# Innovation in Land-resource Allocation for New Quality Productive Forces: Shanghai's Biomedical Industry

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Abstract: Reforming the allocation of land and other production factors is essential to the development of new quality productive forces. This paper examines changing spatial demand arising from scientific-technological and industrial innovation, identifies general principles of land-allocation reform, and uses Shanghai's biomedical industry and three representative parks to examine sector- and place-specific characteristics. Developing new quality productive forces according to local conditions requires supply-demand matching across territory, sectors, and life cycles, together with targeted responses to key fields, locations, and stages. Shanghai's practice expands biomedical space through R&D-manufacturing integration, service clustering, symbiotic environments, and flexible management, providing a representative megacity case.

Keywords: new quality productive forces; land-resource allocation; biomedical industry; innovation space; Shanghai

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New quality productive forces require innovative allocation of labor, capital, land, knowledge, technology, management, and data [1]. Land is both a foundational resource and the spatial carrier of other factors, so its institutional arrangement has a fundamental enabling role [2]. Technological revolutions and industrial restructuring change land demand and the corresponding production relations. Improving the precision and efficiency of allocation has therefore become a key planning issue [3]. New quality productive forces arise from technological breakthroughs, innovative factor combinations, and industrial upgrading [1,4-8].

## 1 Changing Spatial-demand Logic and General Principles of Allocation

Scientific innovation and industrial innovation alter how factors are organized, connected, and supported by place. Land policy should respond across all territories, fields, and life-cycle stages, while differentiating among sectors, enterprises, and development phases [9-21].

### 1.1 From Separation to Agglomeration and Integration

Innovation increasingly depends on close interaction among research, pilot testing, manufacturing, services, and users. Spatial organization is shifting from isolated research or production sites toward mixed innovation ecosystems and R&D-manufacturing integration [9-11]. Emerging and future industries need laboratories, pilot facilities, flexible factories, shared platforms, and spaces that can change as firms grow [12-15]. Land allocation should support functional proximity and combinations of large and small carriers.

### 1.2 From Closed Chains to Open Factor Convection

Innovation networks extend across firms, districts, and regions. Knowledge, capital, data, talent, and production capacity circulate through global and regional industrial chains [16-20]. Spatial policy should therefore support interdistrict project transfer, shared platforms, secondary land markets, and benefit-sharing mechanisms instead of treating each park as a closed unit.

### 1.3 From Basic Sites to Place-making and Environmental Support

Innovative workers and firms value transport, public services, housing, education, health care, social interaction, and urban identity. High-quality place is part of productive capacity [10-11]. Allocation must connect the internal work environment of innovation carriers with the wider living environment and public-service system.

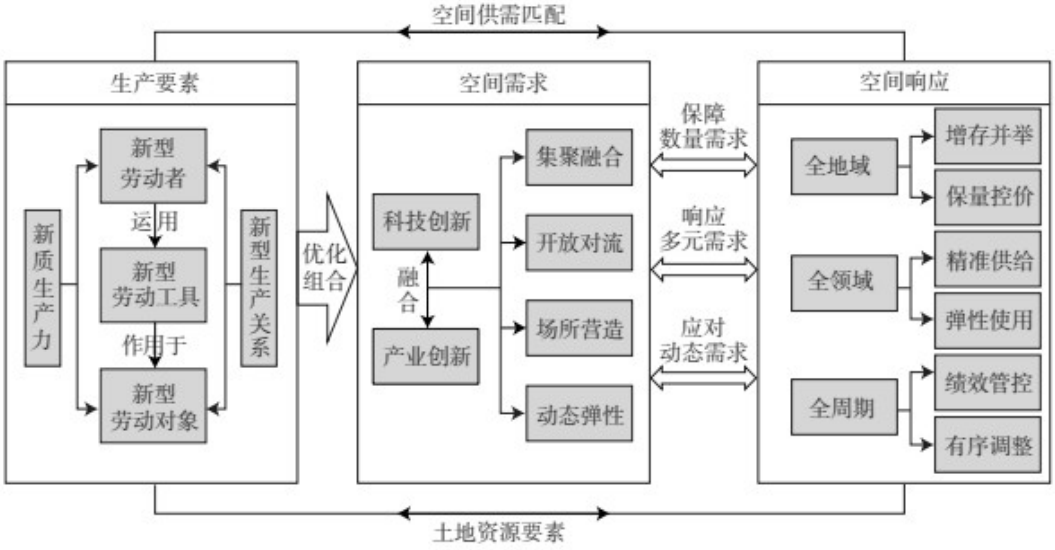


Fig. 1 New quality productive forces and the changing logic of land-resource allocation

## 2 Shanghai's Biomedical Industry and Spatial Pattern

### 2.1 Development Overview

Biomedical production is a strategic emerging industry with long research cycles, high investment, strict regulation, and strong dependence on professional services. Shanghai has built a leading national cluster through scientific institutions, hospitals, enterprises, finance, and international exchange [13-14]. From 2020 to 2024, industrial output and investment grew while the structure shifted toward innovative drugs, advanced medical devices, contract research and manufacturing, and international services.

