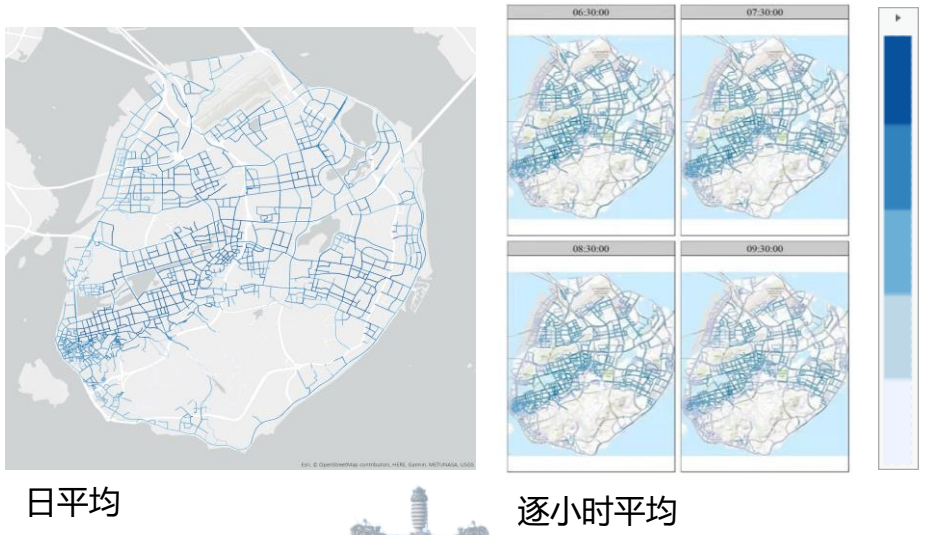

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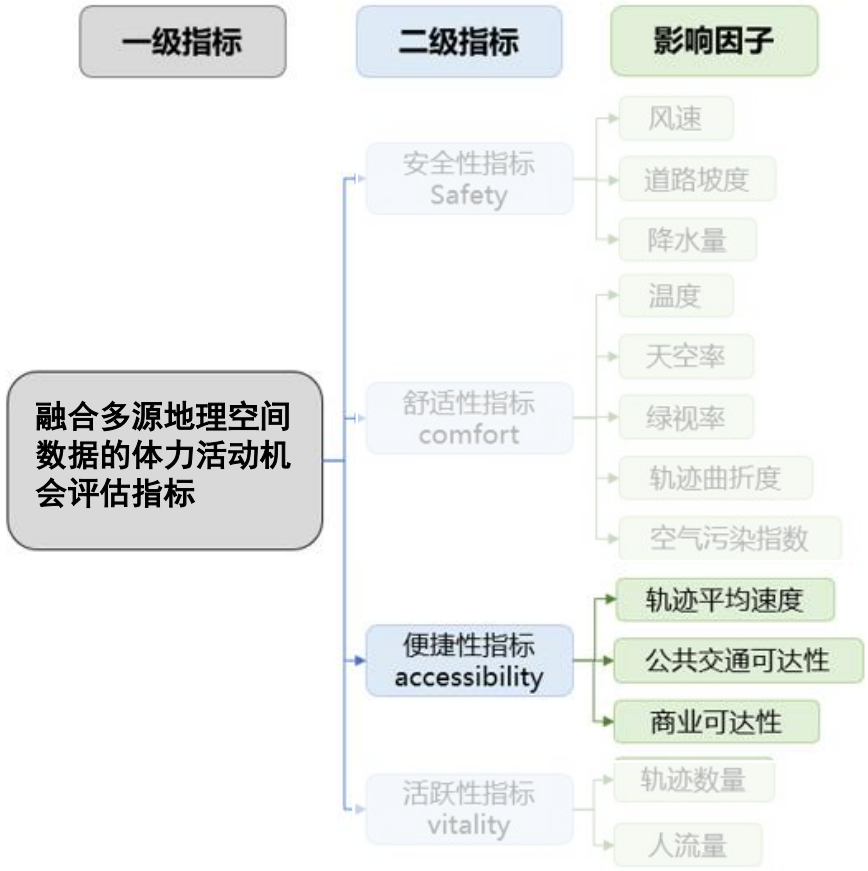
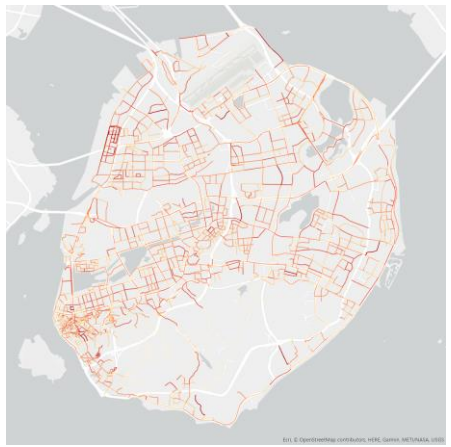


