The Spatial Strategies of Knowledge Corridors in Megacity Development: Case Study of the Optical Valley Knowledge Corridor, China
AIMS OF RESEARCH

● Originated from the linear city model, “corridor” is not only an urban model fully tailored to the transport technology but also a comprehensive spatial concept.

● The modern version of corridors (mega-corridor): in dimensions of infrastructures, economics, urbanizations and ecology to achieve spatial, economic and social integrations.
AIMS OF RESEARCH

- **The Cluster Phenomenon**: A prevalence of knowledge corridors considering their great contributions to knowledge-based developments for megacities.
- **Innovation Strategies**: Great efforts in Chinese megacities have been dedicated to developing knowledge corridors aimed at enhancing regional competitiveness.

**Table B: Top cluster of economies or cross-border regions within the top 50**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cluster name</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tokyo-Yokohama</td>
<td>JP</td>
</tr>
<tr>
<td>2</td>
<td>Shenzhen-Hong Kong</td>
<td>CN/THK</td>
</tr>
<tr>
<td>4</td>
<td>San Jose-San Francisco, CA</td>
<td>US</td>
</tr>
<tr>
<td>5</td>
<td>Boston</td>
<td>GB</td>
</tr>
<tr>
<td>6</td>
<td>Paris</td>
<td>FR</td>
</tr>
<tr>
<td>10</td>
<td>London</td>
<td>GB</td>
</tr>
<tr>
<td>15</td>
<td>Amsterdam-Rotterdam</td>
<td>NL</td>
</tr>
<tr>
<td>20</td>
<td>Cologne</td>
<td>DE</td>
</tr>
<tr>
<td>22</td>
<td>Tel Aviv-Jerusalem</td>
<td>IL</td>
</tr>
<tr>
<td>28</td>
<td>Singapore</td>
<td>SG</td>
</tr>
<tr>
<td>30</td>
<td>Eindhoven</td>
<td>BE/NL</td>
</tr>
<tr>
<td>31</td>
<td>Moscow</td>
<td>RU</td>
</tr>
<tr>
<td>32</td>
<td>Stockholm</td>
<td>SE</td>
</tr>
<tr>
<td>37</td>
<td>Toronto, ON</td>
<td>CA</td>
</tr>
<tr>
<td>38</td>
<td>Madrid</td>
<td>ES</td>
</tr>
<tr>
<td>44</td>
<td>Tehran</td>
<td>IR</td>
</tr>
<tr>
<td>45</td>
<td>Milan</td>
<td>IT</td>
</tr>
<tr>
<td>48</td>
<td>Zurich</td>
<td>CH/OE</td>
</tr>
</tbody>
</table>

Source: See Table 2 in the Special Section Annex.
Note: Codes refer to the ISO-3 codes; see page 52 of the full list.


**AIMS OF RESEARCH**

- Provincial strategies — implement the Chinese innovation-driven development strategy, develop a **more liveable, sustainable and efficient metropolis**, by corridors to enhance their **spatial, economic and social integration**.
AIMS OF RESEARCH

- The Optical Valley, locating at the eastern border of Wuhan, is the **second Innovation Independent Zone of China**, which aimed to be the **Chinese version of Silicon Valley**.
- **30 years’ history**: the foundation of Universities——the birth of the first innovation incubator in China ——the birth of the first optical fiber in China——the spill over of innovation resources.
AIMS OF RESEARCH

- With the agglomeration of high-tech enterprises in the Optical Valley and their spillovers to adjacent areas, there has been a trend of Cross-border development along artery roads and railways between Wuhan and its neighboring cities like E’zhou and Huanggang.
STUDY AND METHODOLOGY

● Literature Review

The concept of corridors has evolved from linear or belts forms to networks, one thing for sure is that the essential characteristic of corridors is the connectivity which enables the free and easy flow of people, goods and information.

The concept of knowledge corridors has not been officially defined.
STUDY AND METHODOLOGY

- **Comparison Case Studies**

  key elements of **corridor projects in knowledge-based urban development**:

  1. **assembly of knowledge infrastructure** (e.g., universities, research and development institutes and etc), technological infrastructure (e.g. ICTs)
  2. **connections to the global economy** (e.g., international companies and finance institutions)
  3. **concentrations of well-educated and creative people** (e.g., knowledge workers)
STUDY AND METHODOLOGY

● Interviews

1. A set of semi-structural interviews with local governments, representatives from 4 local universities and 17 local enterprises;

2. An online survey concerning the needs of knowledge workers.
How to understand the concept of knowledge corridors in the new economies, which do not rely on traditional factors like before?

How to develop knowledge corridor strategies towards a more liveable, sustainable and efficient metropolitan area?
**THE UNDERSTANDING OF KNOWLEDGE CORRIDORS**

- **Knowledge corridors**: a new form of urban and regional spatial structure, which could establish **free flows of innovation resources** by a bundle of infrastructures linking urban agglomerations, so as to **develop local and regional innovation networks**.