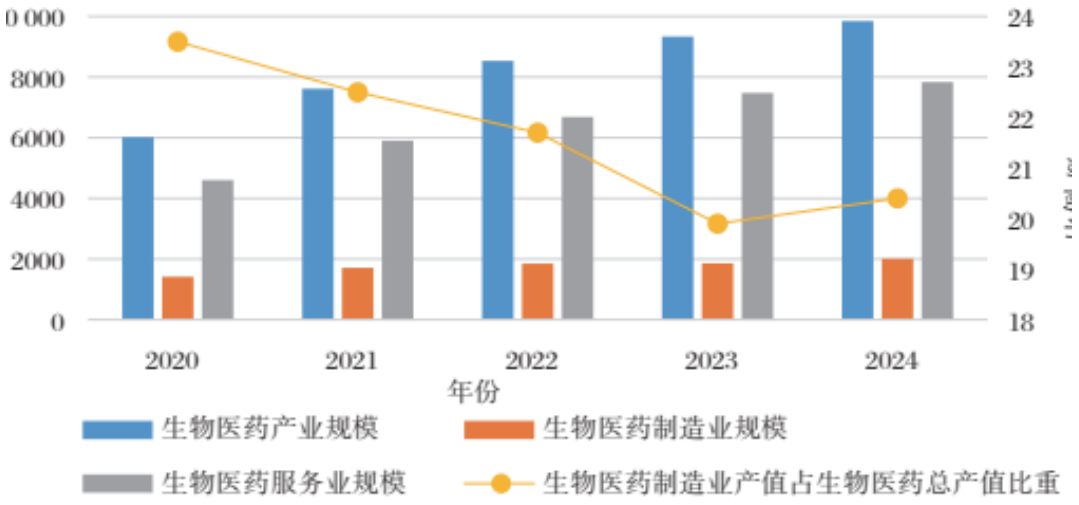


Fig. 2 Development of Shanghai's biomedical industry, 2020-2024

| | 具体内涵 | |
|---|---|---|
| 1 | 张江生物医药创新引领核心区 | 重点发展创新药物、高端医疗器械和生物技术服务等 |
| 5 | 五大特色产业区 | 临港新片区精准医疗先行示范区、东方美谷生命健康融合发展区、金海岸现代制药绿色承载区、北上海生物医药高端制造集聚区、南虹桥智慧医疗创新试验区 |
| X | 若干特色产业载体 | 张江创新药产业基地、临港新片区生命蓝湾、东方美谷医药、湾区生物医药港、北上海生物医药产业园、G60生物医药产业基地、青浦生命科学园等 |

Table 1 Shanghai's 1+5+X biomedical industrial spatial structure

## 2.2 Three Representative Parks

The analysis compares Zhangjiang Innovative Drug Industrial Base, Lingang Life Blue Bay, and Hongkou North Innovation Biomedical Park. They represent a mature suburban R&D-manufacturing park, a growing peripheral manufacturing area, and an early-stage inner-city renewal carrier. Their different locations, development modes, and life-cycle stages reveal how allocation problems vary across the metropolis.

