

Cities & regions

Space Syntax



Contents

Introduction 5

Approach 7

Strategic planning & design 11

Performance forecasting 34

Contact us
81 Rivington St
London
EC2A 3AY

+44 20 7400 1320

london@spacesyntax.com
www.spacesyntax.com

Space Syntax © 2026
Cities & regions

Introduction | Space Syntax

Thriving life in buildings & urban places

We are global leaders in spatial intelligence

- helping organisations harness the power of spatial connectivity
- driving the long-term performance of built assets
- de-risking investment decisions
- delivering social, financial & environmental resilience.

We craft compelling future visions

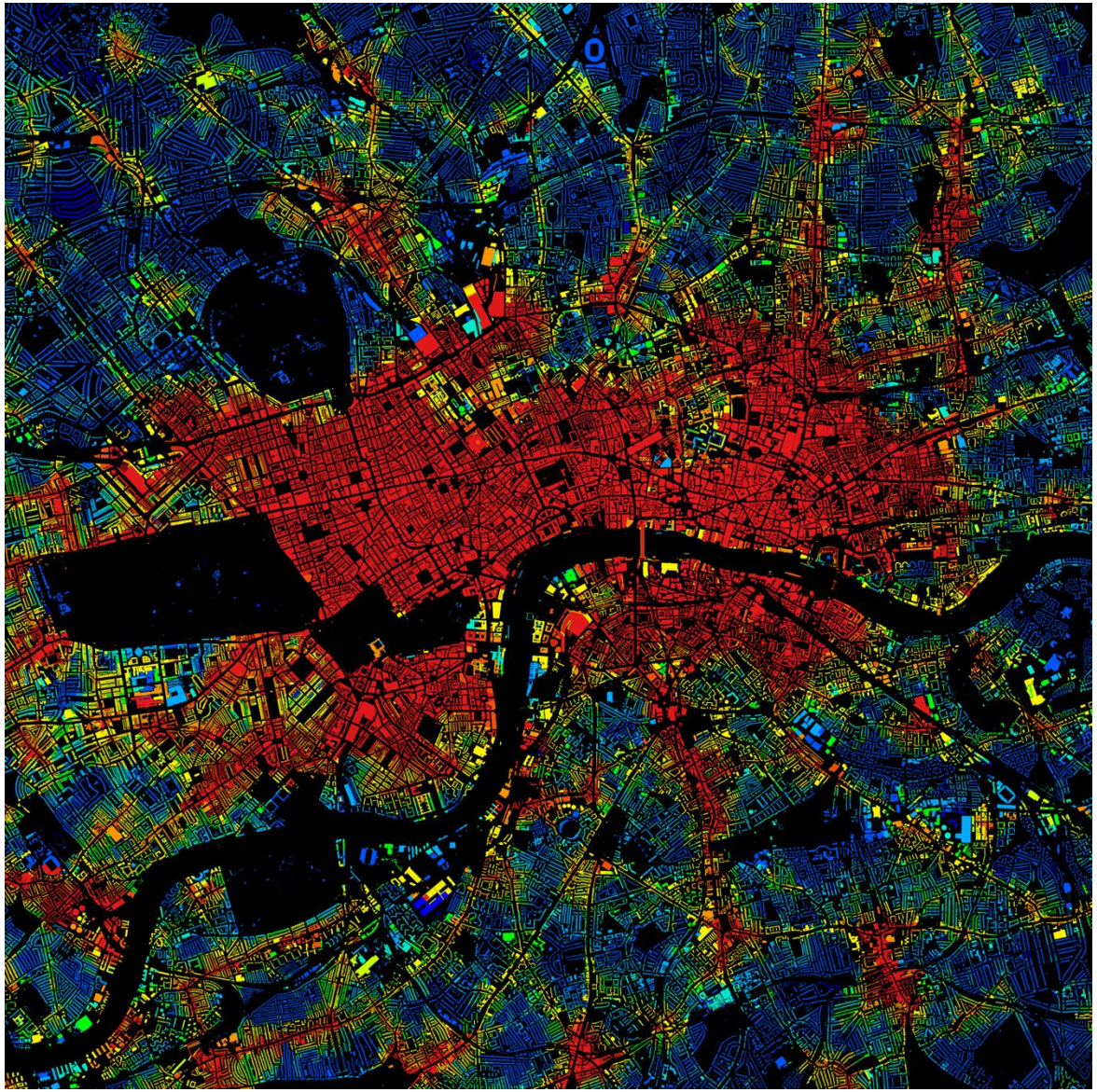
- transforming data-driven insights into development actions
- providing strategic planning & design advice from concept to detail
- identifying the essential features of sustainable, liveable & healthy futures
- quantifying long-term impacts to facilitate decision-making.

We build the capability of our clients & communities

- delivering online & in-person training packages
- developing digital tools
- enhancing the productivity of planners, designers & analysts.

We are trusted, experienced & expert

- offering valued advice & insights to investors, developers, designers, owners & operators since 1989.



Space Syntax © 2026

Introduction | Cities & regions

National, regional & urban planning strategies to create better performing places.

We work with public and private sector organisations to explain how built and natural assets interact with demographic characteristics to shape patterns of daily activity and, in turn, local economic vitality, resident health and carbon emissions.

By harnessing the power of digital modelling, we help create the right balance of spatial connectivity, land use attraction and mobility. In doing so, we give strategies a better chance of delivering what they set out to achieve, maximising value and de-risking investment decisions.

Our spatial intelligence approach

We provide expert advice in the following key areas:

Appraisal & benchmarking

Strategic design

Performance forecasting.



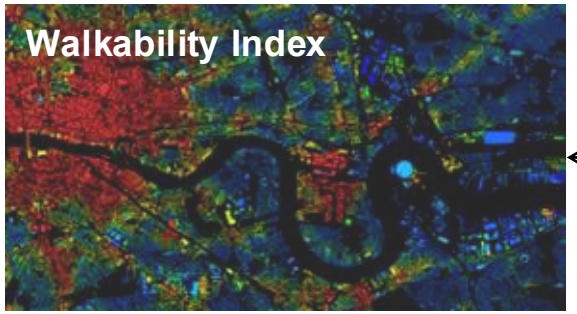
Approach | **How we answer our clients' questions**

- **How do location & spatial connectivity affect current patterns of mobility & transport carbon?**
- **Which planning scenario will perform best?**
- **Where should urban growth be concentrated?**



Spatial Network Model
- Street network

- **By how much will access to schools, shops & community facilities increase?**
- **What is the best route for new public transport and where should transit stops be located?**
- **Where are people more or less at risk of obesity & loneliness?**



Integrated Urban Model
- Spatial Network Model
  +
- Landuse data
- Public transport data
- Density data
- Environment data (topography, hydrology, biodiversity)

- **How should transport and land use be coordinated to reduce transport carbon?**
- **What are the transport carbon implications of different planning scenarios?**
- **How is land value influenced by spatial connectivity, land use & transport infrastructure?**



Multivariate Statistical Model
- Spatial Network Model or Integrated Urban Model
- Census data
- Socioeconomic data

Space Syntax © 2026

Approach | **Appraisal & benchmarking**

We explain how urban form, the environment and population interact to shape patterns of daily activity and long-term outcomes.

We analyse regions, cities and sites to build multi-dimensional profiles which explain how characteristics or location and place relate to population change, economic activity, mode shares and carbon emissions.

Appraisal

- Confirmation of development objectives & summary of spatial requirements
- Collection & analysis of built environment system data
- Collection & analysis of daily activity data
- Summary of relationships between site location, current conditions & activities
- Suitability of site to deliver development objectives.

Benchmarking

- Identification of comparator cities/developments that deliver development objectives
- Analysis of comparator spatial characteristics
- Benchmarking of project location against comparators
- Validation of development objectives against project site characteristics.



Space Syntax © 2026

Approach | **Strategic planning & design**

We shape spatial strategies to deliver development objectives and positive long-term outcomes.