1. A high concentration of different kinds of innovation resources
2. The commercial spin-off effects of knowledge production sectors
3. An attraction for knowledge workers
4. A high density of Grey Infrastructures
5. Smart urban governance
1. A high concentration of different kinds of innovation resources related to the whole process of knowledge production, diffusion and transfer, which act as the foundation of producing innovation flows.

- **knowledge production sectors:** universities as well as their affiliated labs (National labs)
- **knowledge transfer sectors:** research institutions, key technology infrastructures and related servicing facilities including investment captures and incubators
2. The commercial spin-off effects of knowledge production sectors are the roots of innovation networks as well as their dynamics, considering their roles of enhancing expected economic returns of knowledge.

Firm neighbourhood 
“Dandelion effect”
new start-ups within a 5 kilometre-radius circle centred at the local leading enterprise
3. **Keeping an attraction for knowledge workers** can be considered as **catalysts to boom innovation networks**, as **human capitals** are key flows to improve regional competence.

- pleasant climate, seashore and mountain landscapes
- basic urban amenities like schools, gyms, cultural centres and hospitals
- a high density of the third places
4. **Grey infrastructure** which are the backbones of knowledge corridors should be well-equipped, so as to **improve the efficiency of innovation flows**.

Transportation hubs like airports, train stations and harbours as nodal points connected to the regional transit systems.

Inner transit system including highways, subways, bike lanes well established to improve the efficiency of inner flows between nodal points.
5. **Smart urban governance** to keep urban planning, development and management flexible and **adapt to the uncertainty of innovation** is the key to keep constant flows in the places of space.

- top-bottom by governments
- +
- bottom-top by markets

- long-term vision
- +
- short-term actions
- +
- continuous evaluation and revision
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

The OVKC functions as a high-tech catalyst to help Wuhan and its neighboring cities to attract knowledge workers and techno-enterprises and become global innovation centres, in 30-year timeframe and three-phase development.
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

The first phase:
create a **regional innovation hub** in the Yangtze River Economic Belt in three years.

**Substrata:** within the optical valley
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

The second phase:
make the OVKC as an essential part of the Chinese innovation communities until 2035

Substrata: expand to the inner city of Wuhan and suburbia Ezhou, has a length of 35km.
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

The third phase: aim at a world-class innovation cluster, so as to help transform China into a “knowledge nation” till 2050.

Substrata: expand to two airports, covering Wuhan and Ezhou, has a length of 120km.
• A loop of innovation networks
• A boom for knowledge economics
• An attraction for knowledge workers
• A freeway for innovation flows
• A mutual-force for urban governance
1. A Loop of Innovation Networks

Three types of Knowledge neighbourhoods have been proposed to be established centring at key technology infrastructure, local universities and research institutes surrounded by venture captures, incubators and new start-ups within 5 kilometres.

The Spatial Strategies of Knowledge Corridors in Megacity Development
Wenjing LUO, Zhongyin SONG, Li XU
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

1. A Loop of Innovation Networks

11 Knowledge neighbourhoods have been proposed to be established.
2 neighborhoods centered at key technology infrastructures;
2 neighborhoods centered at universities;
7 neighborhoods centered at institutions.
1. A Loop of Innovation Networks

The regional networks of innovation can be developed with the two airports acting as the innovation hubs to input and output knowledge talents and products.
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

2. A Boom for Knowledge Economies

Two types of local neighbourhoods of firms have been proposed to be established centring at local existing and future leading enterprises by locating technological service facilities including public semi-works, data-sharing centres and research labs in 5-km radius.

Firm neighborhood for existing leading enterprises + Firm neighborhood for future leading enterprises
2. A Boom for Knowledge Economies

6 firm neighbourhoods have been proposed to be established.  
3 firm neighborhoods centered at existing leading enterprises;  
3 firm neighborhoods centered at future leading enterprises;
2. A Boom for Knowledge Economies

An industrial corridor specialized in optoelectronics, biotech and intelligent manufacturing
3. An Attraction for Knowledge Workers

establish a complex of “green”, “red” and “yellow” infrastructures.
“green” infrastructures: high-quality urban parks with multi-functions like culture and sports and easy-access pocket parks with communication spaces.
“red” infrastructures: basic urban amenities with high-standards for local residents.
“yellow” infrastructures: specifically target towards local knowledge workers.
3. An Attraction for Knowledge Workers

“green” infrastructures:
6 urban living rooms (culture, assembly) locating at the central business districts;
9 urban balconies (communication) locating near workplaces;
15 urban gateway parks locating at intersections of artery roads.
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

3. An Attraction for Knowledge Workers

“red” and “yellow” infrastructures:
21 living neighborhood centered at red infrastructure (retail, hospital, sports & culture) for local residents at a radius of 5-15 minutes’ walking distances;
15 living neighborhood centered at yellow infrastructure (retail, apartments, leisure, sports) for local knowledge workers as a radius of 5-15 minutes’ walking distances.
Knowledge Corridor Spatial Strategies in Megacity Developments: Case of the Optical Valley Knowledge Corridor

4. A Freeway for Innovation Flows

Improve the passenger capacity of the Shunfen Airport which has been planned as the largest cargo airport in Asia;
Locate highspeed railway stations and a general airport within the Optical Valley;
Establish intercity railways between Wuhan and its neighboring cities.

