PEAK Urban

# LOCAL EVIDENCE
## SYNTHESIS REPORT

# From Quantity to Quality: Supporting China's Urban Transition

PEAK Urban's new approach to understanding cities is supporting China's rapid urbanisation process as it shifts from an economic focus to include environmental, institutional and social factors, to create sustainable, inclusive cities.

**The research was guided by the PEAK Urban approach to urban inquiry and action, shaped by four key pillars:**

**P** **Prediction** – what new approaches can we take to accurately forecast cities' futures?

**E** **Emergence** – What types of urban structures and systems are emerging?

**A** **Adoption** – How do cities adopt new ideas and technologies?

**K** **knowledge** – How, and with whom, can we best share knowledge globally?

## Area

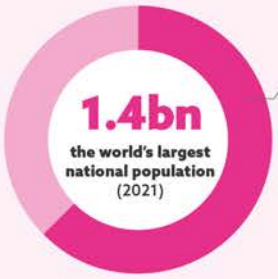
**9.6 million km²**

the world's **fifth-largest** country

**Major urban areas population** (2021)

- Shanghai **27.8 million**
- Beijing (capital) **20.9 million**
- Chongqing **16.4 million**
- Tianjin **13.8 million**
- Guangzhou **13.6 million**
- Shenzhen **12.6 million**

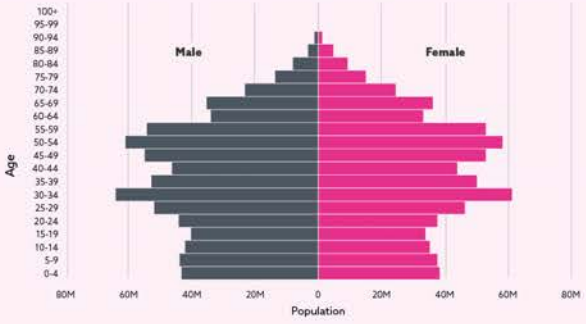
## Population




**Urban population** (2021)
excluding Hong Kong and Macau:
**62.5%**

**Rate of urbanisation**
Annual rate of change estimated for 2020-2025
**1.78%**

**Population by age and gender**




## People

**Literacy rate age 15+**
**96.8%**

**Life expectancy:**
**total population**


**Maternal mortality**
**29 deaths per 100,000 live births** (2017)

## Equality


**Lowest 10% urban household income**
**2.1%** (2012)

**Highest 10% urban household income**
**31.4%** (2012)

## Economy

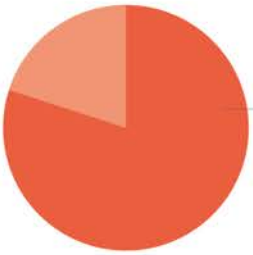
**Nominal GDP**

**$14.8 trillion** (2020)[2]

**Per capita GDP**


the world's **second largest** economy

## Beijing[4] (China's capital)



### Population

**21.9 million**[5] (2021)

**Almost 80%**
of Beijing's population is working age reflecting its economic powerhouse status[6]

### Size[7]

**Official area:**
**16,800 km²**

**Densely populated urban centre:**
**3,900 km²**

### Economy

**Nominal GDP**
**$247.7 billion** (2021)

**Nominal GDP by sector** (2020)[8]

| Industry | Agriculture | Services |
|---|---|---|
| 15.8% | 0.3% | 83.9% |

### Transit passengers (2020)[10]

**Rail**
**2.3 billion journeys**

**Bus and tram**
**1.8 billion journeys**

### City Life[9]

**Population density**
**Almost 6,000 people**
per km² (2020)

**Sewage treatment rate**
**95%**

**Harmless disposal of domestic waste**
**100%**

**Urban green coverage**
**49%**

**Green space (per person)**
**16.6m²**

**Average annual concentration of particulate matter ($PM_{2.5}$):**
**38 micrograms per m³**

### Healthcare[11]

**Certified doctors**
**5.4 per 1,000 people**

**Ward beds**
**5.5 per 1,000 people**


**27%** Heart disease
**26.5%** Cancer
**19.1%** Cerebrovascular disease
**7.1%** Respiratory disease
**4%** Accident or poisoning

See Footnotes on pg 6

# Executive Summary

As cities take on an unprecedented and newly recognised role as drivers of sustainable development, findings from PEAK Urban research in China suggest clear principles to support optimum urban management. The PEAK approach also offers an important new approach to help urban actors **Predict** and project aspects of city life, understand the interaction of **Emerging** systems, consider **Adoption** of appropriate technology and interventions, and facilitate **Knowledge** exchange to support urban inquiry and action (see Box 1).

Based on research from four regional hubs – in China, Colombia, India and South Africa – the PEAK approach yields valuable new insights that can inform more effective urban policymaking in highly diverse contexts worldwide.

One of four regional reports, this paper presents key findings from PEAK research in China covering six broad categories – sustainability, inclusiveness, migration, governance, growth, and health and wellbeing. It offers insights to help government and non-state actors at national and international levels shape stable, equitable cities that deliver decent lives for all residents:

**• A city is an overarching system of interactions between individual systems**
Cities are the complex product of many interactions between systems – an overarching "system of systems". PEAK research shows that they can be best governed by understanding how these interactions shape emerging urban forms, in order to predict cities' needs, adopt the right solutions and technologies, and create knowledge to share, combine and feed back into the system of systems.

**• Policy should respond to cities' constant dynamism**
PEAK research reveals the way cities emerge, understanding this as a dynamic, ongoing, multi-layered process. In China, migrants arrive – and move on; the driving forces behind urbanisation change, new technologies shape urban life. Interactions between these dynamic factors mean the futures of cities will always be open and uncertain. This calls for a transition in urban planning philosophy, from controlling scale to promoting efficiency, from rigid regulation to flexible guidance, and from top-down arrangement to participatory coordination.

**• Effective prediction is based on understanding**
PEAK research in China reveals emerging patterns and suggests how this understanding can inform the detailed data-led prediction most useful to urban planning. When planners understand the mechanisms underlying cities' emerging characteristics – who does what, and why – they can choose the right methods to analyse big data, predict future trends and shape policy, allowing governments to manage processes of change. Maintaining understanding requires ongoing reinvestigation, as Chinese society is changing dramatically, transforming urban drivers such as migration.

**• A wide lens offers the most effective solutions**
Research across the PEAK China portfolio repeatedly shows the need to adopt urban planning approaches that draw on knowledge from different sectors and systems, and apply joint solutions in each. No aspect of sustainable urban development can be successfully planned in isolation from other aspects.