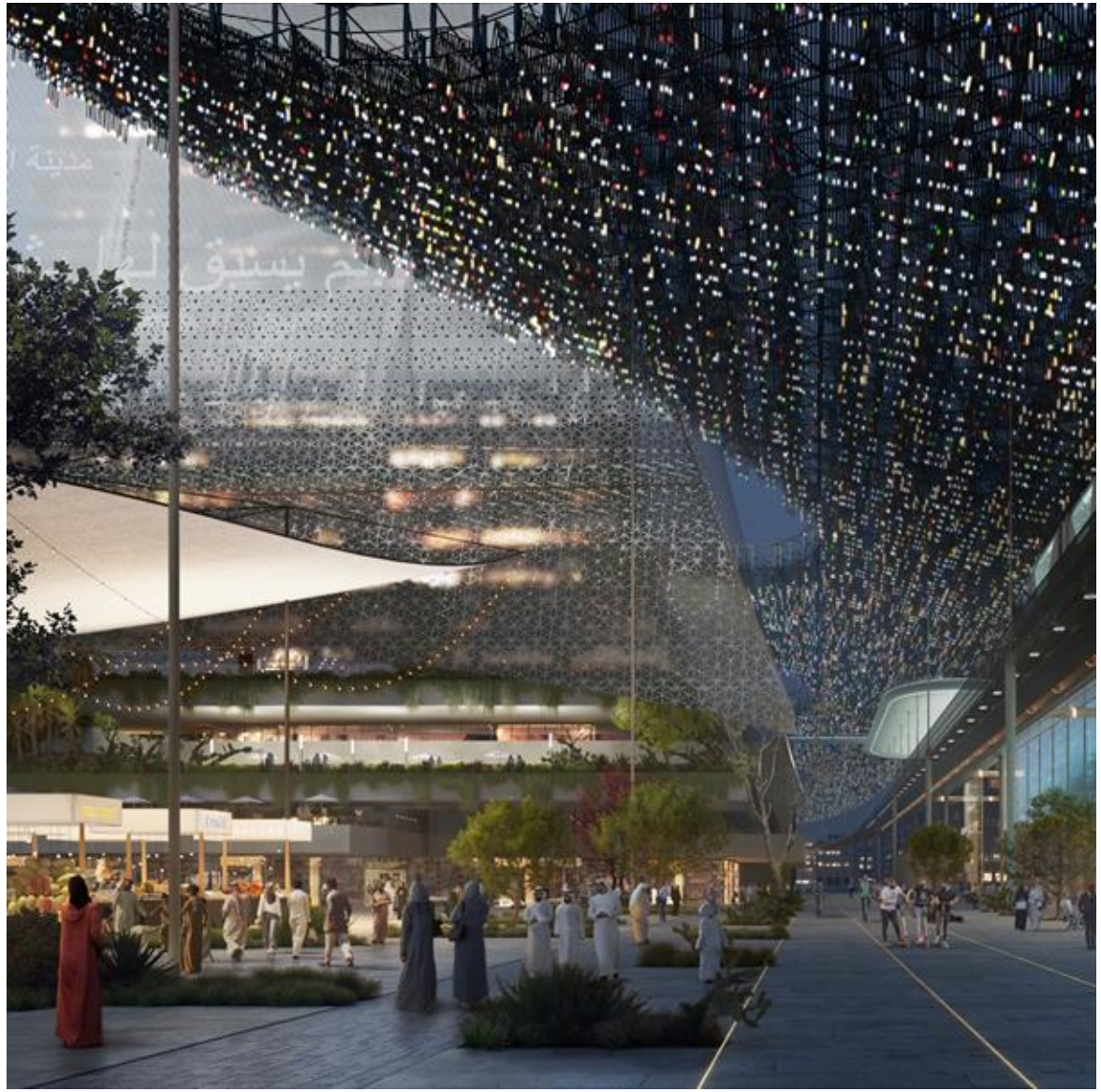
We create concept designs that set out spatial layouts, land use, density, massing distributions & open space.

Spatial strategy

- High level allocation of population & employment growth
- Integration of growth with spatial & mobility infrastructure.

Reference plan

- Spatial framework to coordinate development
- Defines street centrelines, street typologies, urban blocks, key edges, land use & density allowances.



Approach | **Performance forecasting**

We de-risk strategic design decisions made early in the development process.

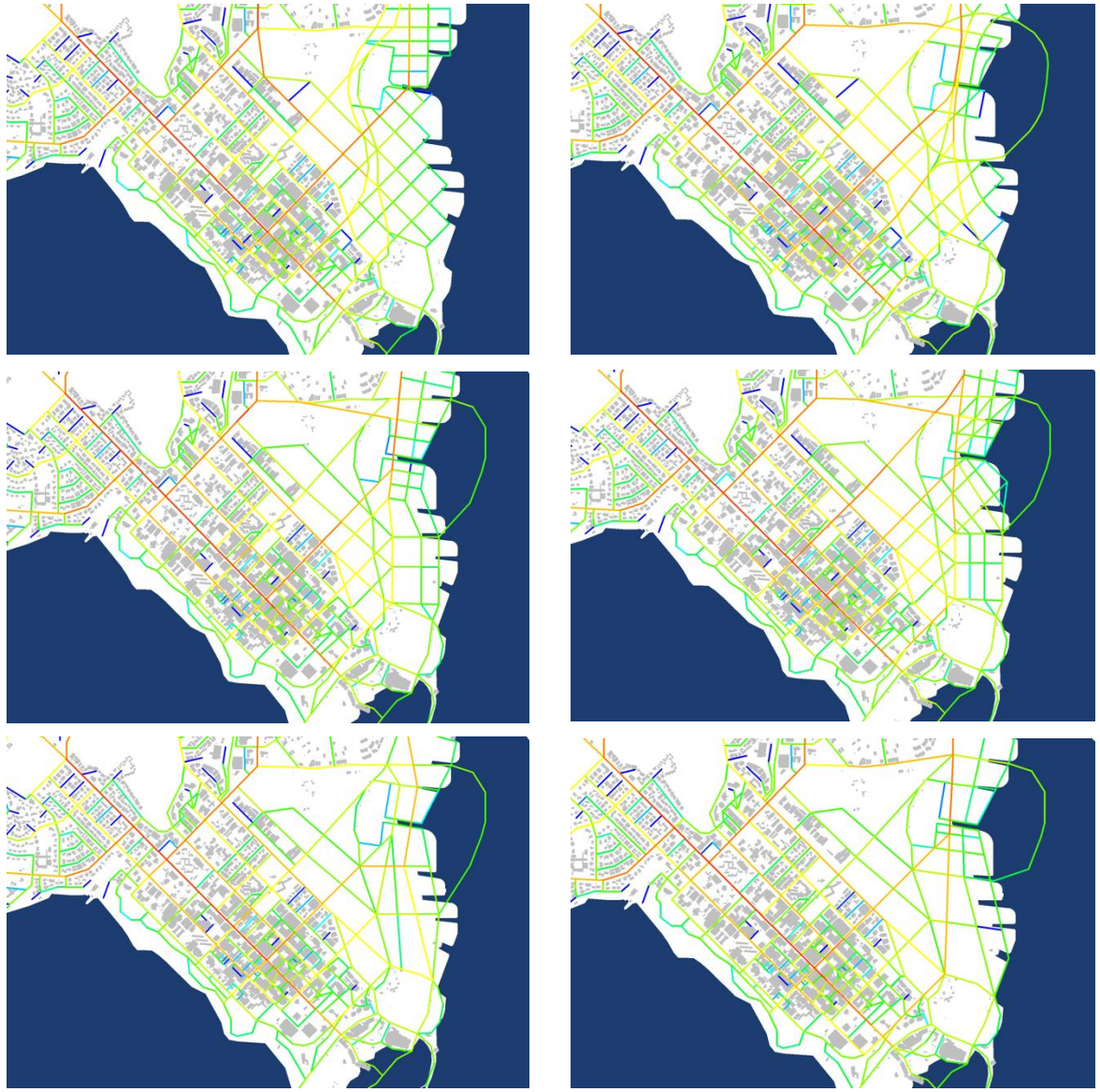
We rapidly test design options by measuring their impact, explaining whether they work as intended & advising how they can be further improved.

Performance testing

- Rapid testing of options during design development
- Forecast modelling of final design impacts.

Strategic design advice

- Feedback on design performance
- Detailed advice on improvements to spatial layout
- Advice on location of land use, density, massing & open space.



Space Syntax © 2026

Strategic planning & design

Space Syntax © 2026

Case study | **Regional Plan** Aseer, KSA



A multi-domain analysis of the Aseer region to better understand how environmental conditions have shaped patterns of settlement growth, informed the development of sub-regional economic systems & population change.

Client
Aseer Development Authority

Year
2024-25

Role
Spatial Strategy & Expert Advisor

Team
Space Syntax
MIC-HUB
Climate Cartographics

Key Features
Regional spatial analysis
Population growth mapping

The opportunity

Space Syntax was commissioned by Aseer Development Authority (ASDA) to support their Regional Plan process.

The Aseer region covers a large area, and includes environmental conditions which include sea front, mountains, forest and desert. A series of settlements, which range from around 1m people to under 100, have grown in the region and are interconnected in smaller sub-regions.

During the last two decades there has been population decline in many settlements which has increased in the last ten years. This decline reduces the strength of local economies and makes delivery of public services more difficult.

Cities in the region include a rich variety of heritage buildings which are unique across the Arabian peninsula.

The Regional Plan needs to understand these dynamics and their relationship to place in order to understand where there will be demand for growth, improved infrastructure and services, and simultaneously where areas will need additional support.

Space Syntax © 2026

Case study | **Regional Plan** Aseer, KSA

Our contribution

We carried out multiple regional scale spatial analysis that combined data on the environment, climate, demography, economy, urban form and mobility patterns.

Our analysis was able to identify how settlements which had historically developed in clusters around proximity to the wadi network, or along pilgrimage routes through the mountains, formed distinct sub-regions with differences in their urban form, and these consistently related to recent patterns of population change.

Settlements that have seen the highest population decline were both below a population threshold of 200k people, but are also in less spatially integrated sub-regions, with less diverse environmental conditions.