轨迹平均速度

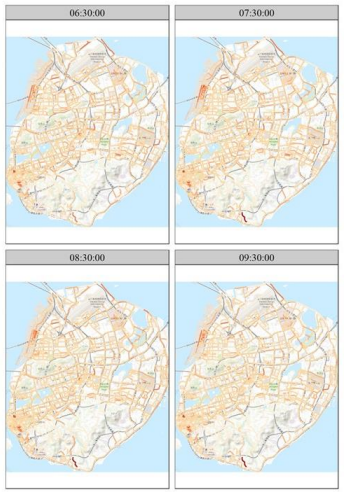
公共交通可达性

商业可达性

便捷性指标



日平均



逐小时平均

Dai, S., Zhao, W., Wang, Y., Huang, X., Chen, Z., Lei, J., ... & Jia, P. (2023) Assessing spatiotemporal bikeability using multi-source geospatial big data: A case study of Xiamen, China. *International Journal of Applied Earth Observation and Geoinformation*, 125, 103539. (**IF=7.5**)

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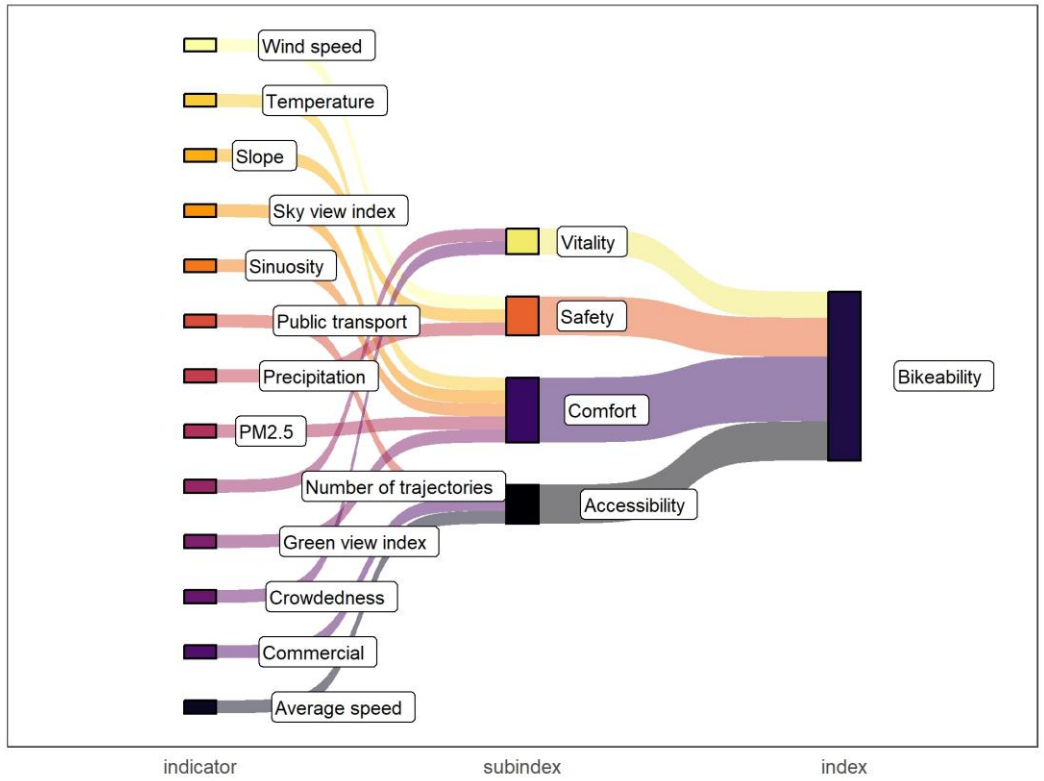