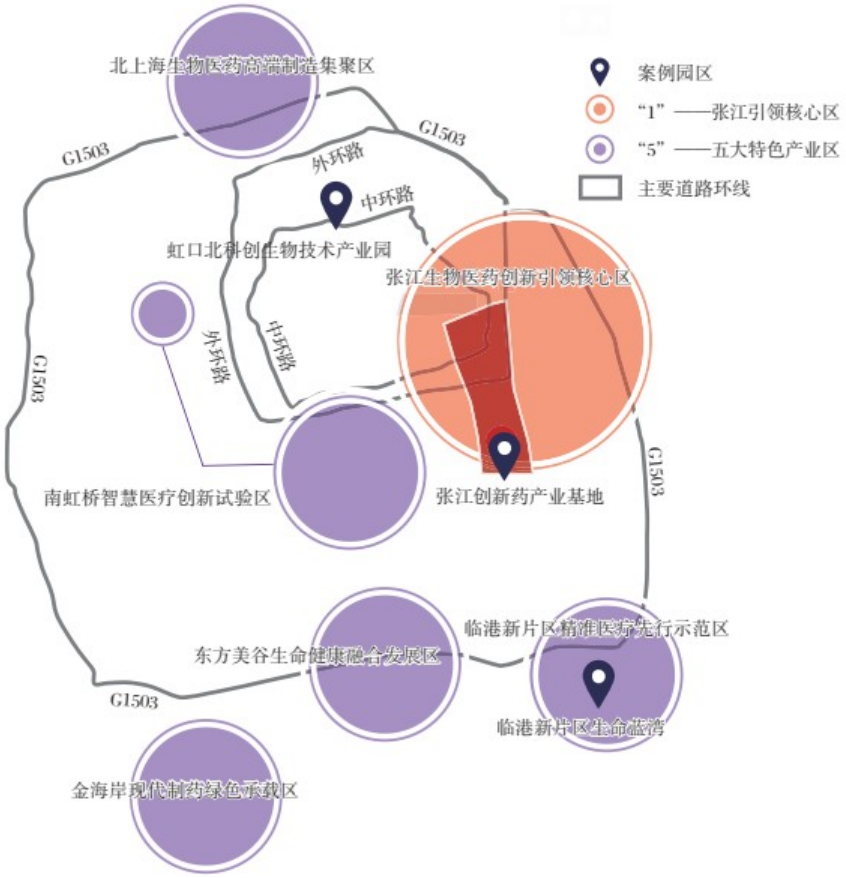


Fig. 3 Location of the three case parks within Shanghai's biomedical spatial structure

| 园区 | 建设时间 | 规划面积 / $km^2$ | 开发主体 | 空间区位 | 空间类型 | 发展阶段 |
|---|---|---|---|---|---|---|
| 张江创新药产业基地 | 2019年4月 | 3.13 | 张江集团 | 城市近郊 | 新建更新并存型，张江核心区 | 成熟型 |
| 临港新片区生命蓝湾 | 2020年9月 | 4.39 | 临港集团奉贤公司 | 城市远郊 | 新建型，特色产业区 | 成长型 |
| 虹口北科创生物技术产业园 | 2024年4月 | 0.039 | 北科创集团 | 中心城区 | 更新型，特色产业载体 | 起步型 |

Table 2 Overview of the three case parks

# 3 Land-resource Allocation Challenges

## 3.1 Structural Mismatch in R&D-manufacturing Space

Biotech firms increasingly become biopharma firms and require seamless transitions from research to production. Shanghai has expanded CRO, CMO, and CDMO platforms and added nearly 5 million $m^2$ of biomedical manufacturing space. The main constraint has shifted from total shortage to insufficient low-cost space and uneven distribution. Office rents and industrial land prices remain far higher than in

nearby cities, urban renewal is costly, and manufacturing carriers are concentrated in outer districts. Interdistrict cooperation and benefit sharing are still limited [22-32].

### 3.2 Service-space Agglomeration Has Not Yet Become a Full Cluster

Biomedical innovation depends on research outsourcing, testing, clinical registration, sales, consulting, finance, and commercialization [33]. Shanghai is a regional service-network core, but service firms remain widely dispersed among parks and office buildings. Research-institution-oriented, business-environment-oriented, and special-policy-oriented concentrations have emerged, yet simple agglomeration has not produced a branded, large-scale cluster comparable to Kendall Square [34].

| 类型 | | 名称 | 核心功能 |
|---|---|---|---|
| 园区 | | 张江药谷 | 研发主导，兼具临床和注册上市、应用推广、国际交流、金融咨询等 |
| | | 张江创新药产业基地 | 产业化为主，兼具研发服务、中试等 |
| | | 临港新片区生命蓝湾 | 产业化为主，兼具研发服务、中试、出海等 |
| | | 虹口北科创生物技术产业园 | 合成生物领域的CRO研发服务等 |
| 楼宇/集聚区 | 科研机构导向 | 徐汇枫林生命健康产业园、黄浦广慈—思南国家转化医学创新产业园区、环同济医学院生命健康总部基地等 | 临床研究、研发外包、中试孵化等 |
| | 商务环境导向 | 南京西路总部集聚区、淮海路—新天地总部集聚区、前滩总部集聚区等 | 总部研发为主，兼具营销展示、国际交流等 |
| | 特殊政策导向 | 外高桥医疗器械总部集聚区、新虹桥国际医学园区等 | 离岸研发、数据跨境流动、国际交流等 |

Table 3 Distribution of selected biomedical service spaces in Shanghai

### 3.3 Support-space Function and Quality Require Improvement

Biomedical workers are highly educated, young, international, and relatively well paid. They need high-quality offices and collaborative social spaces, as well as housing, transport, education, health care, and recreation. Internal park environments have improved, but Zhangjiang and Lingang still lack rail coverage and high-level public services. Hongkou's renewed R&D space contrasts with lower-quality surroundings, creating an island effect. The small work environment and the large living environment need integrated improvement.