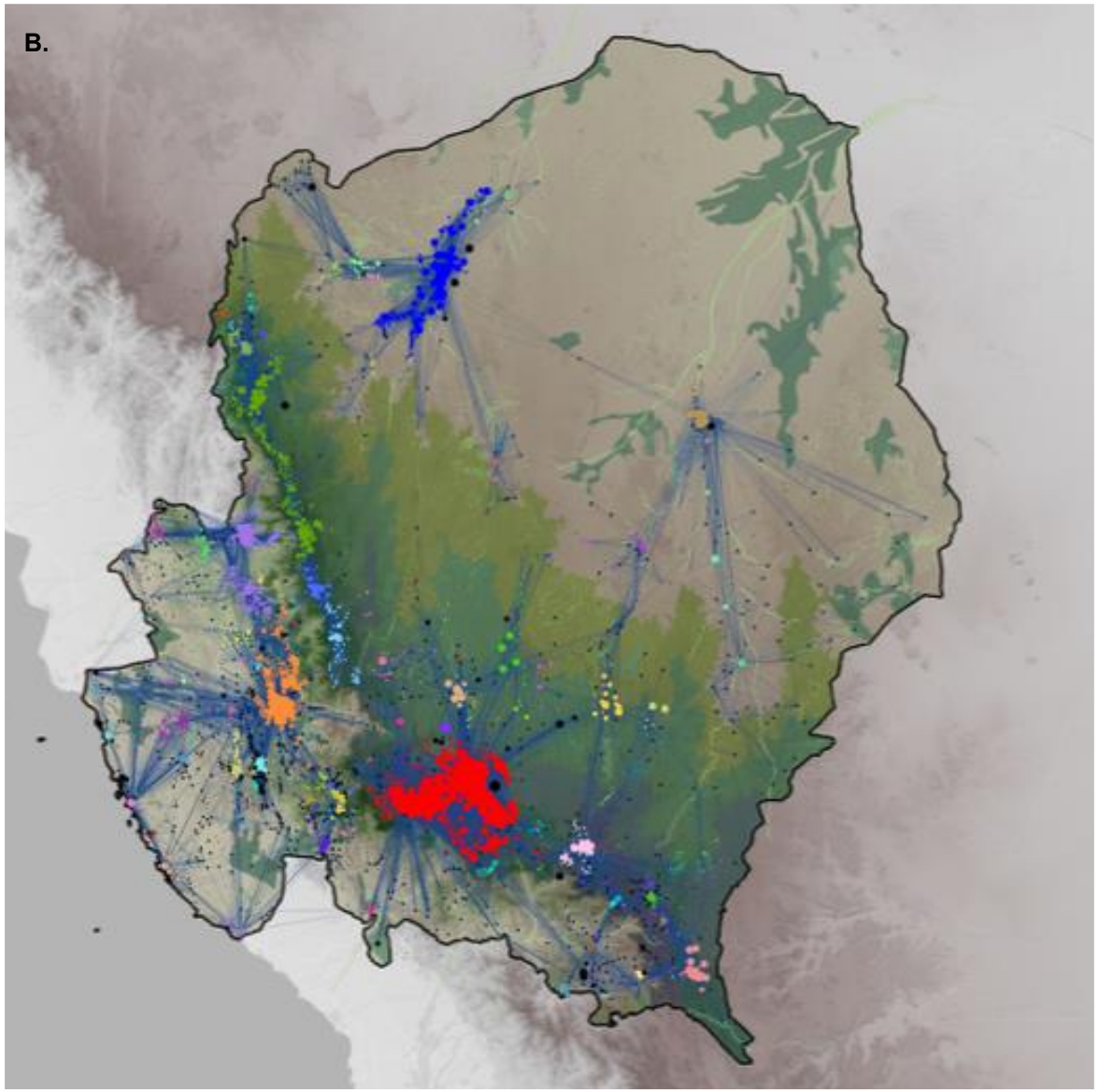
The largest agglomeration in the region, Abha/Khamis Mushait is on the intersection of routes and wadis, acting as the major centre for the region and experiencing growth.

Settlements in the mountains have developed as smaller individual towns but have the spatial characteristics that enable them to work as an interconnected sub-region.

The outcome

Our work had multiple impacts:

- We contributed to the Aseer vision, which is based on preserving its environmental assets and working with unique built heritage while also harnessing opportunities to grow the economy through tourism.
- The analysis was used to explain patterns of growth across the region, to define a hierarchy of existing settlements and shape the way that growth was allocated in the Regional Plan. This makes it more likely that planning decisions will respond to the characteristics, local economies and important regional factors.
- Based on the analysis a series of sub-regions were identified. In these areas, integrated place-based strategies were developed linking local economies and skillsets to locational opportunities.



A. *Central Abha, the capital of the Aseer region (previous page).*

B. *Analysis of Aseer showing environmental characteristics, settlement clusters and commuting patterns.*

Space Syntax © 2026

Case study | **Mountain strategy** Aseer, KSA



Integrated place-based strategy to help grow the economy of the mountains around its natural assets & skillsets.

Client
Aseer Development Authority

Year
2024-25

Role
Spatial Strategy & Expert Advisor

Key Features
Place profiling
Integrated development strategy

The opportunity

Working for the Aseer Development Authority (ASDA), we were asked to develop spatial strategies for sub-regions within Aseer.

The mountain area includes a sharp topographic change of around 3,000m, linking coast in the west to desert plateau in the east.

The mountains align with a pilgrimage route to Makkah, and many small settlements have grown along these historic routes. Rich soil combined with a cooler, wetter climate create conditions that support agriculture and large areas of the mountains were terraced hundreds of years ago.

Settlements in the mountains are home to unique heritage buildings, some of which have fallen into disrepair.

In the last two decades, populations in some settlements have fallen as younger people have moved to larger cities to access higher education, a wider range of jobs, and a different lifestyle.

Our strategy for the area aimed to work with the unique characteristics of the region to support new economic activities that could reverse population decline and improve standards of living.

Space Syntax © 2026

Case study | **Mountain strategy** Aseer, KSA

Our contribution

We developed integrated strategies that linked local characteristics of place to wider regional economic strategies that focus on alternative forms of tourism, including Agri-, Eco-, Adventure- and Heritage-tourism.

Combining data sets on soil quality, bio-diversity, built form, spatial connectivity, demography and economy we created multi-dimensional profiles of each settlement.

Profiles were used to identify where there were opportunities for specific types of tourism, or specific forms of agricultural practice, and in turn these influenced a set of strategic interventions.

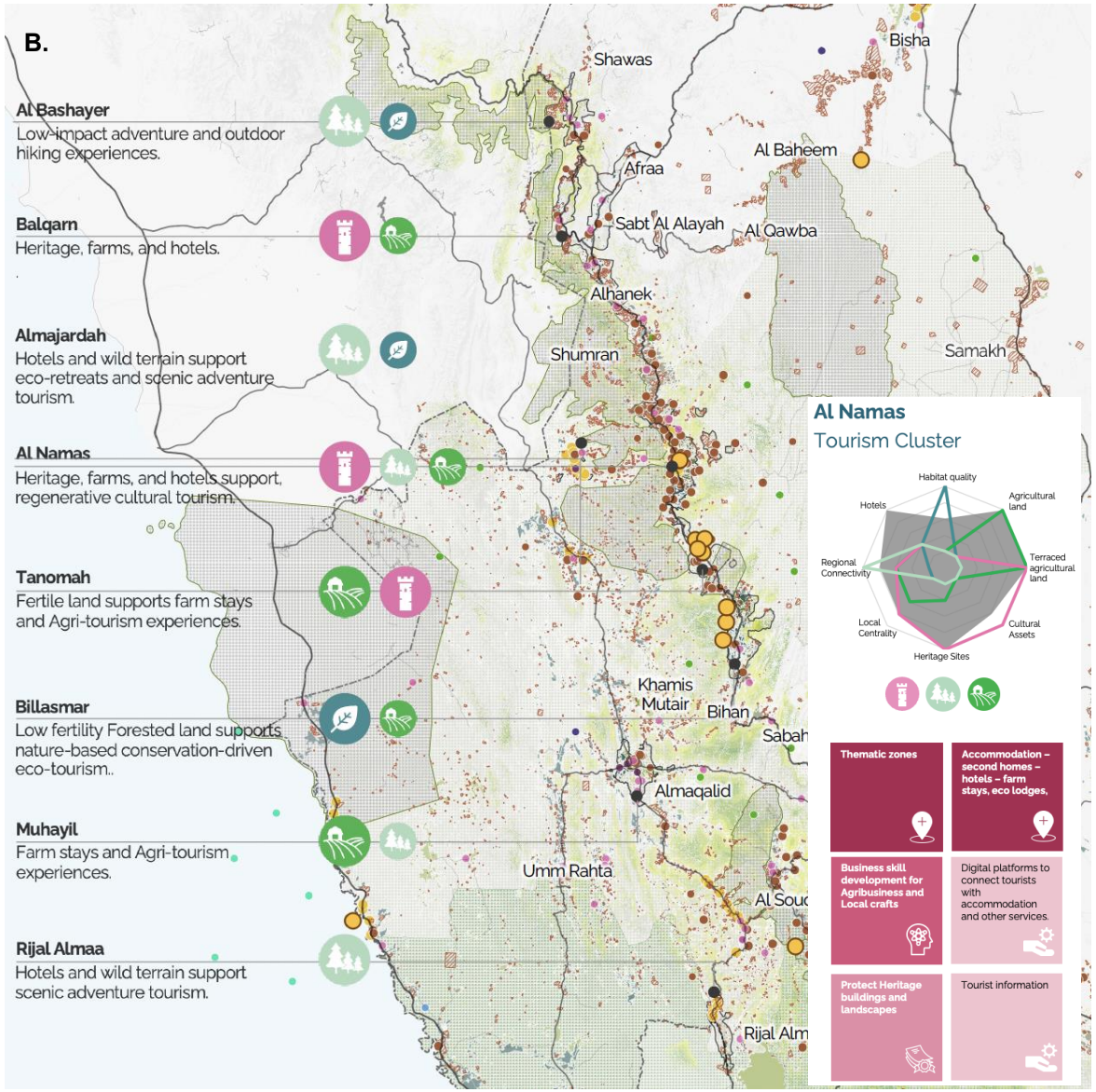
Profiles showed that while some areas may need spatial intervention, other areas already had the required conditions in place and what was needed was a non-spatial intervention to unlock this potential.