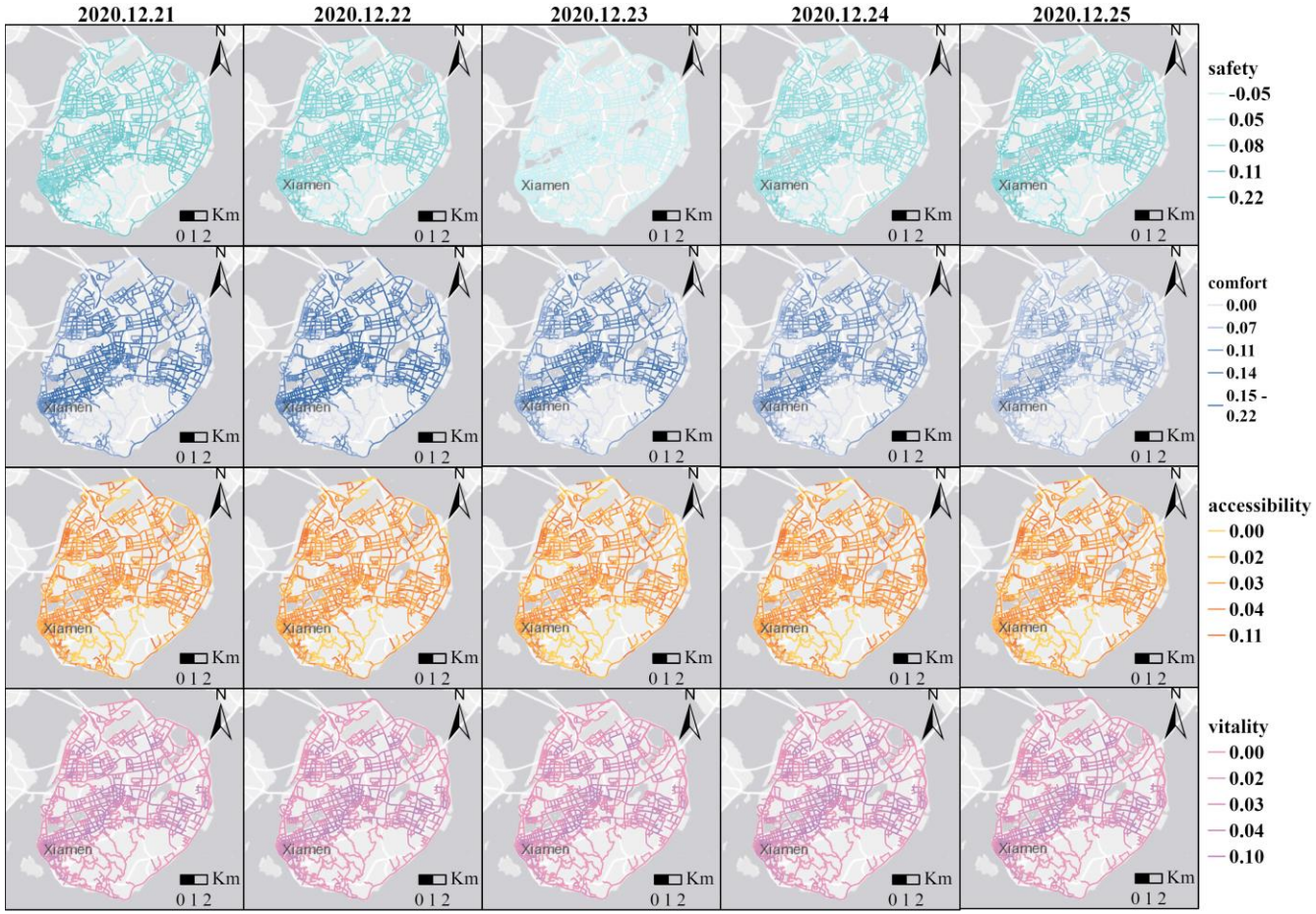

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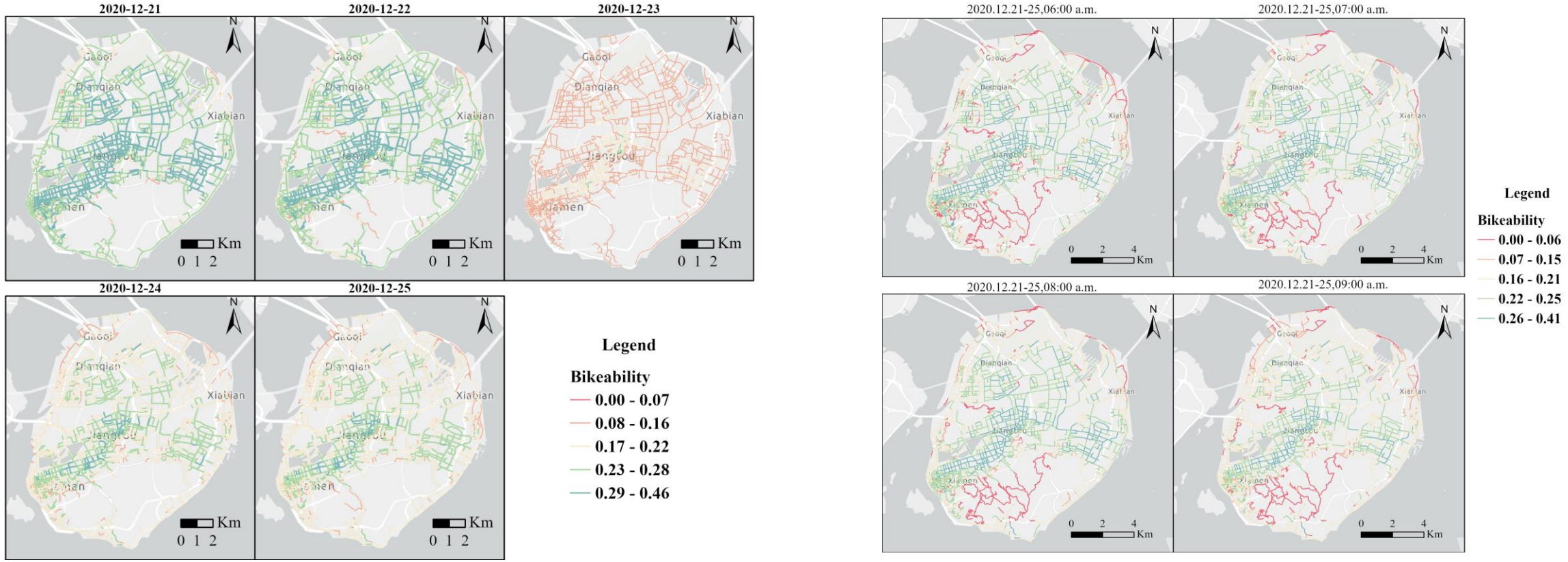