**• Context-specific approaches maximise impact**
Approaches suggested by PEAK research findings in China suit contexts of rapid urbanisation, yet within a country, levels of development can be uneven, meaning urban policies need tailoring if they are to best support each city.

**• Knowledge exchange feeds sustainable solutions**
Spotting the links between sectors and creating knowledge to nurture the "system of systems" is vital for effective urban management. In China, knowledge on migration can inform epidemiology, for example, while urban road layouts affect public health. As global cities, some Chinese urban centres, including Beijing, now have a similar profile to those in developed countries, such as London. This makes it beneficial to view Chinese and Western mega-cities as being similar in some respects. This means greater knowledge exchange between such cities would be highly valuable for national governments and global policymakers.

**Image credit: Unsplash**

As urbanisation expands and cities become increasingly critical to our planet's future, PEAK's collaborative approach gives policymakers a more powerful lens through which to see the interactions that generate new urban characteristics. It also provides new tools to optimise urbanisation processes, helping cities deliver their explicit role in achieving the Sustainable Development Goals.

By creating interconnected networks of knowledge and action, these policy approaches can deliver cities that are environmentally, economically, institutionally and socailly sustainable and inclusive of all their people.

> PEAK's collaborative approach gives policymakers a more powerful lens to see the interactions that generate new urban characteristics.

# Introduction

Over the past 50 years, China has urbanised at an unprecedented rate. In 1978, less than 20 per cent of its population lived in cities. By 2020, 63.9 per cent – over 900 million people – were urban dwellers, with urbanisation projected to reach 70 per cent – around a billion people – by 2030.

Despite this staggering transition, China has successfully avoided many pitfalls of rapid urbanisation. Since the mid-1980s, 260 million migrants have moved from rural areas to cities, supporting swift economic growth, yet Chinese cities have few slums. Rapid industrial development has kept urban poverty and unemployment low. The authorities have managed largely to contain migration or channel it towards small or medium-sized cities, including through the hukou, or household registration system, which controls migrants' access to services such as healthcare and education.

China's coastal region has seen the highest levels of development and migration from rural areas, with most of the population now living in the eastern half of the country. This has resulted in two distinct areas of economic development. Inland Chinese cities are still industrialising, while those in coastal areas are moving into service-based economies, reflecting Western urbanisation.

## Cities under threat

Unsurprisingly, such dramatic change is generating urgent challenges. As migration continues, China must sustain swift growth to provide jobs and infrastructure – yet threats are emerging to its economy-driven approach.

Rapid urbanisation brings soaring energy demand and environmental degradation, with tensions between urbanisation and the environment expected to rise further. Residential energy consumption per capita increased almost fourfold between 1980 and 2019, and China is the world's largest single emitter of carbon dioxide from fossil fuels, with pollution a serious concern both for human health and climate change. The country aims to reach peak carbon emissions by 2030 and achieve carbon neutrality by 2060, while continuing its urbanisation process, but achieving a sustainable balance between economic growth and the environment is a major challenge.


Image credit: Adobe Stock

Rapid urbanisation has also brought rising social inequality. Income gaps between urban and rural areas, coastal and inland regions, and migrants and local residents have widened, while the "floating population" of unsettled migrants is highly disadvantaged in access to essential services. This threatens the social stability on which economic progress relies. The government has responded with a drive to create "common prosperity", by reducing income inequalities and social polarisation.

Yet city governance lags behind the pace of urbanisation, and must adapt to tackle emerging problems such as urban sprawl, water scarcity and the care requirements of rapidly ageing populations.

These challenges require new approaches to city development and governance. The institutional and cultural contexts of Chinese urbanisation are very different from the historical worldwide lens through which urbanisation is usually understood. The Chinese state is both the market regulator and an important participant, while kinship and relationships rooted in place play a central role in organising Chinese society.

## PEAK Urban: towards balance in Chinese cities

Unparalleled dynamism makes predicting China's urban futures highly challenging. The rhetorical focus of urbanisation is currently shifting from "quantity" to "quality", widening from economic growth to balancing economic, societal and ecological aspects. The PEAK approach addresses this new context and its policy implications, viewing Chinese cities through a comprensive lens that reveals how their component systems – such as water, energy or education – are linked and impact one another. It also explores the drivers – such as migration – shaping each city's unique context, and how to harness knowledge, using pioneering data-driven analysis to predict urban China's future development and needs.

This approach offers solutions that take stakeholders beyond traditional city planning to the cross-sectoral solutions needed to develop equitable, sustainable cities of the future.

Successful urban planning will require coordination and knowledge exchange between a wide range of actors, including central and municipal government departments; national and international research institutions; development banks and investors; international, non-governmental and academic organisations, and urban planners and practitioners.

These new joined-up approaches can generate valuable learning for countries undergoing similar rapid urbanisation. As this report demonstrates, PEAK research findings in China offer important new insights to other countries, especially in East and Southeast Asia.

Given cities' central role in sustainable global development, acquiring, sharing and acting on this knowledge will be critical to quality of life for billions of urban dwellers, in China and beyond.