Our strategies therefore combined multiple types of intervention, including:

- Spatial
- Capacity & Capability
- Policy & regulation
- Management & Operation

The outcome

Our place-based strategies went on to inform decisions in the Regional Plan about allocating population and employment growth to specific areas of the region, as well as informing decision on the infrastructure and support programmes also required.

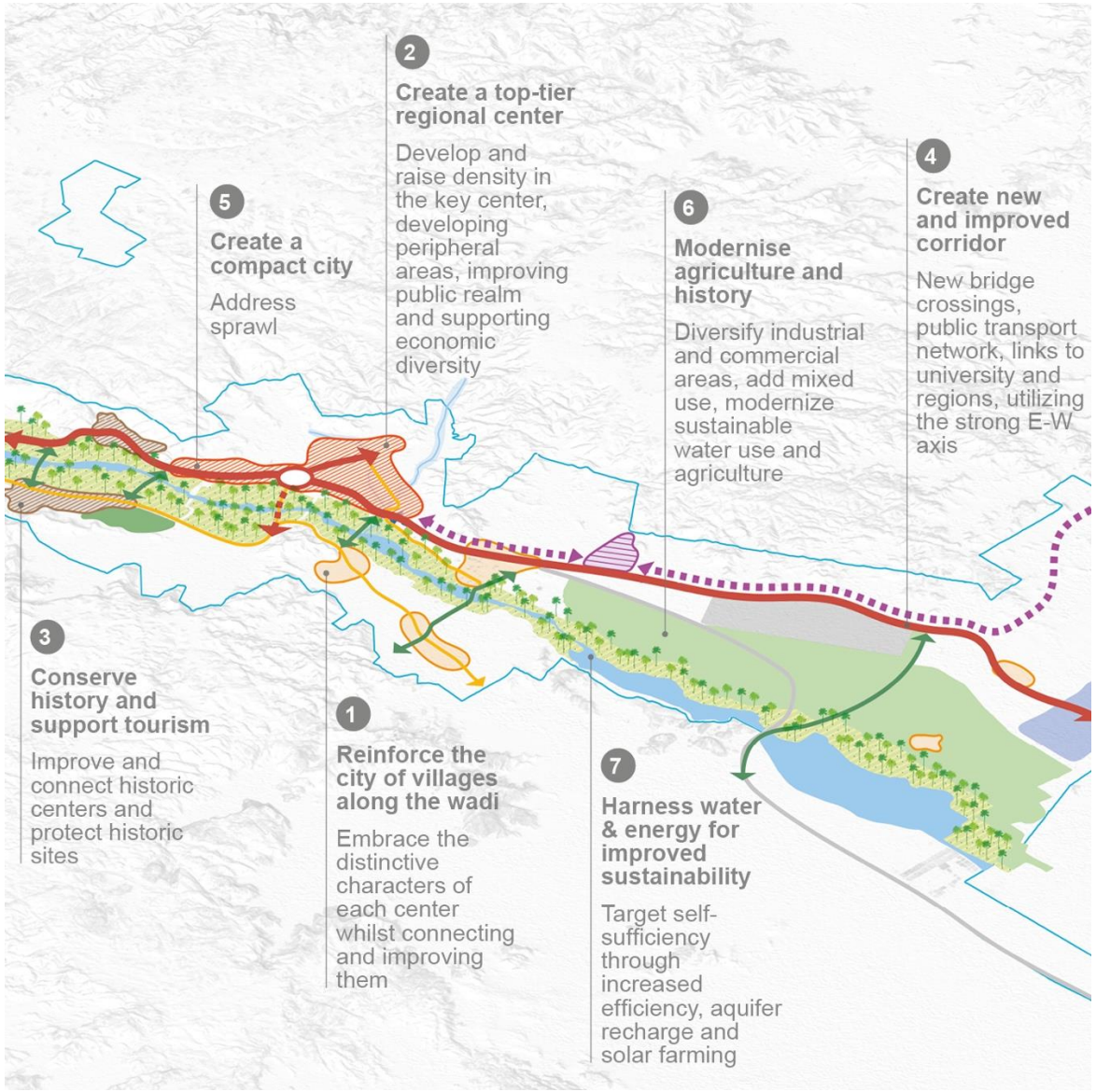


A. *Heritage landscapes combining traditional architecture and agricultural practices (previous page).*

B. *Summary analysis of the mountain area matching alternative forms of tourism to specific locations.*

Space Syntax © 2026

Case study | **Reference plan** Najran, KSA



An evidence-based vision & strategy to transform Najran into a compact, connected & culturally vibrant regional hub by 2040.

Client
Ministry of Municipal Rural Affairs and Housing

Year
2022-24

Role
Lead designer

Team
Space Syntax
SALFO
TPA
Pegasys

Key Features
Strategic design
Urban Baseline Study
Option Testing

The opportunity

Najran stands at a pivotal point in its development: a city with over 4,000 years of history, defined by its unique landscape of villages strung along the wadi, rich agricultural tradition and cultural heritage sites.

Its strategic location on historic trade and pilgrimage routes and its proximity to regional centers such as Jazan and Riyadh, offers untapped potential to become a thriving hub for tourism, logistics and public services.

However, the city currently suffers from fragmented urban form, sprawling low-density development, underutilized land and severe reliance on private vehicles—all of which strain infrastructure, limit accessibility and inhibit economic interaction.

With a projected population increase from 380,000 to 490,000 by 2040 and the need to create over 30,000 new jobs, Najran faces a critical opportunity: to shift from reactive, peripheral growth toward a proactive, compact and sustainable urban model.

This transformation requires rethinking how land is used, how people move and how heritage and innovation can be woven together to create a resilient, liveable city that supports both Najran's residents and the wider region that the city serves.

Space Syntax © 2026

Case study | **Reference plan** Najran, KSA

Our contribution

Najran 2040 provides an evidence-based strategic framework to reshape the city. Using digital modelling and scenario analysis, the plan identifies clear spatial strategies — such as a Primary Development Boundary definition — to intensify growth in the city core, raise densities and improve walkability.

The plan introduces flexible housing models near jobs and infrastructure, retrofits and intensifies underutilized land and delivers coordinated upgrades to mobility networks, social infrastructure and economic assets.

Heritage and cultural identity are embedded throughout, with plans to revitalise historic sites and enhance public space through sustainable, context-sensitive design. Sustainability is addressed with ambitious water and energy strategies, including solar infrastructure and climate adaptation.