### 3.4 Use Control Remains Insufficiently Precise and Adaptive

Different biomedical subsectors and stages require different floor heights, load capacity, elevators, waste treatment, safety, and environmental controls. Shanghai has introduced enterprise-specific supply, combined industrial-chain supply, integrated land reservation and delivery, and M0 mixed-use pilots. Coverage for small firms remains limited, standardized factories do not fit all processes, and changes in land use or buildings still require coordination across environmental and fire-safety departments.

## 4 Response Strategies

### 4.1 Strengthening the Zhangjiang R&D plus Shanghai Manufacturing Structure

Municipal coordination should improve interdistrict project allocation and benefit sharing within the 1+5+X structure. High-level manufacturing projects can be placed across districts while remaining close to research teams. A stronger secondary land market should integrate supply, transactions, registration, supervision, and services; reduce transaction costs; and increase the holding cost of idle land. This combination can improve access to affordable space and reuse existing carriers.

## 4.2 Building Biomedical Technology-service Clusters

Service clusters should be differentiated by their anchors. Research-oriented clusters can form around universities, major hospitals, laboratories, and clinical centers. Business-oriented clusters can use renewed office buildings with incubators, accelerators, and shared laboratories. Special-policy clusters can use Pudong, Lingang, Hongqiao, and the Eastern Hub to pilot offshore R&D, cross-border data flows, bonded equipment, and international medical cooperation.

## 4.3 Creating a Symbiotic Industrial Ecology across Work and Living Environments

Outer parks should add platforms, services, public transport, hospitals, and high-quality schools so that parks become integrated urban districts. Inner-city carriers should use their embedded location to provide affordable, accessible innovation space and stimulate improvement in surrounding neighborhoods. The objective is a reciprocal relationship between the small work environment and the larger urban environment.

## 4.4 Flexible Management for Dynamic Demand

Land terms should reflect enterprise stage and asset intensity. Short-term lease-transfer combinations suit small, light-asset, mobile firms; longer terms suit large, capital-intensive facilities [35]. Standard-factory transfer ratios can respond to anchor firms needing larger carriers. Shanghai should also expand M0/C0/W0 zero-category mixed-use policies for biomedical projects and establish coordinated environmental, fire-safety, and planning rules.

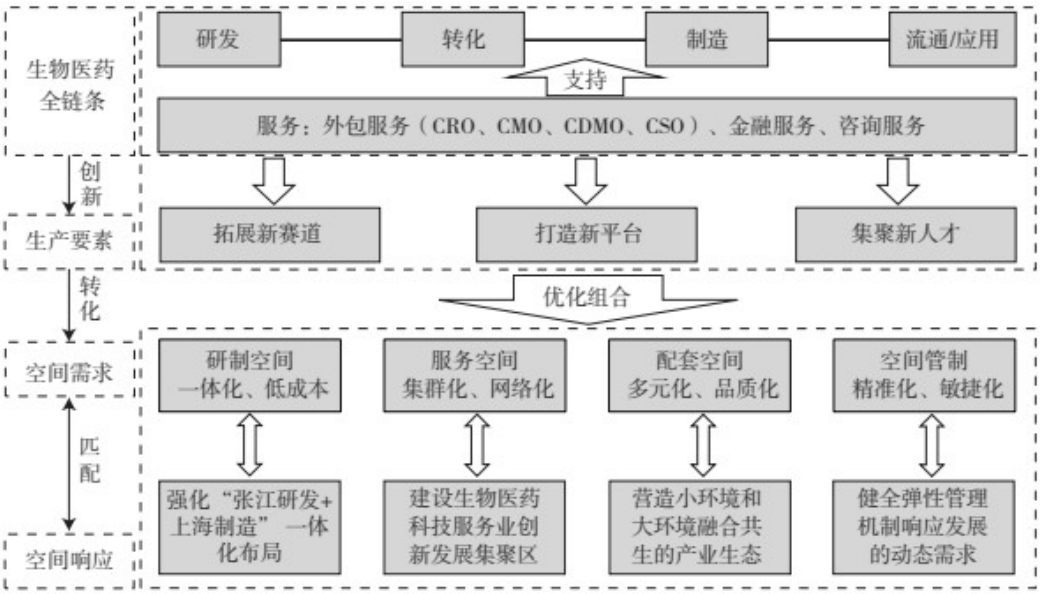


Fig. 4 Whole-chain biomedical innovation and the proposed spatial response

# 5 Conclusion

Land-resource allocation should support high-quality development, quality of life, and effective governance [36]. This study identifies general principles across territories, sectors, and life cycles and then develops targeted responses for Shanghai's biomedical industry. R&D-manufacturing integration, service clustering, symbiotic work and living environments, and adaptive control can improve supply-demand matching. Because both new quality productive forces and land institutions evolve continuously, further research should refine sector-, place-, firm-, and stage-specific mechanisms.

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