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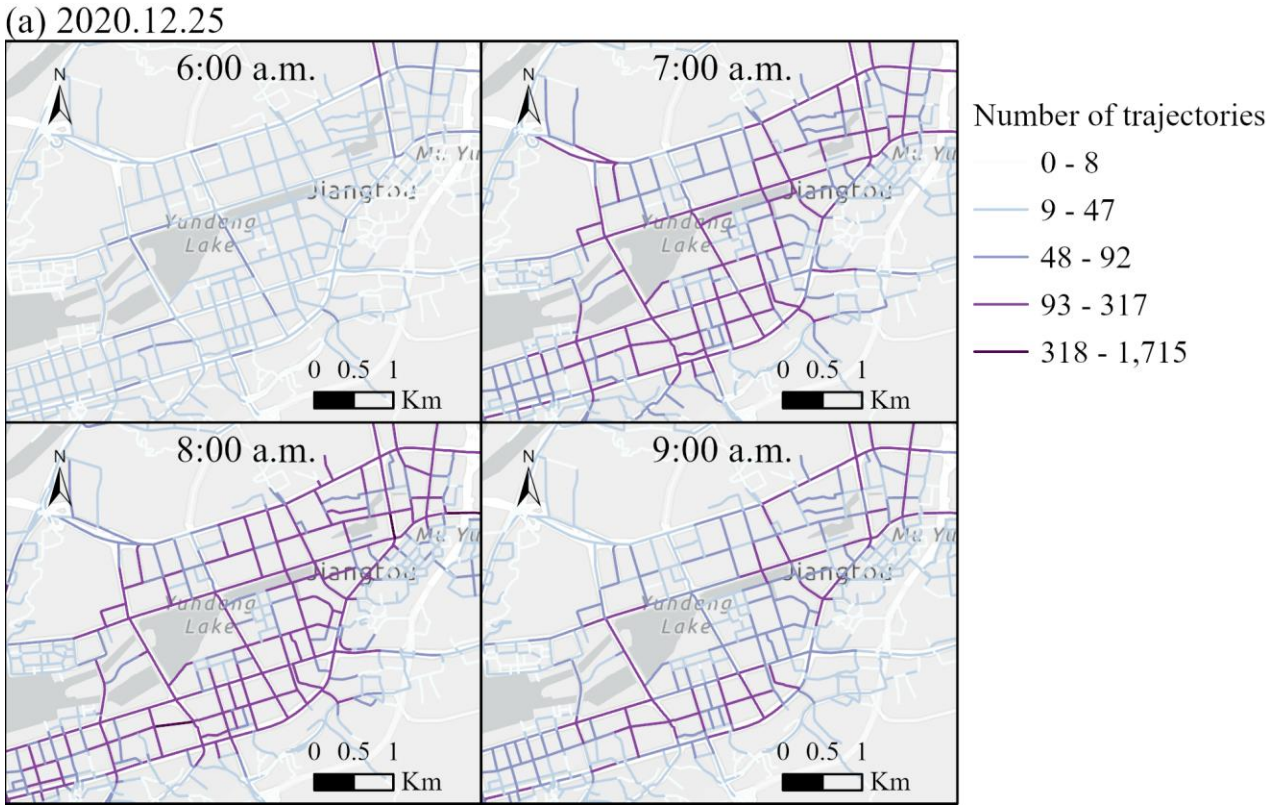