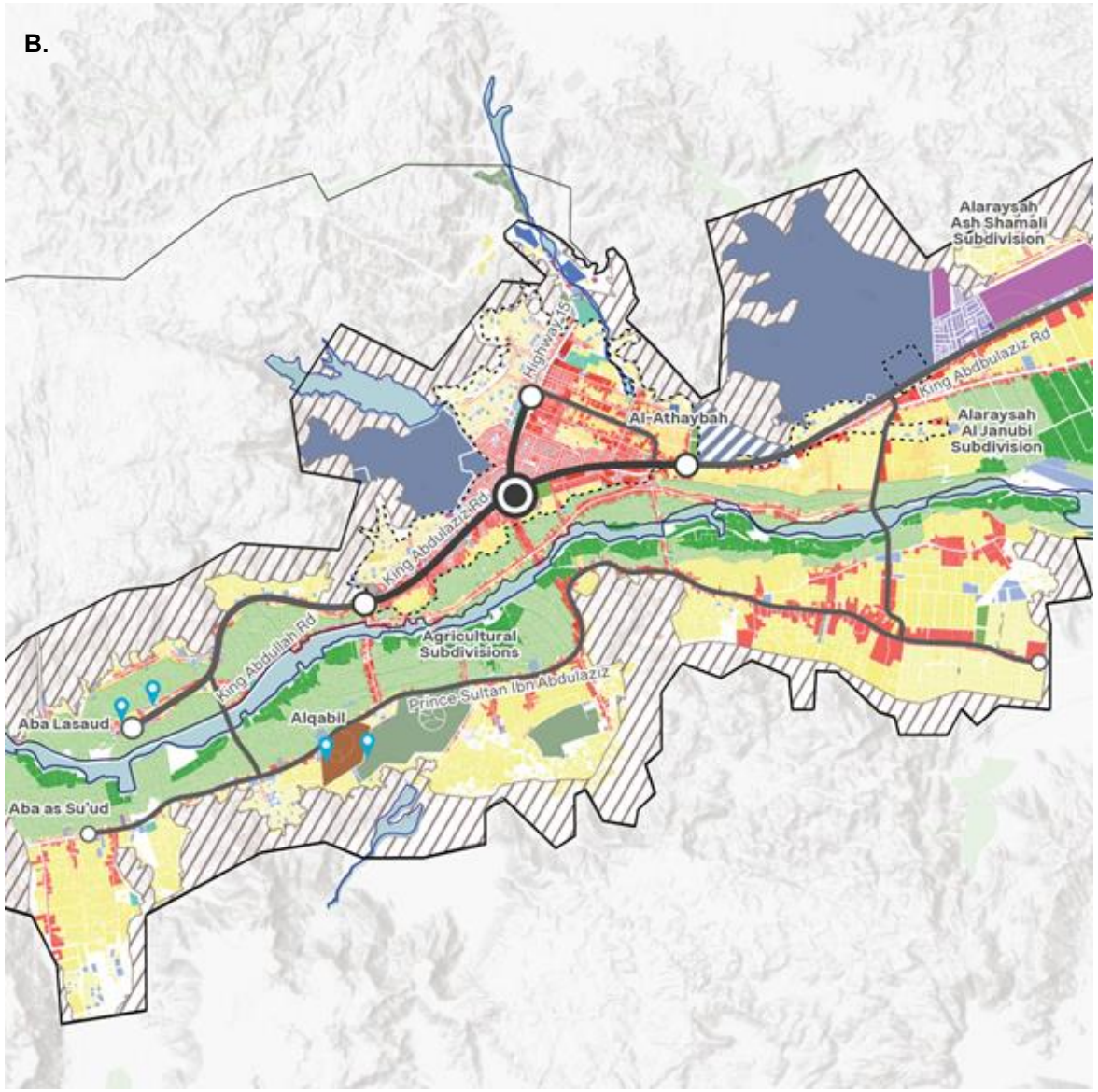
The outcome

Najran 2040 envisions a compact, connected and culturally vibrant city that can support 490,000 residents with a greatly improved quality of life.

Projected outcomes include a 614% increase in walkability in new housing areas, 26% better access to education, and significant gains in healthcare accessibility. Economic diversification is embedded, with over 30,000 new jobs planned across tourism, green economy and innovation sectors.

The plan also lays out a pathway for resilient infrastructure, a 2040 net-zero carbon stretch target and revitalised mobility networks reducing car reliance. Delivered through strategic governance, pilot projects and public-private collaboration, Najran 2040 positions the city as a model of integrated urban development in the region.

B.



A. *Key moves capturing the vision and outlining notable interventions across the city (previous page).*

B. *Extract of Najran 2040 Local Plan showing Area Types.*

Case study | **2050 growth plan** Astana, Kazakhstan



A competition-winning Urban Growth Plan, created using an AI-driven design process, to become a global benchmark for liveability, resilience & cultural vibrancy.

Client
Astana GenPlan

Year
2019-2020

Role
Masterplan lead

Team
Expedition Engineering
Gustafson Porter + Bowman
MIC-HUB

Key Features
Baseline study
Growth Strategy

The opportunity

Astana, capital of Kazakhstan, was forecast to significantly increase its population by 2050. Rapid growth, extreme climate, fragmented urban form and car-dominated development have challenged the city's ability to create cohesive, people-friendly places.

Space Syntax was invited to take part in an international design competition to address these issues and produce an Urban Growth Plan for Astana.

We led a multi-disciplinary team including Expedition Engineering, Gustafson Porter + Bowman and Smart Growth Associates, to develop a proposal to accommodate this growth, address existing problems in the city and create a flexible plan that could be implemented over time to create a city that prioritises people.

Space Syntax © 2026

Case study | **2050 growth plan** Astana, Kazakhstan

Our contribution

After analysing the city, our approach was set out in three steps:

- first, to **improve** the city for the people already living there
- second, to **intensify** it, using infill development to create the densities and diversities of land use required to create active, engaging cities
- third, to **grow** the city to accommodate further population increase.

We developed and applied generative algorithmic processes (AI) to create a plan that set in place the fewest number of most important urban systems – street centrelines, urban blocks, plots and plot allowances. This approach brings flexibility, in that development can speed up or slowdown in response to wider economic conditions.

To generate street centrelines, we applied multiple generative and analytic techniques, which included creating 'desire lines' across the site using agents, bundling desire lines together to create primary route centrelines, then developing a network of secondary centrelines, which created urban blocks of different sizes. These generative processes set in place the spatial conditions found in cities that have developed over many years and which are associated with more walkable and liveable places.

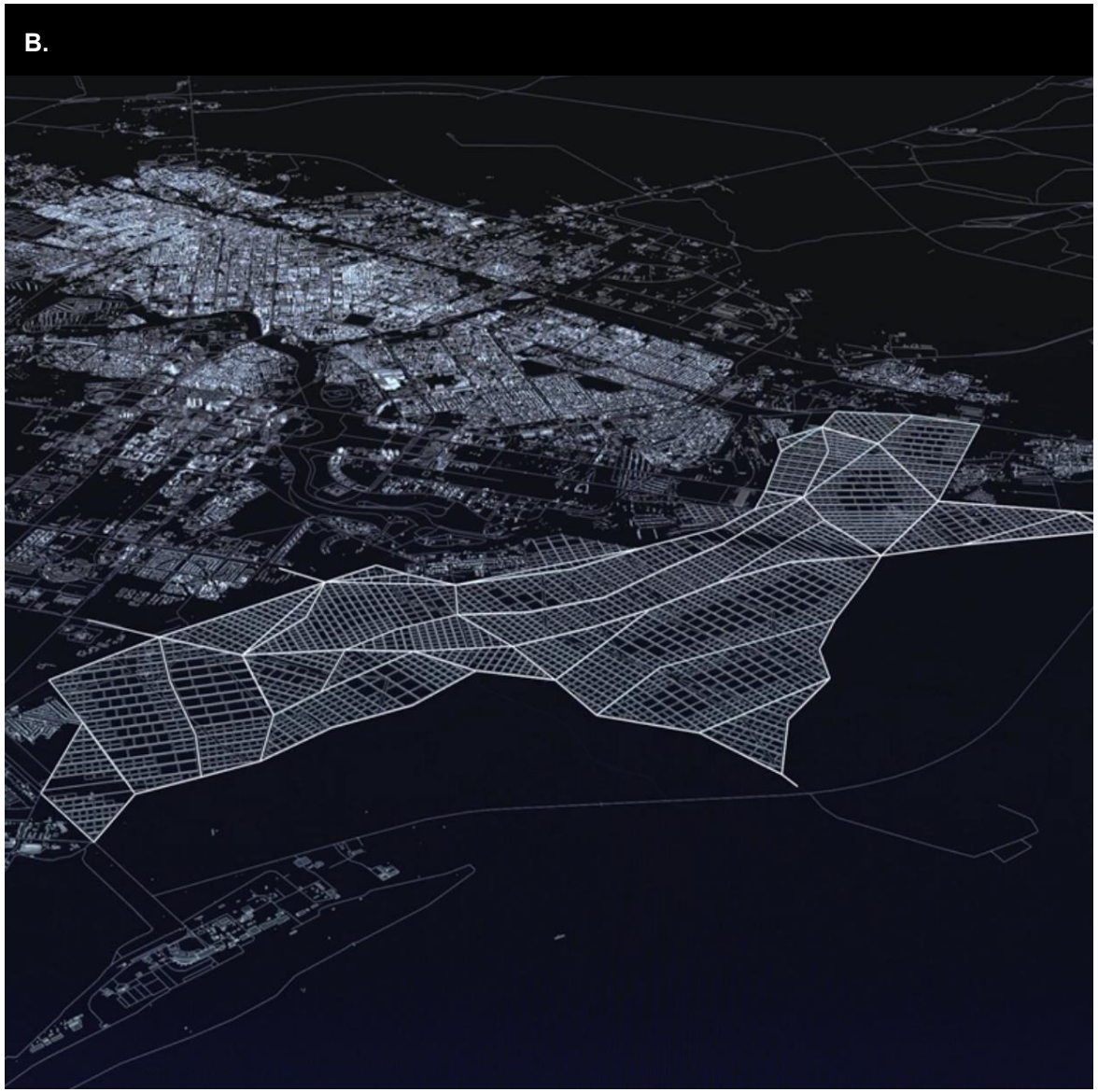
Analysis of the resulting street network allowed us to allocate land uses and densities to plots across the extension area. Within the existing city, smaller-scale urban block based studies identified how public realm improvements could be made, as well as illustrating how infill development could be applied to intensify the existing use of the city. The plan was phased over thirty years to show how the plan could be implemented.

The outcome

By upgrading, intensifying and extending in a phased and coordinated way, the Urban Growth Plan positions Astana to become a global benchmark for liveability, resilience and cultural vibrancy — celebrating its identity while preparing confidently for the challenges and opportunities of the future. Space Syntax's submission won the international design competition and we were subsequently commissioned to produce the 2030 Astana Masterplan.