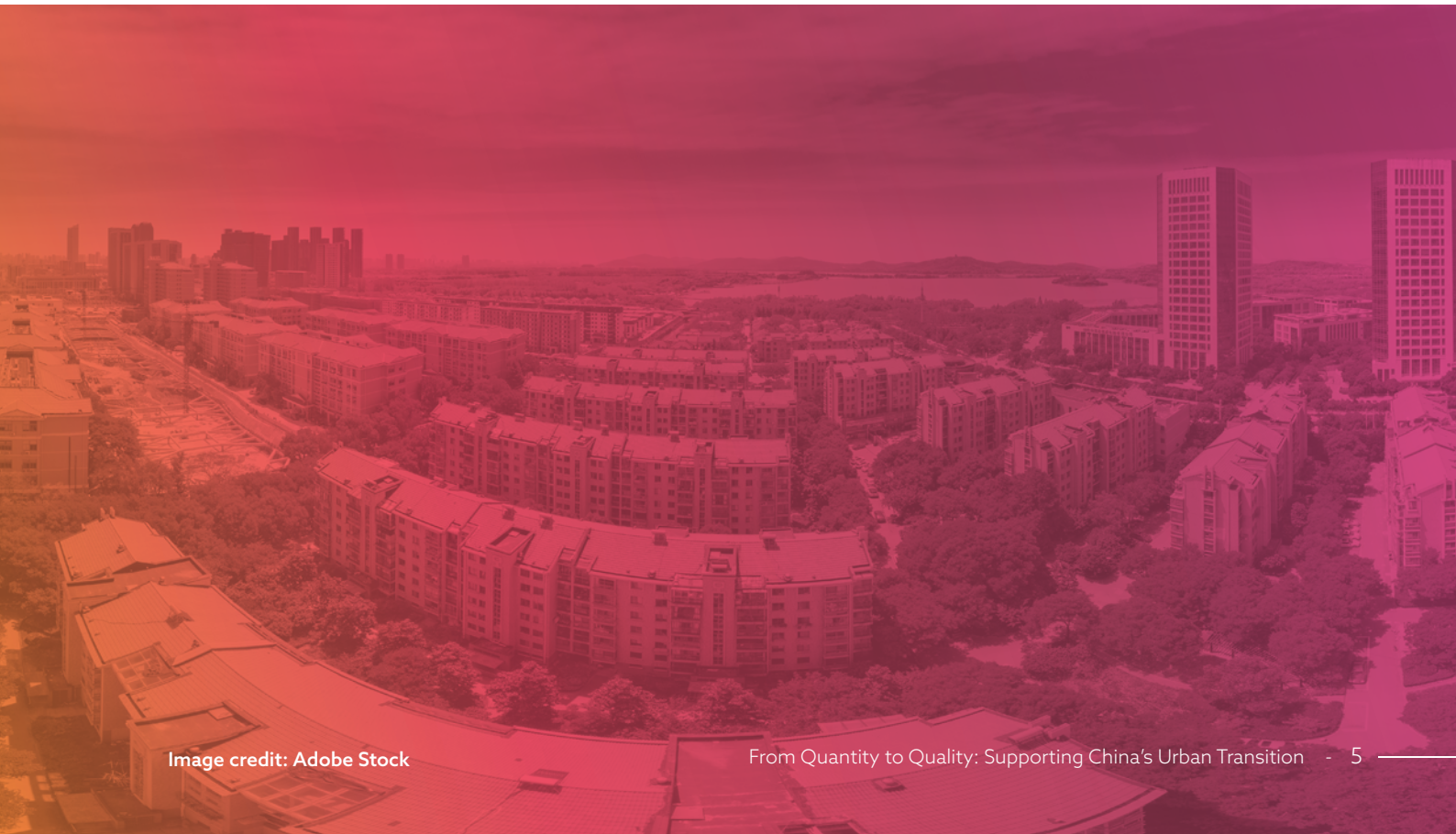


Image credit: Adobe Stock

# The PEAK Urban Approach

An innovative approach to urban inquiry and action guided the research that informs this report. It defines a way of asking questions, employing methods for inquiry, gathering and analysing data and reflecting or acting on the implications of findings. Organised into the acronym PEAK – Prediction, Emergence, Adoption and Knowledge – and underpinned by principles that apply to all urban contexts globally, the approach is useful in guiding urban interventions, including policymaking, placemaking and investments. The research considered the four constituent elements of PEAK together, leveraging each as required. This report demonstrates how use of these elements supports urban inquiry and intervention.

## P – Prediction and projection

PEAK emphasises interdisciplinary inquiry into city futures, based on urban sciences that use new sources of urban data, providing unprecedented – often real-time – information on urban dwellers' activities. This includes tracking telecoms data, satellite imagery and street photography; personal and environmental statistics from mobile apps and fixed sensors, and social networks via online platforms. However, the increasing pace of urban change limits the accuracy of longer-term predictions from new data and methods. Predicting urban futures also requires other forms of understanding the city, including institutional analysis and ethnography.

## E – Emergence

Cities are constantly evolving and building on what already exists. They are never finished. The concept of emergence rests on the understanding that city systems are rarely in equilibrium. The urban health system, for example, is made up of components including individuals, collective actions, technologies, markets and infrastructure. As the system and its parts change, interactions with other city systems result in newness emerging. In particular, technological changes within systems can reconfigure city economic and social life. Even minor changes at the interface of different systems can generate major changes in the complex system of the whole city.

## A – Adoption

Histories and geographies matter in understanding how city systems work and evolve, shaping the ideas and technologies a city adopts. Complex systems display characteristics of "lock in" and "path dependency", with the city's past and its geography shaping but not necessarily determining its future. As a result, knowledge and technologies are taken up, valued and captured differently by cities. Residents may use and be affected by technologies in ways different from other cities or neighbourhoods. The future city is shaped by the needs of both present and future generations.

## K - Knowledge

Different approaches to understanding and alternative models of scientific knowledge are rooted in diverse moral values and valuation scales, which can at times be competing, contested and not directly comparable. For example, the values informing an economist's analysis of developing housing in a forested area may clash with those of an environmentalist. These values influence how the city is understood from alternative vantage points. However, different perspectives – including those of urban actors such as elected officials, appointed professionals or community groups – have merit. Through dialogue between these perspectives, policymakers can avoid sub-optimal interventions that affect parts of the city, rather than the city as a whole. Urban futures are shaped by balancing often competing elements, and power structures affect how loudly different voices are heard. This demands an ability to see the city from different perspectives, to recognise structures of power and influence, and to mediate, evaluate and understand such trade-offs.

## Footnotes to accompany visual on page 2:

**1** Source unless otherwise indicated: CIA World Factbook. 2021. https://www.cia.gov/the-world-factbook/countries/china/

**2** China Country Report. Economist Intelligence Unit. 2021. https://store.eiu.com/products/country-analysis/china

**3** World Bank data. 2021. https://data.worldbank.org/indicator/SI.POV.GINI?locations=CN

**4** World Population Review. 2021. https://worldpopulationreview.com/world-cities/beijing-population

**5** China's Seventh National population Census. 2020. http://www.stats.gov.cn/english/PressRelease/202105/t20210510_1817185.html

**6** Populationstat.com. 2021. https://populationstat.com/china/beijing

**7** Populationstat.com. 2021. https://populationstat.com/china/beijing

**8** Statista.com. 2021. https://www.statista.com/topics/6745/beijing/#dossierKeyfigures

**9** Beijing Municipal Bureau of Statistics. 2021. http://nj.tjj.beijing.gov.cn/nj/main/2021-tjnj/zk/indexeh.htm

**10** Beijing Municipal Bureau of Statistics. 2021. http://nj.tjj.beijing.gov.cn/nj/main/2021-tjnj/zk/indexeh.htm

**11** Beijing Municipal Bureau of Statistics. 2021. http://nj.tjj.beijing.gov.cn/nj/main/2021-tjnj/zk/indexeh.htm

# PEAKUrban in CHINA

The **PEAK** approach helps urban actors **PREDICT** aspects of city life, understand **EMERGENCE**, **ADOPT** appropriate interventions, and facilitate **KNOWLEDGE** exchange to support urban inquiry and action.