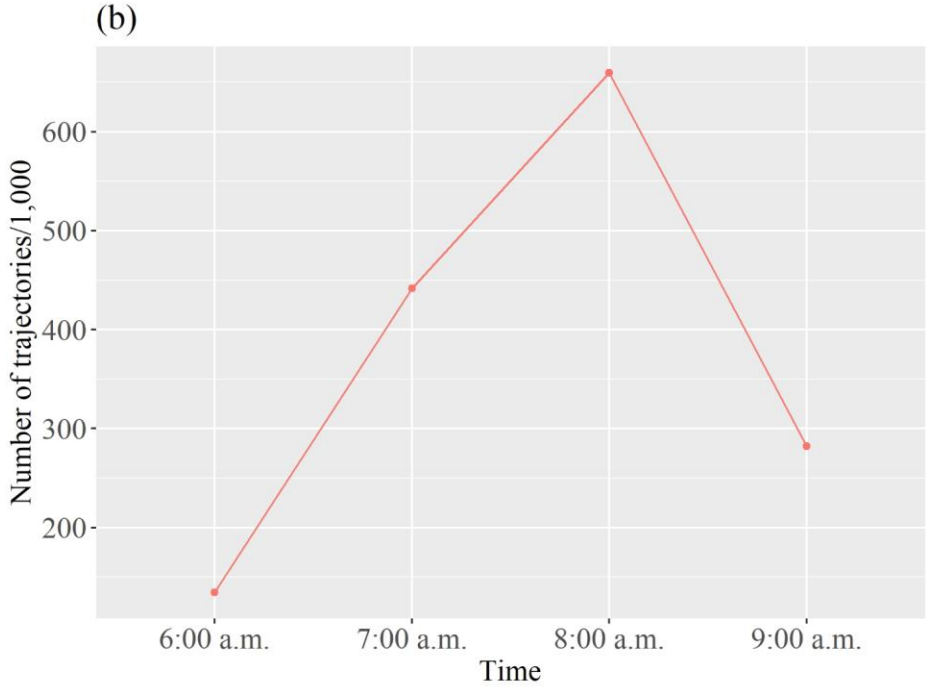

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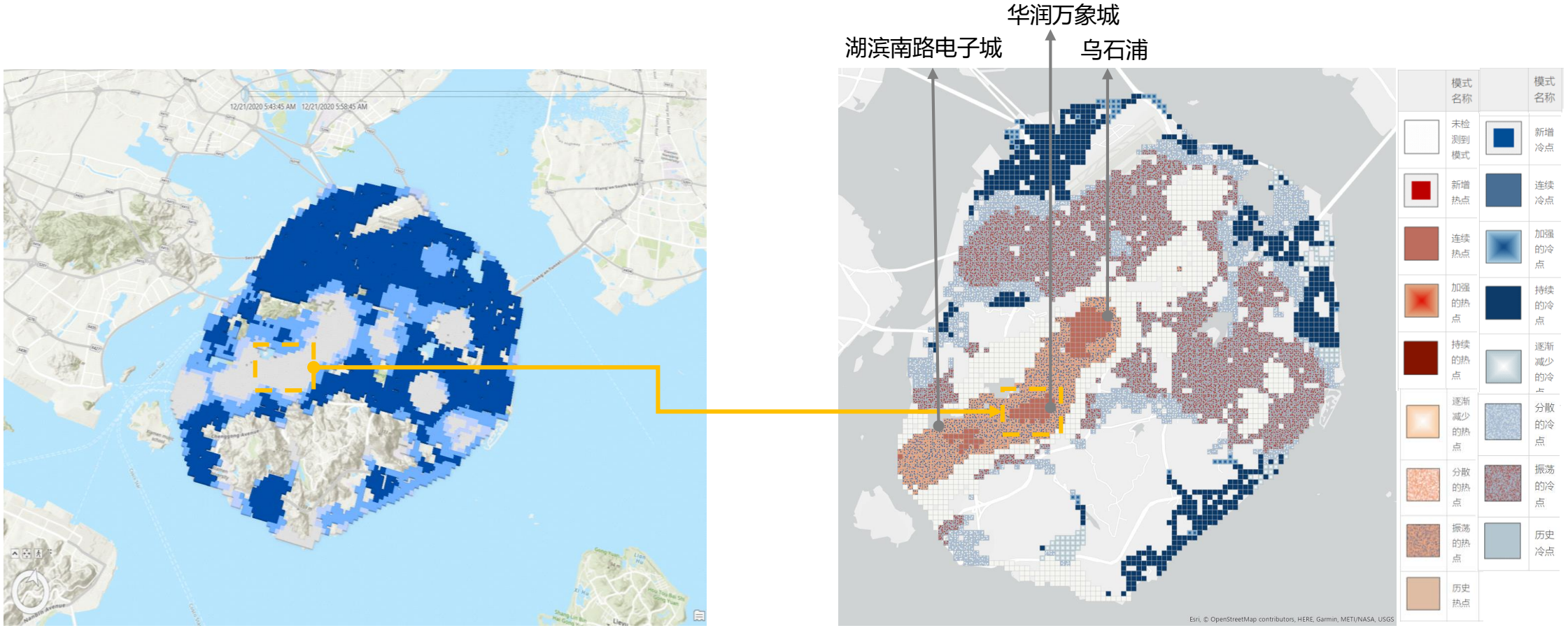