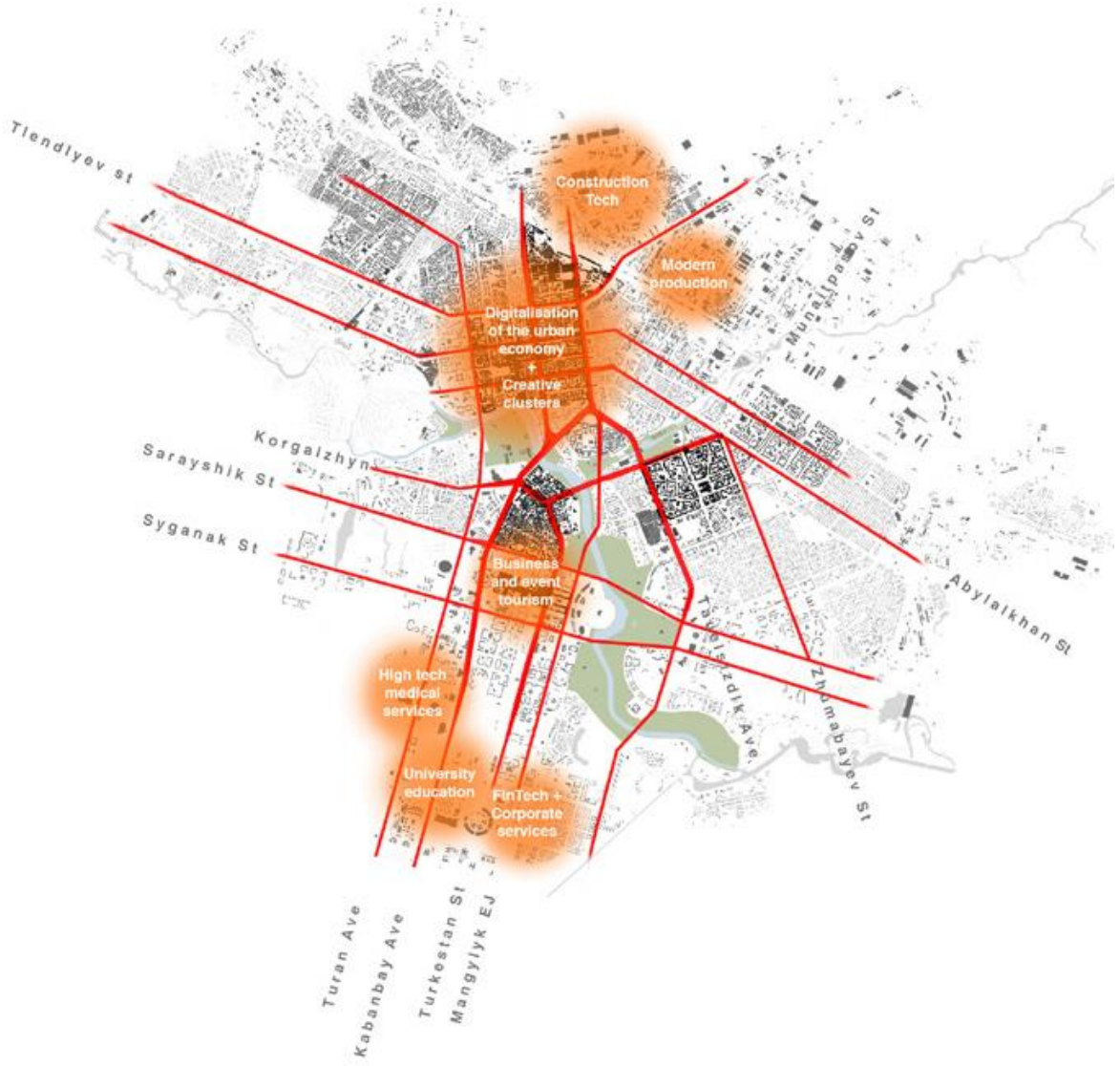
A. *Masterplan aerial view (previous page).*

B. *Spatial network produced using generative digital processes.*



Space Syntax © 2026

Case study | **2030 urban plan** Astana, Kazakhstan



An award-winning urban plan, created using a 'data-driven design' approach, to Improve & Intensify the capital city of Kazakhstan.

Client
Astana GenPlan

Year
2018-20

Role
Lead Designer

Team
Expedition Engineering
Gustafson Porter + Bowman
MIC-HUB

Key Features
Strategic Design
Urban Baselining
Option Testing
Generative Reference Plan

The opportunity
Capital of Kazakhstan since 1994, Nur-Sultan has a population of around 1m people, forecast to increase by 60% by 2030. The city is located in the centre of Kazakstan and experiences an extreme climate with temperatures ranging from -30◦c in winter to +30◦c in summer.

Having won an international design competition in 2018, Space Syntax led an international, multi-disciplinary design team to apply a unique, outcomes-focused and evidence-based approach to the creation of a masterplan for the development of Nur-Sultan, the capital city of Kazakhstan.

The design process involved the use of Space Syntax Integrated Urban Models to address a series of key questions:

- what should Nur-Sultan be like in 2030 in terms of Liveability, Sustainability and Health objectives?
- what is it like now?
- how should its physical and spatial infrastructure change to meet these objectives?
- how are these changes likely to work?

Space Syntax © 2026

Case study | **2030 urban plan** Astana, Kazakhstan

Our contribution

The masterplan creates a comprehensive set of proposals for the physical development of the city, enabling it to deliver a future vision, shaped by local stakeholders, of becoming a liveable, sustainable and healthy city.

The proposals cover three scales: city-wide strategies, opportunity area masterplans and local, tactical interventions. City-wide strategies use forecasts of population and employment growth to improve and intensify the city in key areas before extending it.

In considering how to accommodate growth, a series of Opportunity Area Masterplans were developed. Detailed proposals for these areas were created with the intention that they also provide the opportunity to introduce new models of development into the city, including private-led redevelopment, public-private regeneration, and public-led improvement.

A series of local, tactical interventions were proposed across the city. To help the city to efficiently deliver these, Space Syntax created a bespoke GIS Plugin, allowing city users to access advanced analytic tools, to ultimately deploy improvements at scale across the city.

The outcome

The 2030 masterplan demonstrates how the three key objectives can be delivered through a targeted set of development proposals, with scenario modelling showing that:

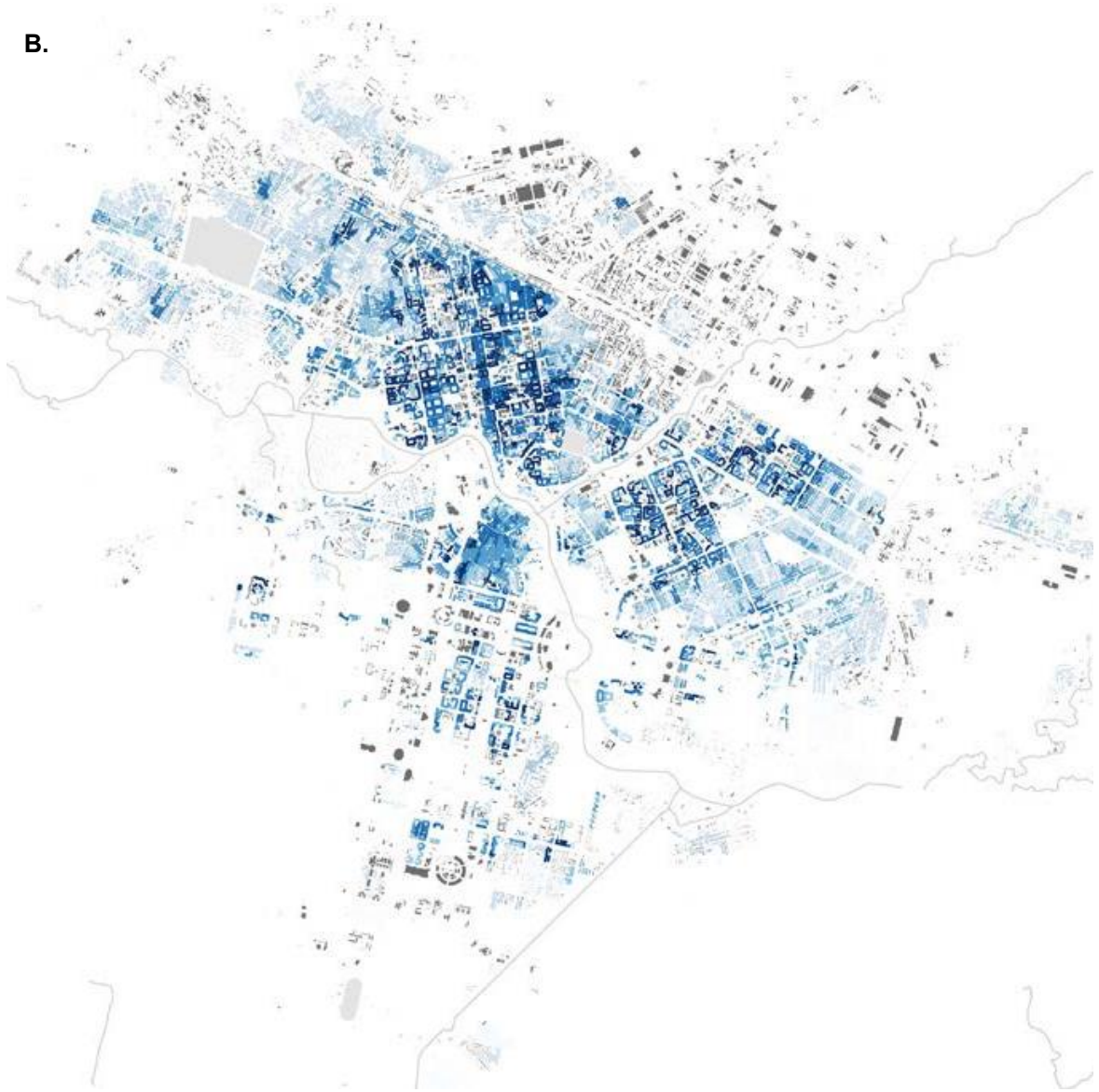
- liveability is improved by enabling 20% more residents to walk to key services such as education & health facilities, by activating parks & the public realm as a series of vibrant social spaces, & by using urban form & massing to create a sheltered & comfortable environment at street level.
- sustainability is improved through the development of policy roadmaps that enable the city to reach its emission & re-cycling rates, & through the application of technologies such as renewable energy generation & SUDS to opportunity areas.
- the city creates the conditions to enable healthy lifestyle by supporting daily activity, reducing average car-dependence by 10%, with some parts of the city now offering access to equal amounts of employment by active & public transport as by car.