![Map of the Optical Valley Knowledge Corridor showing transportation networks]
4. A Freeway for Innovation Flows

Three expressways have been proposed to establish to connect transportation hubs; no more than 60 minutes will be taken to reach nodal points especially the airports, train stations and other transportation hubs from anywhere within the boundary of the OVKC.
5. A Mutual Force for Urban Governance

Top-down governance:
Designate strategic areas regulated as M0 to enhance the flexibilities of current land use regulations by increasing the upper limit of mixed-use functions

Designate Key areas to enhance the hurry-up the construction speed of infrastructures.
5. A Mutual Force for Urban Governance

A **continuous policy monitoring system** to recognize the current development stage to ensure that the **long-term vision and short-term actions** can be achieved.

36 indexes in 5 dimensions and 10 sub-categories.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation</td>
<td>Resources</td>
<td>Number of key technology infrastructures</td>
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<tr>
<td>Innovation</td>
<td>Input</td>
<td>Number of incubators</td>
</tr>
<tr>
<td>Innovation</td>
<td>Output</td>
<td>Number of Public Spaces for Startups</td>
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<tr>
<td></td>
<td></td>
<td>The percentage of research and development expenses in GDP (%)</td>
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<tr>
<td></td>
<td></td>
<td>Valid patents per 10000 people per year</td>
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<td>Industries</td>
<td></td>
<td>Number of PCT patents per year</td>
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<tr>
<td></td>
<td></td>
<td>Percentage of invented international standards</td>
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<td>Industries</td>
<td>Structure</td>
<td>Percentage of the added value of strategic industries in GDP(%)</td>
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<tr>
<td></td>
<td></td>
<td>Percentage of the added value of new economies in GDP(%)</td>
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<tr>
<td></td>
<td></td>
<td>Percentage of high-tech service industries incomes(%)</td>
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<td></td>
<td>Enterprises</td>
<td>The Increasing rate of gazelle enterprises(%)</td>
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<tr>
<td></td>
<td></td>
<td>Number of unicorn enterprises</td>
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<td></td>
<td></td>
<td>The Increasing number of high-tech enterprises per year</td>
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<td>Number of enterprises with venture capitals</td>
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<tr>
<td>Physical</td>
<td>Environments</td>
<td>Areas of parks per person(square meters)</td>
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<tr>
<td></td>
<td>Public Spaces</td>
<td>Coverage of urban parks with an area of more than 5000 square meters to residential districts within 500 meters(%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of urban parks with an area of more than 10 hectares per 10000 people</td>
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<tr>
<td></td>
<td></td>
<td>Coverage of greenways to residential districts within 5-minute walking distances</td>
</tr>
<tr>
<td></td>
<td>Urban amenities</td>
<td>Number of international schools per 10000 people</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of hospital beds per 10000 people</td>
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<tr>
<td></td>
<td></td>
<td>Number of larger urban amenities(including exhibitions, libraries, art galleries, theaters and etc.) per 10000 people</td>
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<tr>
<td></td>
<td></td>
<td>Coverage of urban amenities to residential districts(%)</td>
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<tr>
<td></td>
<td></td>
<td>Areas of the third places(like coffee houses) per person (square meters)</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td>Coverage of airports within 60-minute travel(%)</td>
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<td></td>
<td>Accessibility</td>
<td>Coverage of train stations within 45-minute travel(%)</td>
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<td>The Density of high-way network(meters per square meters)</td>
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<td>Connectivity</td>
<td>The Density of branch network(meters per square meters)</td>
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<td></td>
<td>Milestones of subways(kilometers)</td>
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<td></td>
<td>Percentage of travel by public transport(%)</td>
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<td></td>
<td>Milestones of public transport per 100000 people(kilometers)</td>
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<td>Governance</td>
<td>Spaces</td>
<td>Percentage of increased spaces for innovation activities in office buildings per year(%)</td>
</tr>
<tr>
<td></td>
<td>Policies</td>
<td>Percentage of increased apartments for knowledge workers in housings(%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage of policies for innovators (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage of policies for capitals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage of policies for related issues (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage of policies for coordination(%)</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND LESSONS LEARNED

What are knowledge corridors?

- various knowledge resources to establish local and regional innovation networks
- Clustered leading enterprises to nurture start-ups to boom knowledge economies
- pleasant environments urban amenities to attract knowledge workers

Connections within and between

- well-connected transit systems to improve the efficiency of innovation flows
- co-governing mechanism to adapt to the uncertainty of innovation.
CONCLUSIONS AND LESSONS LEARNED

The framework of knowledge corridor strategies ≠ the wholesale packages.

Like an orchestra, the implementation of knowledge corridor strategies does not only require a **conductor to vision, lead, monitor and make adjustments** constantly but also a **group of music players to collaborate**.

**Audiences**=the country-specific social, cultural, economic and technological circumstances

**Music books**
the framework of the strategies
Thanks for your attentions!