## PREDICTION

**Look ahead through a powerful lens, using data and new analytics**

Example of PEAK in action:

Computer modelling + Land rights information = Sustainable urban growth

See p. 12

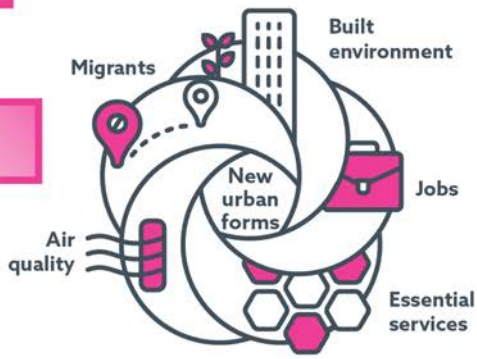
The average time a Chinese migrant stays at a destination. See p. 11

**5 YEARS**

## EMERGENCE

**Understand how different systems interact to create new consequences**

Example of PEAK in action:




See p. 10

**OVER 70%**

Proportion of China's energy and greenhouse gas emissions that occurs along manufacturing supply chains before the final production stage. See p. 8

## ADOPTION

**Use the right technologies and solutions for each urban context**

Example of PEAK in action:

City A Environmental quality | City B Economic expansion | City C Better services

**49.7** lowest life expectancy in China in 2010 (in Yushu)

**83.5** highest life expectancy in China in 2010 (in Xining)

**Goal**
**Improve life expectancy**

See p. 13

## KNOWLEDGE

**Value and combine different stakeholders' knowledge to co-create new learning**

Example of PEAK in action:


See p. 9

**33.2%**

the degree to which construction land in Changping district exceeded the urban master plan between 2004 and 2014. See p. 12

# PEAK Urban research and findings in China: highlights

## 1. Sustainable cities

PEAK research repeatedly shows the interdependence between urban systems, providing strong support for a "system of systems" approach to urban design. By integrating ecological, economic, institutional and political systems, policymakers can operate in an overarching urban system that is sustainable.

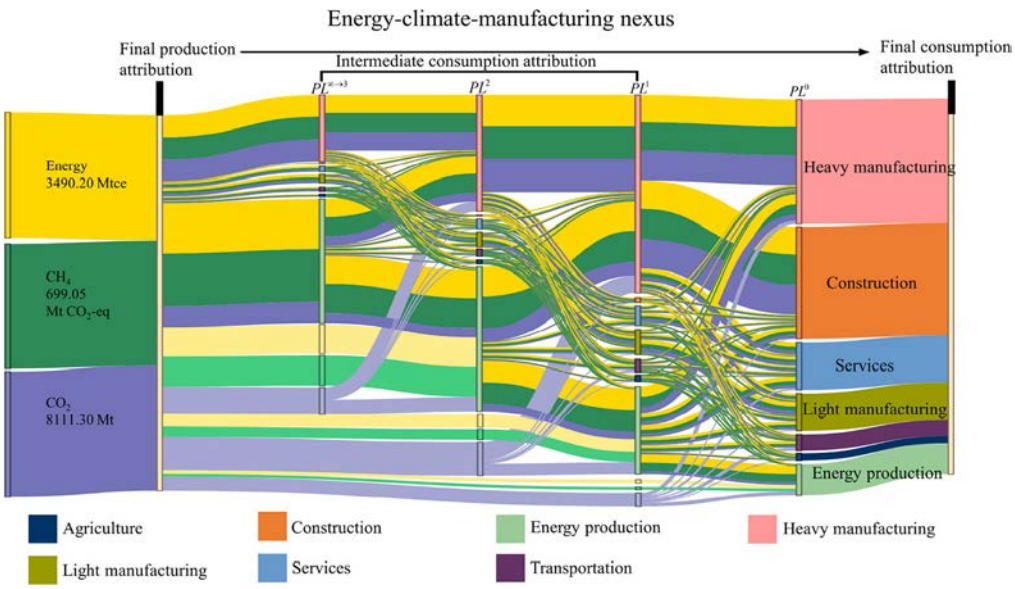
### Cross-sectoral responses key to pollution control

PEAK's knowledge-sharing lens showed that to reduce greenhouse gas (GHG) emissions, policymakers need a cross-sectoral approach at every stage of the supply chain. Very little of China's energy and greenhouse gas emissions at the final stage of production is attributable directly to meeting final demand. Manufacturing along the supply chain resulted in over 40 per cent of national energy-related methane and carbon dioxide emissions in 2012, while inputs purchased from other sectors were associated with just over 30 per cent of emissions. Higher water use along China's supply chains is also linked to higher GHG emissions, especially in manufacturing, agriculture and power. Policymakers from the water and climate sectors can reduce emissions by jointly focusing on supply chains and coordinating to implement measures such as incorporating climate policy tools into water management instruments.

China's River Chief System already takes a successful cross-sectoral approach to control water pollution, coordinating different government agencies at provincial, city and township levels. An individual, accountable river chief is responsible for pollution control in each river, overseen by a provincial office staffed by government departments including environmental protection, water, agriculture and land. With strong evaluation and accountability mechanisms, the system is controlling water pollution in Foshan, suggesting policy design can improve water quality effectively by eliminating institutional fragmentation in water management.

> "Policy design can improve water quality effectively by eliminating institutional fragmentation in water management."

**Figure 1:** Graphical Abstract: Energy-climate-manufacturing nexus




**Source:** Zhang, B., Zhang, Y., Wu, X., Guan, C., and Qiao, H. How the manufacturing economy impacts China's energy-related GHG emissions: Insights from structural path analysis.

### Shaping the built environment for green travel behaviour

PEAK's exploration of interacting urban systems shows that emissions control is also strongly affected by urban design. Unlike Western cities, "compactness" in the megacities of developing countries has a limited or even negative impact on people's walking behaviour. Walking in Beijing is influenced by population density, land use and street design. A higher population density, with congested roads and pavements, means more people commuting on foot, but less recreational walking. People living in neighbourhoods combining commercial and residential land use are more likely to walk for recreation than those in entirely residential neighbourhoods, but mixed land use does not affect walking for commuting, which depends more on distance between home and workplace. To encourage walking, policymakers should create neighbourhoods with a strong job-housing balance, where residents can live and work without travelling further.