The Nur-Sultan 2030 Masterplan draws on Space experience, incorporating principles of spatial planning & design that have been demonstrated through practice to deliver the liveable, sustainable & healthy outcomes of the project brief.

A. *Spatial strategy to accommodate economic growth in clusters (previous page).*

B. *Car dependency analysis of proposed urban plan. Average car dependency decreased by 10% while in some places there is no advantage to car ownership.*

B.



Space Syntax © 2026

Case study | **Urban vision** Riyadh, KSA



A vision for a walkable, human-centred city extension that blends learning, living & public life — unlocking new patterns of interaction & urban experience.

Client
PIF

Year
2022

Role
Masterplan lead

Team
Expedition Engineering
!Melk

Key Features
Growth Strategy
Generative design

The opportunity

The project represents a bold new vision for urban living — one that redefines how cities can support human connection, environmental sustainability and technological advancement.

Set within the Riyadh context, it offers the chance to create a city deeply rooted in local culture and fully prepared to address global challenges such as climate change, resource scarcity and public health.

The ambition is to design a truly walkable, human-scaled city, free from car dependence — one that fosters serendipitous interactions, supports active lifestyles and offers a vibrant public realm through shaded streets, cultural spaces and ecological integration.

The project's unique opportunity lies in its ability to fuse lessons from historic cities with future-facing digital tools. It enables a multi-scalar, systems thinking approach to city-making — from region to neighbourhood — using data, AI and machine learning to guide urban form, infrastructure and social experience.

The project provides a model for how cities can grow flexibly around human needs while remaining resilient to economic and environmental change.

Space Syntax © 2026

Case study | **Urban vision** Riyadh, KSA

Our contribution

50+ years of global urban research have been used to link spatial design decisions to measurable social, environmental and economic outcomes.

Around this knowledge, we developed a digitally-augmented design process that used advanced spatial analysis, AI and machine learning to guide every stage of design.

This approach allowed us to ‘grow’ the city from the movement network up — beginning with a fine-grained pedestrian-first street layout that shapes development plots, land uses, massing and infrastructure in a way that supports liveability and flexibility.

Beyond modelling, systems thinking at every scale has been embedded: aligning urban form with climate adaptation strategies, integrated utilities, mobility networks and a framework of inclusive neighbourhoods.

Our team shaped not only a physical city but a resilient urban code — a set of spatial and infrastructural principles that can accommodate everything from iconic towers and cultural venues to family homes and community agriculture, adapting as future needs evolve.

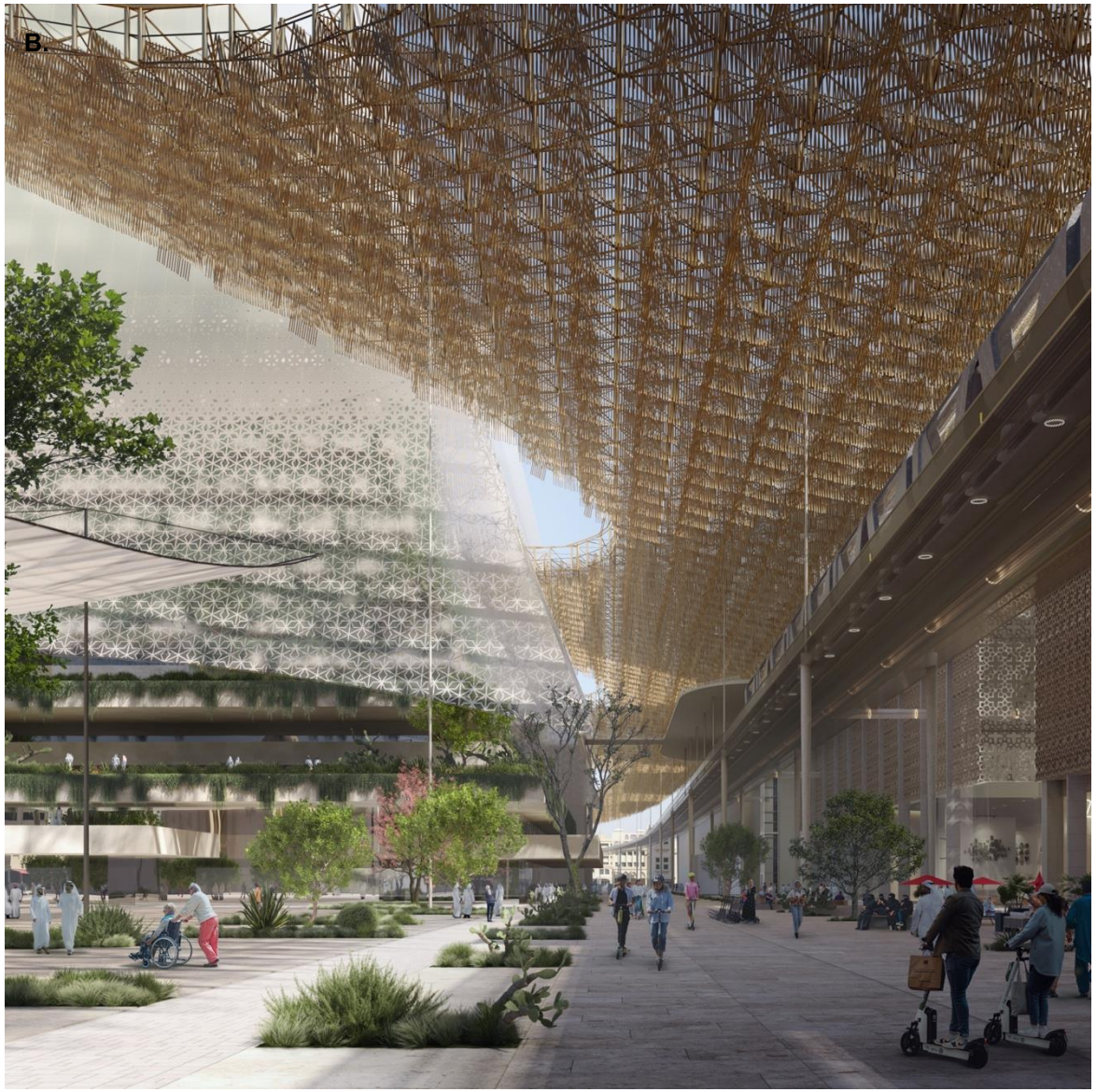
The outcome

The result is a coherent and flexible framework for a next-generation city — a place of structured spontaneity and deep sustainability.

The project integrates shaded public spaces, mixed-use boulevards, natural wadis and active urban centres into a dynamic spatial network that fosters interaction, supports well-being and works in harmony with the environment.

It’s open, walkable form enables people to meet, connect and thrive, while integrated logistics, utilities and mobility systems reduce car dependency and carbon emissions.

The new city is future-ready: its design datasets and models form the backbone of ongoing digital operations, community engagement and behavioural insight. It shows how technology can enhance — not replace — human values, setting a global benchmark for inclusive, climate-conscious urbanism.