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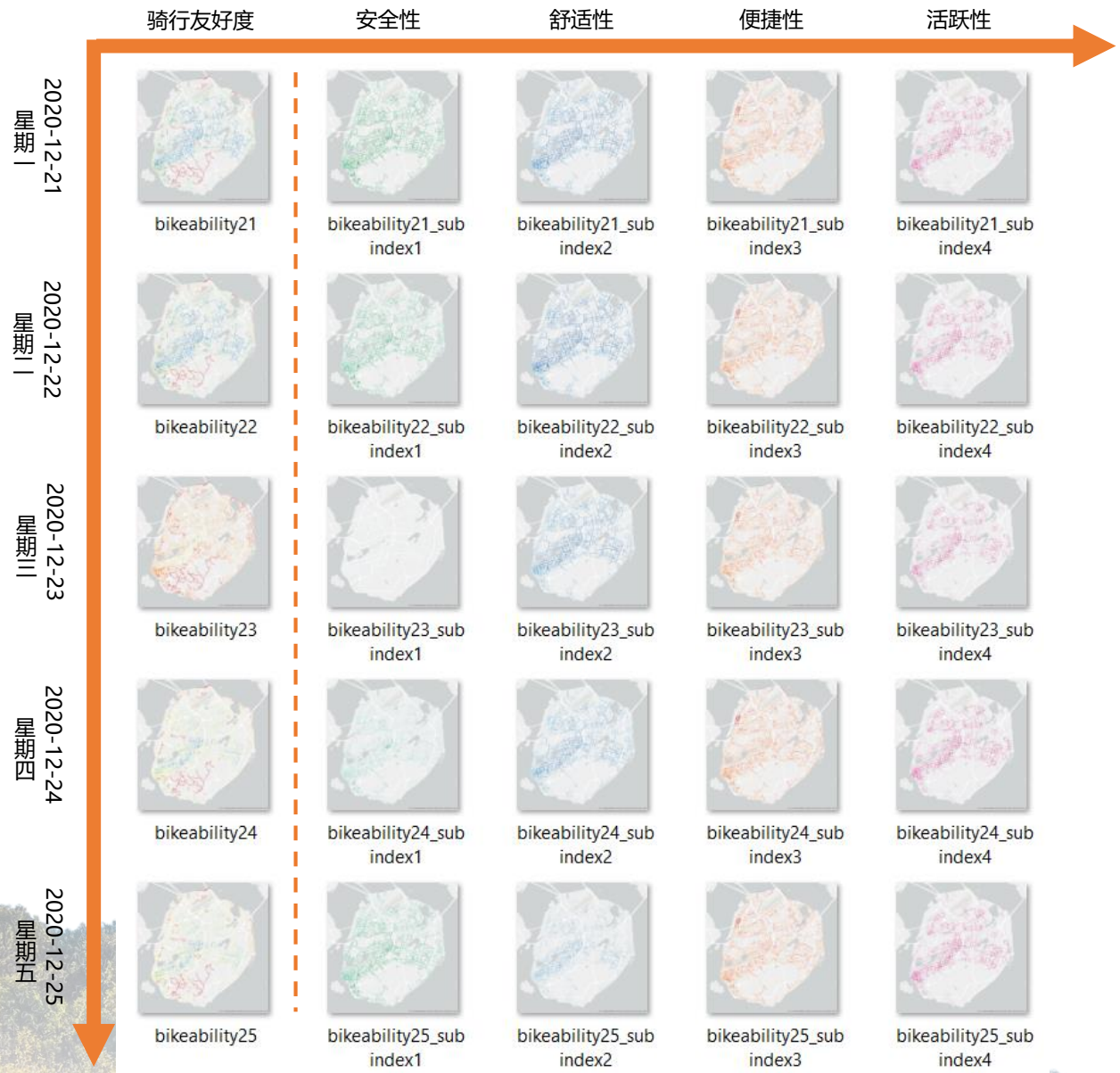
Part 4 小结与展望