### Where can policies for green travel behaviour work best?

To promote greener shopping travel behaviour, policies need to integrate sustainable transit networks and shopping facilities into neighbourhoods, and improve transit connections between residential locations and major shopping destinations. In Beijing neighbourhoods with shopping facilities and sustainable transit networks, people with lower incomes or from small households are most likely to switch to walking, cycling and public transport for shopping. People from wealthier or larger households drive more often and further for shopping, regardless of local amenities. Urban design initiatives to promote greener travel behaviour might therefore be more effective in disadvantaged neighbourhoods than upmarket ones, and when tailored to different income groups and lifestages.

## 2. Inclusive cities

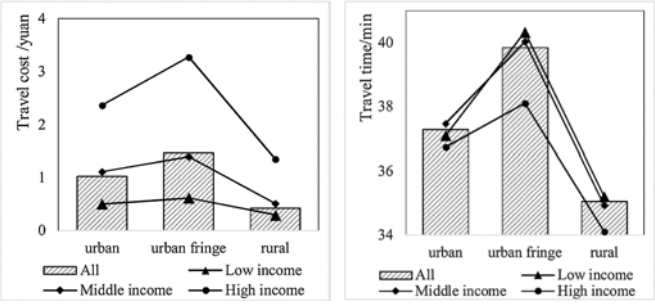
As China's economy has expanded, values informing policy choices have shifted. The mid-1990s national agenda of "let some people get rich first" has been replaced since the 2000s by that of "common prosperity". PEAK's research into how cities emerge shows that beyond a certain economic threshold, social factors gain priority – a shift likely in other fast-developing countries. This requires that governments develop equitable cities, inclusive of all residents.

### What makes urban design inclusive?

Despite recent urban-rural integration initiatives, travel time and cost in Beijing's urban fringe are significantly higher than in urban or rural areas. Urban fringes offer fewer employment opportunities and lack public amenities, including transport, schools, hospitals and roads, meaning residents need to make more and longer journeys than those living elsewhere. To improve integration, policies should create public services and employment opportunities in urban fringes.

**Figure 2:** Average travel cost by income class *(left)*

**Figure 3:** Average travel time by income class *(right)*




**Source:** Zhao, P., and Wan, J. Land use and travel burden of residents in urban fringe and rural areas: An evaluation of urban-rural integration initiatives in Beijing

Research shows that residential segregation is also caused by rental housing prices in Beijing. Moving from the suburbs towards the centre, both social and private rental housing become increasingly less affordable. In the inner city, rental housing is more expensive in areas with good public services. In the suburbs, prices increase the closer housing is to a metro station. To make city neighbourhoods more inclusive, policymakers could tailor social housing provision to different income groups, including through separate pricing mechanisms from the private market. Beijing city centre needs a better supply of affordable rental housing around metro stations, while suburban areas need better rail networks and more affordable rental housing near stations, particularly for tenants sharing accommodation, who are generally less affluent.

## Avoiding the "housing only" trap

People living in Beijing's urban fringe face higher travel times and costs than those in rural or urban areas. The hasty development of these new residential areas to accommodate explosive population growth since 2000 means they lack job opportunities and public amenities. Residents must travel far for work and basic needs – a situation likely in other cities experiencing fast urban expansion. Beijing shows the need for urban planning that includes public service facilities from the start.

## Technology as important as design

PEAK's wide lens includes examining how technological change affects the way cities emerge. Chinese people can now access services such as shopping, healthcare and public transport via smartphone, making disadvantaged groups feel excluded. During the Covid-19 pandemic, use of QR codes to allow people with virus-free status to access public transport made groups such as the elderly feel far less mobile. Such technology favours people already familiar with smartphones, who are relatively affluent, highly educated and young. Policies should therefore include measures such as dual digital and traditional access to services before switching to digital-only approaches, and encouraging manufacture of simpler, more affordable smartphones.

# 3. Migration

Understanding people's movement choices is crucial for policy both responding to and shaping the emergence of urban areas. Economic opportunities are important for attracting migrants, but Chinese urban development has now reached a stage where the "amenity migration" common in more developed countries is shaping where people choose to live.

## Migration beyond economic opportunity

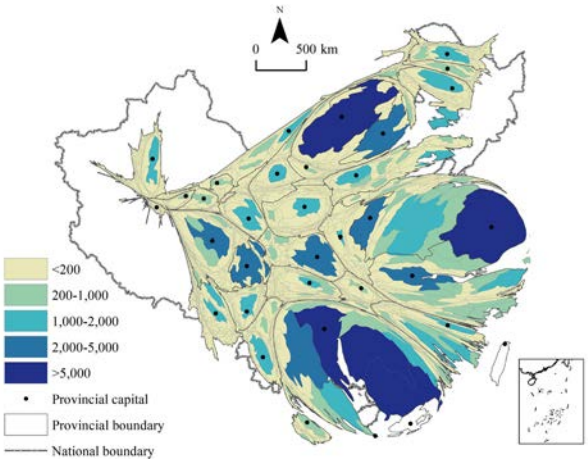
Chinese migrants no longer care solely about economic opportunities in deciding where to move. Urban-urban migrants tend to choose destinations in the same province and dialect area, where many people share their educational background. This creates a vicious circle that makes it hard for some cities to attract a skilled workforce. Policies to develop higher education and vocational training and improve existing residents' educational background could help attract more skilled migrants. Environmental factors are also significant, with air quality a determinant of Chinese migration since 2005.

## Shaping China's current Five-Year Plan

PEAK research findings on what motivates urban-urban migrants' choice of destination helped shape China's 14th Five-Year Plan for National Economic and Social Development (2021-2025). To inform the plan, the state Academy of Macroeconomic Research asked Peking University to write a report on migration trends in China. Widely acclaimed, the report presented PEAK findings on emerging patterns and mechanisms of migration, and was used to formulate the plan. The research team has since been advising China's National Development and Reform Commission on migration policies.

**Figure 4: Distribution of the floating population and their share in the total population.**

**Note:** Area is proportional to the floating population in each county in 2010.




**Source:** Shi, Q., and Liu, T. Glimpsing China's future urbanization from the geography of a floating population.

Successful urban planning understands migration as a continuous process, with onward migrants tending to choose a new destination geographically close to their origins and previous destinations. Migrants often want to return to their home province, but fear limited employment opportunities. Provinces facing dramatic outwards migration could attract return migrants through job-creation policies.

### What makes migrants put down roots?

Urban policies should consider not just how to attract people, but how to retain them. A Chinese migrant stays at a destination for five years on average, and is very likely to move to another in the third or fourth year. This movement is particularly pronounced among those who move within their province or work in manufacturing. In China's megacities, the environment, housing costs and amenities are now crucial to retain migrants. In Beijing, migrants' willingness to stay depends less on economic opportunities than access to medical services. Those with better education and skills, and strong social support in the city are also more likely to stay, although assimilation levels decrease the further migrants live from the city centre. To improve social assimilation, urban policy should provide extra support to people with less education, those who migrate alone and those living in the suburbs.

# 4. Governance

China's urbanisation highlights the need for new governance approaches that accommodate the uncertainty and unpredictability of urban development, rather than imposing rigid, top-down regulations. PEAK's integrated approach includes innovative types of prediction, with new technologies, data forms and methods of analysis creating tools that simultaneously model several urban systems – such as transport, employment and land. Planners can see cities in real time, at a finer scale and from fresh angles – including citizens' perspectives – informing more impactful policymaking.

**Figure 5:** Yearly predicted urbanization by the SLEUTH CA and ML models for Jiaxing.

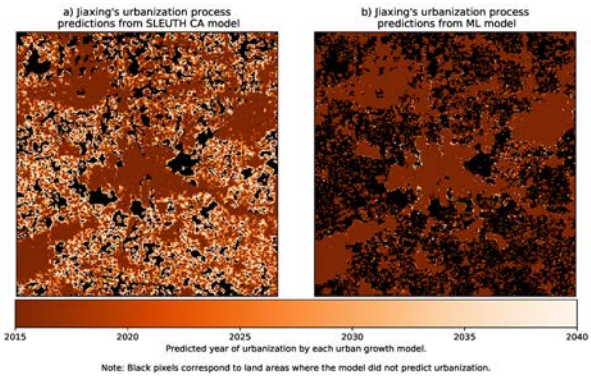
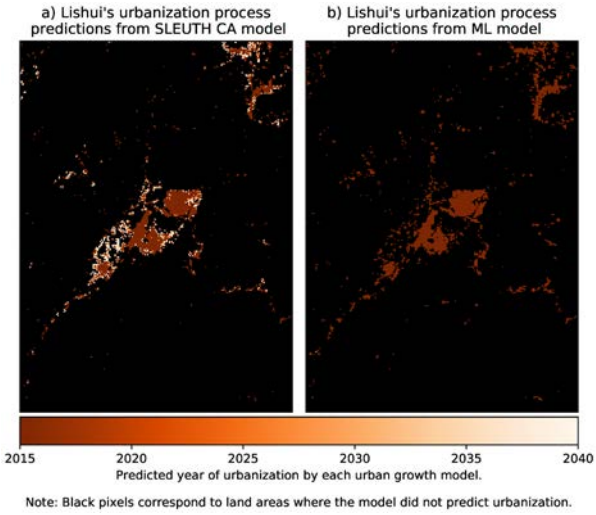



**Figure 6:** Yearly predicted urbanization by the SLEUTH CA and ML models for Lishui.




**Source:** Gómez, J. A., Guan, C., Tripathy, P., Duque, J. C., Passos, S., Keith, M.,... Liu, J. Analyzing the Spatiotemporal Uncertainty in Urbanization Predictions.

## Finetuning urban growth predictions

PEAK's predictive lens strengthens governance by developing more reliable city growth models. Existing models give differing predictions for where and when land will become urban. For the cities of Jiaxing and Lishui, data-driven computer modelling predicts different urban expansion from a model using rules to encode human intuition. A new approach combines different models to improve the accuracy of predictions. By identifying areas where the models predict the same results occurring at the same time, planners can better predict urban expansion. This helps policymakers develop infrastructure requiring long lead times, welfare facilities and commercial clusters.

## Setting realistic boundaries

Chinese urban plans and land-use plans can be inconsistent with each other, while both failing to control urban sprawl. The plans for Beijing's

Changping suburb conflicted over how much urban land would be developed between 2005 and 2020, and the extent to which both plans were followed decreased from the city centre to the periphery. Policymakers could better manage urban sprawl by integrating land-use, urban and other planning systems and focusing on peripheral areas, where urban development proceeds fastest.

China also needs stronger methods for delimiting city growth boundaries, to maximise urban density while protecting arable land. Existing approaches are subjective, defined by local government intentions, land markets and planners' personal experiences. Officials usually delineate land by its physical suitability for development, ignoring local demand for construction land. Through PEAK's predictive approach, researchers developed a system to draw urban growth boundaries for Shenyang, using computer modelling to calculate future demand for urban and rural land use, and combining this with information on village property rights. The system defines land suitable for future development into urban areas, giving policymakers urban growth boundaries that balance with demand for agricultural land.

# 5. Economic growth

PEAK's examination of how cities emerge reveals the significance of contextual variations, not only between different sizes of city, but also between China's newly industrialised inland regions and the more developed coastal regions. This highlights the need for tailored policies to manage urban growth.

## One country, different pathways

Between the 1980s and 2010, the factors driving Chinese urbanisation evolved significantly. While economic development remains an important driver, its role decreased, with services surpassing manufacturing in importance since 2000. The role of enterprises owned by township governments and village collectives also decreased, although that of foreign investment remained significant and stable. To continue urbanising successfully, China should focus on attracting foreign investment, rather than supporting township and village enterprises. Urban policy should also encourage traditional manufacturing industries to shift inland, while promoting technological upgrades and industrial innovation in the more advanced coastal areas.

Economic Development Zones (EDZs) in China's coastal regions already enable greater manufacturing specialisation and allow companies to benefit from tailored infrastructure and larger markets, with a positive effect on employment rates. City size has a similar positive effect on employment growth, with larger cities' consumption market promoting job creation. This effect is most pronounced in China's less developed western regions, where fewer large cities means economic and administrative power are concentrated in each, increasing the effect of city size on the rate of job creation. In coastal cities of similar size, with equal economic weight but no administrative power, the effect of their size on job creation rates is less pronounced. Policymakers in different regions should therefore adopt tailored approaches to increasing the rate of local employment creation. In less developed areas, policy should aim to increase the scale of the local economy and promote urbanisation. In larger cities, administrative centres and coastal regions, policies promoting manufacturing specialisation and service sector diversification will increase rates of employment creation.

> "PEAK's examination of how cities emerge reveals the significance of contextual variations, highlighting the need for tailored policies to manage urban growth."