关于“体力活动机会”：

（1）**动态的体力活动机会时空评价体系**：各因素对体力活动机会影响大小和方向在时间和空间上存在较大的差别。

（2）**自然环境因素影响**：自然环境对安全性、舒适性影响明显。

（3）**建成环境因素影响**：建成环境对便捷性与活跃性影响明显，从而影响居民以骑行方式的出行意愿。

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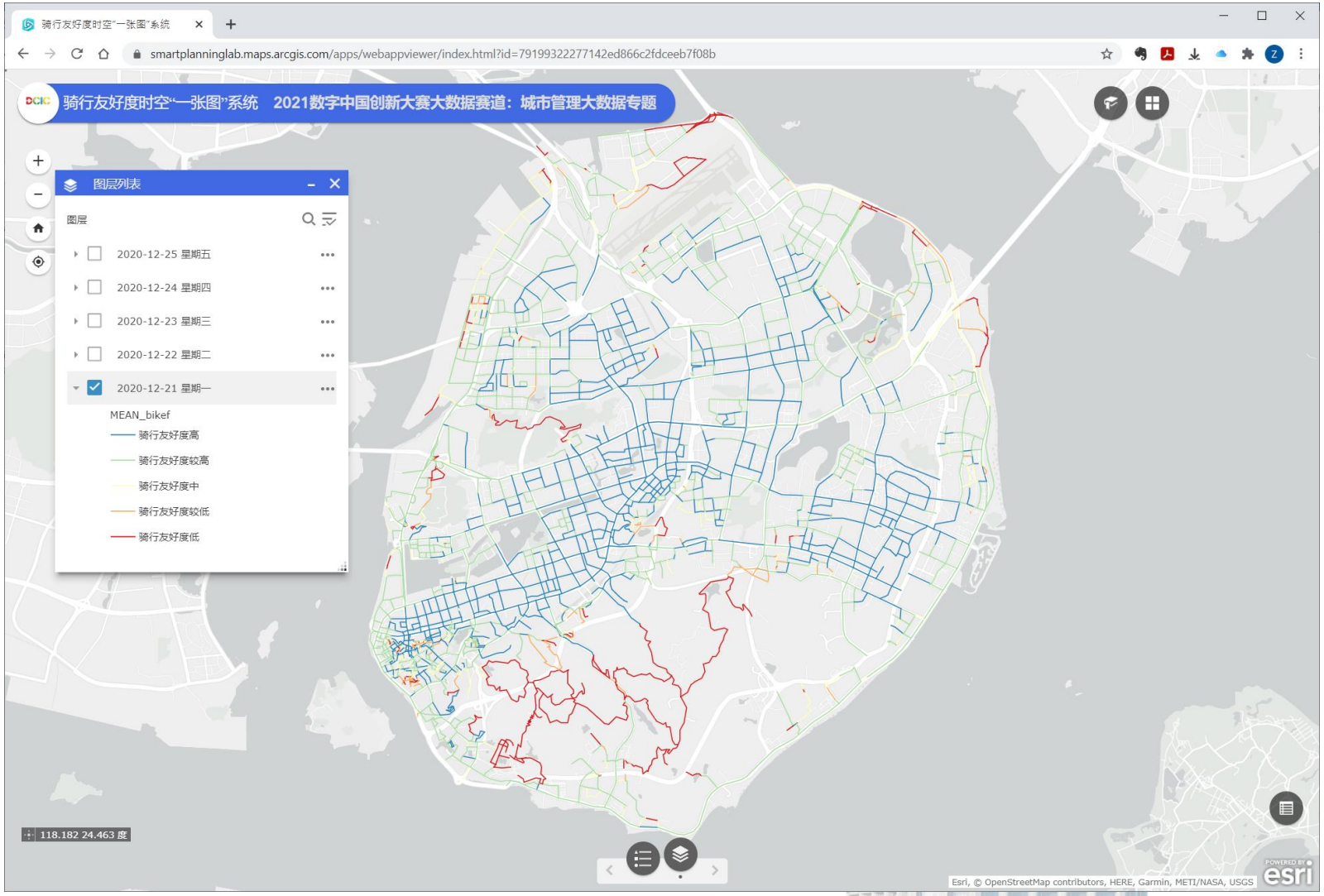
Part 4 小结与展望