## Growth with minimal loss of cultivated land

Much previously cultivated land in China's coastal regions has been taken over for EDZs, generating significant economic growth, whereas inland, formerly cultivated areas have mainly been used for infrastructure, generating limited economic returns. Urbanisation has resulted in a severe decline in food cultivation, as migrants to cities retain their former homesteads for security, even when living elsewhere. However, rapidly urbanising contexts require a careful balance between land used for construction and cultivation. To maximise growth while minimising cultivated land losses, policymakers should encourage EDZs inland, and manage rural and urban construction land in a single system. Policies that help migrants integrate

into cities could also make people feel confident enough to relinquish uncultivated rural homesteads, allowing others to produce food after they migrate.

**Figure 7: Numbers of additional Economic Development Zones in China, 1996-2006**

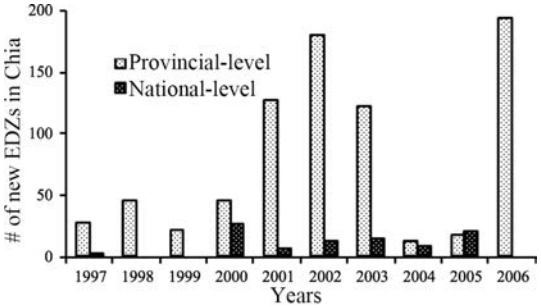
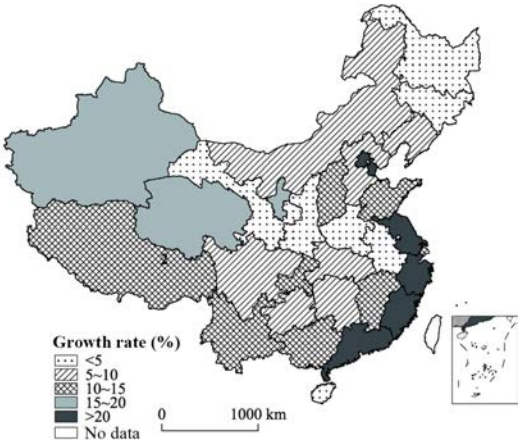



**Figure 8: Growth rate of the land for settlements, industrial and mining, 1996-2006**




**Source:** Liu T, Shi Q J, Wang Y, Yang Y. Urban-rural development and occupation of cultivated land in China: trends, geography, and drivers.

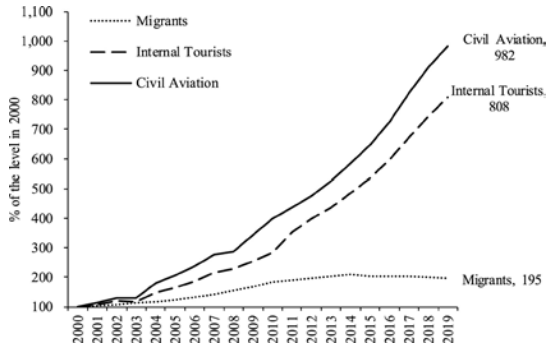
# 6. Health and wellbeing

Building and sharing knowledge across different sectors is key to maintaining healthy urban populations. For example, PEAK's sustainability research linking the built environment and walking also has implications for health policies. Patterns of population movement reveal strategies for disease control, while understanding factors affecting life expectancy is crucial for shaping health policies.

## Containing disease by understanding travel

Rapid changes in population movement typical in developing countries meant Covid-19 spread differently in China from the SARS virus in 2002. Migration is now a nationwide phenomenon, enabling Covid-19 to spread nationally and then globally. Migrants take a wider range of jobs, and their movements within cities are greater and less predictable. This meant ordinary cities were hit harder than expected by the pandemic. Increased tourism and business travel also enabled Covid-19 to spread faster and further than SARS. The Chinese cities first affected by Covid-19 were megacities connected with the epicentre, Wuhan, more for business and tourism than migration. Policymakers should therefore focus infectious disease control measures initially on business travellers and tourists, who are far more mobile than migrants.

**Figure 9: Trends in migration, internal tourism, and civil aviation in China (2000–2019)**




**Source:** Shi, Q., Dorling, D., Cao, G., and Liu, T. Changes in population movement make COVID-19 spread differently from SARS.

> "Rapid changes in population movement typical in developing countries meant Covid-19 spread differently in China from the SARS virus in 2002."

## Directing public spending to raise life expectancy

Beyond infectious disease, factors affecting urban life expectancy include the economy, the environment and public services – to varying degrees across Chinese cities. In less developed western China, urban life expectancy is mainly affected by economic development. In more developed northern and southern regions, public services are key, while in highly developed eastern China, environmental factors are most significant. Policymakers should therefore prioritise different measures in different regions to raise urban life expectancy.

Increasing life expectancy also requires health policies that address physical and mental health in ageing urban populations. The overall disability rate for elderly people in China is 28.5 per cent, but the figure is higher in western China and in rural areas, suggesting that economic development affects disability levels. Cognitive impairment among China's elderly population is similarly linked to lower living standards, with groups most affected including women, low-income groups and people living alone. Depression among China's elderly people is also affected by social and economic factors, along with chronic disease and negative life events. Policies to prevent and manage disability, cognitive impairment and depression among elderly people can therefore achieve most impact by targeting specific population groups, and encouraging approaches at government, society and family levels.

# Recommendations

PEAK research findings highlight the value of a systematic, wide-angled approach to urban policymaking at all levels. This entails using innovative prediction tools, understanding the interactions that shape how cities emerge and the ideas they adopt, and targeting knowledge exchange across sectors.

**The recommendations apply to all actors who shape the urban ambit at all levels and from different angles. In particular, they are aimed at China-focused international agencies and donors, development banks and investors, central and city government planners and departments, urban practitioners, academic and research institutes, and international and non-governmental organisations.**

Each should interpret and apply these recommendations according to their role and context, and encourage colleagues and partners at all levels to adopt these approaches. This will create the coordination needed to optimise policy for sustainable, equitable cities in China and similar rapidly urbanising contexts.

## Establish mechanisms for a collaborative approach across traditional city government silos

Key PEAK insights result from exploring the interactions between systems, from travel behaviour to land use. Others testify to the benefits of cross-sectoral, multi-level policy approaches, such as river-water management across departments from local to provincial levels in China's River Chief System. These findings reinforce the value of building PEAK's collaborative approach into future urban policymaking, planning and research. By creating formal bodies and mechanisms that institutionalise meaningful collaboration – at different levels, across sectors, and between cities and regions – policymakers can create a fully networked system through which to govern and manage sustainable, equitable cities.

## Identify the links and interfaces between systems

Diverse aspects of PEAK research in China show the interdependence between urban systems, yet these systems are traditionally shaped by policies that view them in isolation. The wide-angled PEAK lens reveals links between water use and greenhouse gas emissions; technology and exclusion from transport, or accurate land-use predictions and adequate infrastructure development. State and international policymakers should proactively seek such links between systems, to understand how they impact one another, and leverage these interactions.

## Promote cross-sectoral knowledge exchange and solutions

By embracing and developing knowledge from different sectors and disciplines, policymakers can better understand the challenges they need to address and develop solutions that can be applied across different sectors for maximum effect. PEAK's findings show how targeted knowledge exchange on migration can support epidemiology, for example, or how economic growth can underpin urban health policy.

## Reform planning philosophies to guide and coordinate

PEAK research shows cities as constantly dynamic – in terms of population movement, governance, technology use or the underlying forces driving urbanisation. Despite increasingly advanced data-led prediction, such as PEAK's modelling of demand for urban land, the futures of cities can never be fully known. This means policymakers can best achieve sustainable, equitable cities by replacing urban planning philosophies of rigid regulation and top-down control, with flexible guidance and participatory coordination aimed at maximising efficiency.

### Shift from "attracting people" to "retaining people"

To build inclusive societies and retain workforce talent, Chinese cities should address the needs of newly arrived migrants. PEAK research shows that many migrants now seek urban amenities and quality of life, above economic gain. Cities therefore require policies to strengthen public services, reduce living costs and improve the environment. Policymakers should also encourage family migration and communities with active local-migrant interactions, to help migrants assimilate.

### Adopt city-specific policies and measures

PEAK findings show the importance of policies that consider local contexts, even within a country. Different urban environments, at different stages of development, need different approaches and technologies . Coastal China's cities, for example, resemble those in developed countries, and require industrial upgrading and service sector support, while inland regions are similar to developing countries, and need support for manufacturing and low-skilled industries.

### Use the PEAK approach to investigate complex urban issues

The PEAK approach is particularly useful to underpin planning on complex, multi-faceted urban issues. It can be used to diagnose barriers and enablers to inclusive, sustainable development at city, regional and national levels (such as rigid, top-down planning approaches) and design integrated development programmes which draw on various knowledge sources, including local communities. International, regional and national investment partnerships and coordination mechanisms should support such programmes, to optimise development of sustainable cities, inclusive of all their people.

## Conclusion

PEAK's research offers specific insights for policymakers to act on, while also showing the value of a cross-sectoral, collaborative approach to urban policymaking. By revealing how different urban systems interact to create the overarching city system, this allows policymakers to respond to the realities of cities as they emerge, rather than trying to mould them into forms that ignore the underlying drivers of urbanisation.

### Building on the PEAK approach in China

This report highlights leading insights from PEAK's new ways of understanding of the city as a system of interacting systems. Given the rapid speed and deep uncertainties of urban development in China, planners need advanced technologies and data analytics to create dynamic models that predict urban futures – from patterns in people's daily lives, to how cities as a whole emerge.

This would allow policymakers to see how China's cities challenge traditional concepts in urban research and bring new insights to support sustainable urban futures. China can then share knowledge from its own urbanisation process with similar centres of development, while seeking to learn from urban experiences in other countries.

### From individual lives to global sustainability

As urbanisation increases and cities become critical to our planet's future, PEAK's collaborative approach gives international institutions, donors and investors a more powerful lens through which to see the interactions that generate new urban characteristics. It also provides the global policymaking community with new tools to harness and optimise urbanisation processes, helping cities fulfil their role in achieving the Sustainable Development Goals.

By creating interconnected networks of knowledge and action, policy approaches can deliver cities that are environmentally, economically, institutionally and socially sustainable, and inclusive of all their people.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For a wide range of project overviews, journal articles, policy and research briefings, and blog discussions, visit our China research pages, including:

• Internal migration and urbanisation in China

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• Mega-city region and metropolitan area development

**https://www.peak-urban.org/project/mega-city-region-and-metropolitan-area-development**

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**https://www.peak-urban.org/project/urban-land-use-and-housing-china**

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[8] In China, these actors include, for example, the Development Research Centre of the State Council of China and the Beijing Municipal Institute of City Planning and Design; central and municipal government departments including transport, rural development, education and health; the Chinese Academy of Social Sciences; UN Habitat, the Urban Planning Society of China and Peking University; the Asian Development Bank, and urban practitioners such as Tsinghua Urban Planning and Design Institute.

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2. Fostering the next generation of leaders that draw on different perspectives and backgrounds to address the greatest urban challenges of the 21st century;

3. Growing the capacity of cities to understand and plan their own futures.

In PEAK Urban, cities are recognised as complex, evolving systems that are characterised by their propensity for innovation and change. Big data and mathematical models will be combined with insights from the social sciences and humanities to analyse three key arenas of metropolitan intervention: city morphologies (built forms and infrastructures) and resilience; city flux (mobility and dynamics) and technological change; as well as health and wellbeing.

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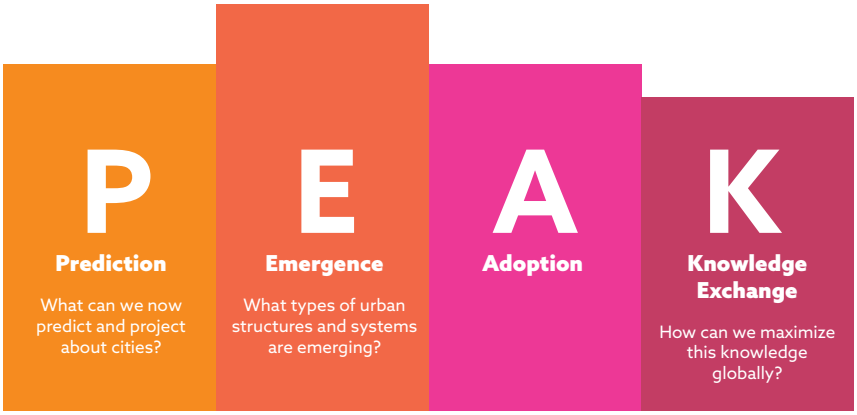


**The PEAK Urban programme uses a framework with four inter-related components to guide its work.**

First, the sciences of **Prediction** are employed to understand how cities evolve using data from often unconventional sources.

Second, **Emergence** captures the essence of the outcome from the confluence of dynamics, peoples, interests and tools that characterise cities, which lead to change.

Third, **Adoption** signals to the choices made by states, citizens and companies, given the specificities of their places, their resources and the interplay of urban dynamics, resulting in changing local power and influencing dynamics.

Finally, the **Knowledge** component accounts for the way in which knowledge is exchanged or shared and how it shapes the future of the city.

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