骑行友好度时空"一张图"系统
smartplanninglab.maps.arcgis.com/apps/webappviewer/index.html?id=79199322277142ed866c2fdceeb7f08b
骑行友好度时空"一张图"系统 2021数字中国创新大赛大数据赛道：城市管理大数据专题
图层列表
图层
2020-12-25 星期五
2020-12-24 星期四
2020-12-23 星期三
2020-12-22 星期二
2020-12-21 星期一
MEAN_bikef
骑行友好度高
骑行友好度较高
骑行友好度中
骑行友好度较低
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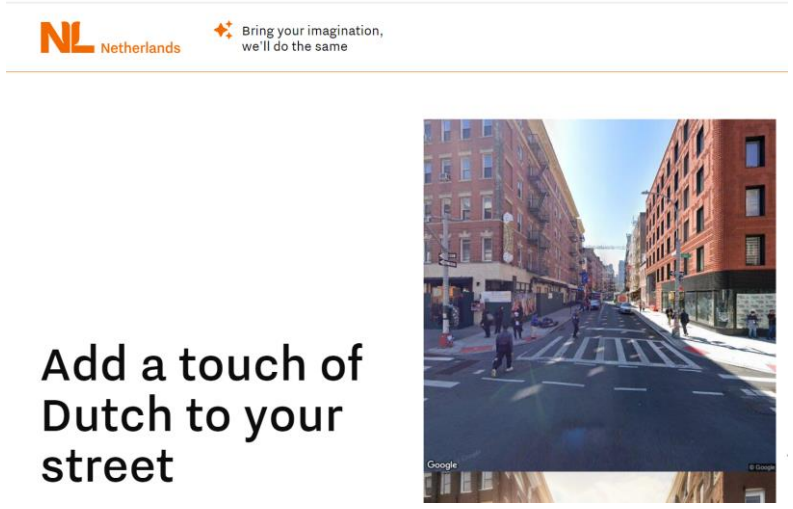
Esri, © OpenStreetMap contributors, HERE, Garmin, METI/NASA, USGS

- **AIGC**



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非常感谢！
敬请诸位老师批评指正！

Thanks for your listening

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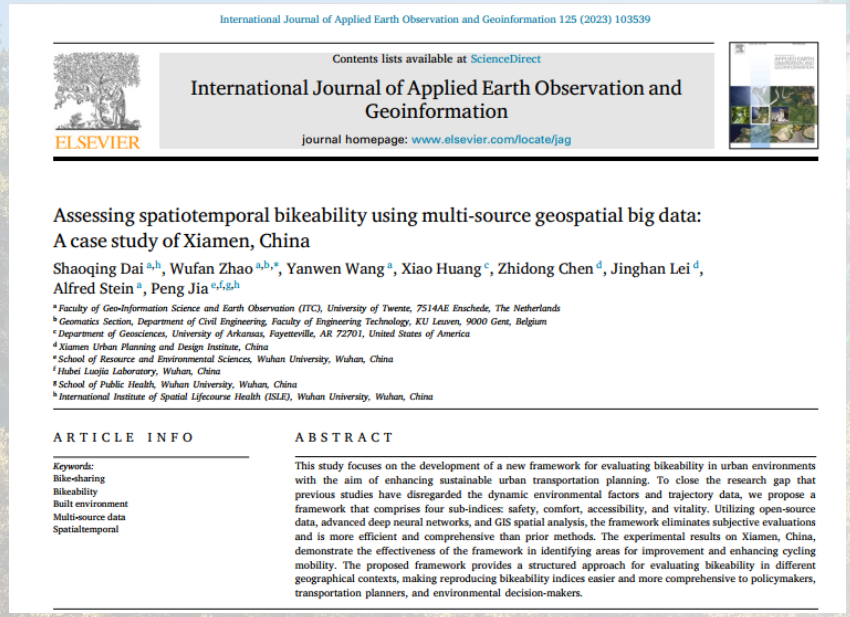

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Assessing spatiotemporal bikeability using multi-source geospatial big data: A case study of Xiamen, China

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ABSTRACT

This study focuses on the development of a new framework for evaluating bikeability in urban environments with the aim of enhancing sustainable urban transportation planning. To close the research gap that previous studies have disregarded the dynamic environmental factors and trajectory data, we propose a framework that comprises four sub-indices: safety, comfort, accessibility, and vitality. Utilizing open-source data, advanced deep neural networks, and GIS spatial analysis, the framework eliminates subjective evaluations and is more efficient and comprehensive than prior methods. The experimental results on Xiamen, China, demonstrate the effectiveness of the framework in identifying areas for improvement and enhancing cycling mobility. The proposed framework provides a structured approach for evaluating bikeability in different geographical contexts, making reproducing bikeability indices easier and more comprehensive to policymakers, transportation planners, and environmental decision-makers.

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