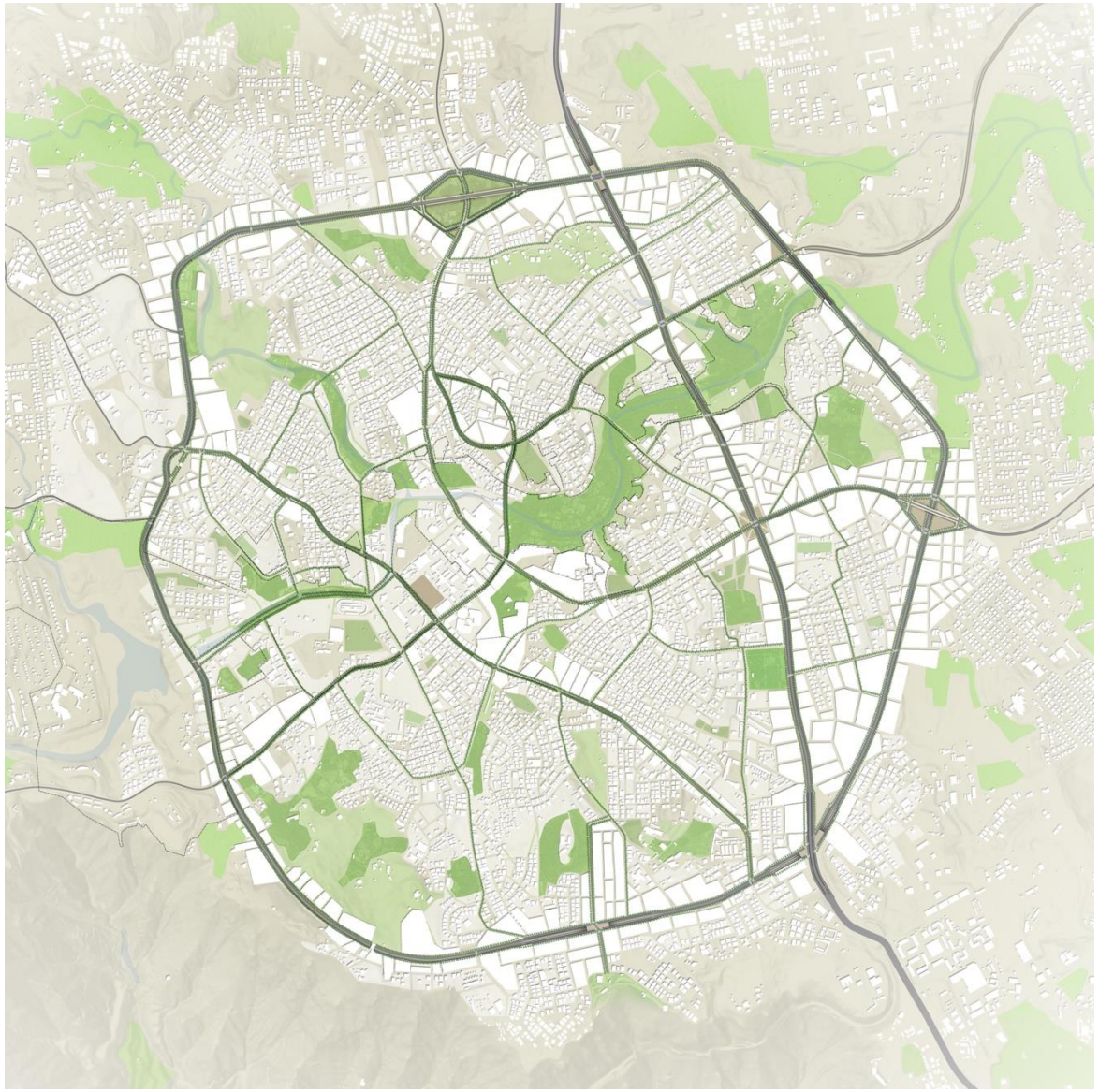


A. *Urban vision (previous page).*

B. *Street level view*

Space Syntax © 2026

Case study | **Regeneration plan** Abha, KSA



An urban plan to repair city centre severance by down grading highways, slowing traffic & introducing public transport & in the process unlocking new land to accommodate population & jobs growth.

Client
Aseer Development Authority

Year
2024-25

Role
Spatial Strategy & Expert Advisor

Key Features
Place profiling
Integrated development strategy

The opportunity

Abha city centre is unique in the Arabian peninsula, combining dramatic topography, cultural landscapes and heritage buildings in a vibrant settlement. It has unique assets including historic villages and an agricultural wadi running through its centre, as well as newer areas of better quality, active public realm.

Unfortunately, these are very localised areas of quality. The city centre has become isolated from its context following the implementation of a large urban highway in the form of a ring road. The ring road prioritises fast vehicle movement around the city centre, and makes access to the centre by all modes of transport more difficult. Since its implementation, Khamis Mushait, which is part of the same urban agglomeration, has gone through major growth.

During construction of highways, large areas of the settlement were demolished, and these are left as an unconsolidated and vacant waste land. The public realm is generally run down with inadequate space for people.

Within the city centre, a one-way system makes circulation for cars inconvenient, and in turn makes streets less pleasant for people as they are occupied by faster moving traffic.

In the 2034 World Cup, Abha will be a host city, and it is in the objective of the Regional Governor that the city centre, and public realm in particular, is improved by the time the eyes of the world are on the city.

Space Syntax © 2026

Case study | **Regeneration plan** Abha, KSA

Our contribution

We developed a regeneration plan for the city based on the following principles:

First, downgrading the ring road to become a slow speed, high volume, multi-modal spine. Changing speed limits allowed junctions to reduce in size, unlocking land for new development and public transport infrastructure.

Second, improving the public realm of the streets that would be most used by visitors and locals alike. These streets could be identified through spatial analysis which could also explain which are required to mix multiple modes of transport and how street sections are required to respond.

Third, removing the one-way system in the city centre and reducing speed limits. This allowed streets to be redesigned around the needs of people, creating a more pleasant urban environment and unlocking opportunities to activate ground floors through active uses.

Fourth, to re-stitch key streets into their local context, and in doing this unlock parcels of land for development. Studies showed that new parcels of land created in the urban plan could accommodate a significant amount of forecast growth, as well as generate income from land sales to part fund improvement.

The outcome

The Abha Uplift plan has gone on to inform more detailed concept masterplans for the city centre, landscape and public realm designs and wider approaches to public and active transport.

The proposal shows how careful intervention through targeted intervention can have a much wider impact on the wider centre, and create conditions which combine larger scale development with smaller scale emergent regeneration.

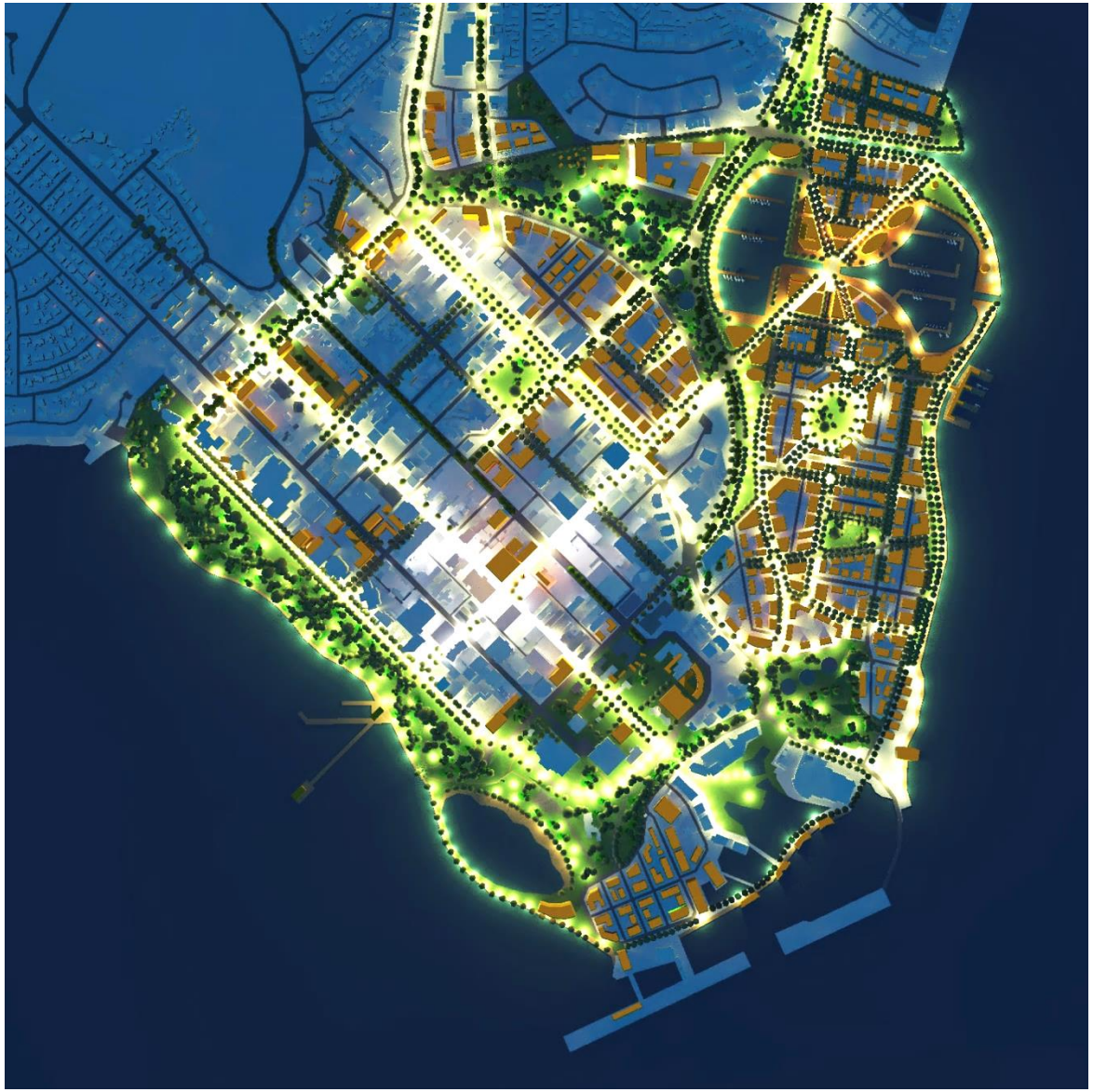
A. *Abha Uplift figure ground drawing (previous page).*

B. *Street level view of street improvement principles which slow traffic, shade pedestrians and introduce active ground floor frontages.*



Space Syntax © 2026

Case study | **Reference plan** Darwin, Australia



A proposed urban extension that maximises the value of new development without reducing the strength of the current city centre.

Client
City of Darwin
Northern Territory Government
Australian Government

Year
2013-14

Role
Urban Planning & Design Advisor

Team
Design Urban
Urbacity
Michels Warren Munday
Clouston Associates

Key Features
Urban Baseline Study
Urban Design Strategy
Urban Performance & Forecast Model

The opportunity

In 2012 the City of Darwin secured a grant from the Commonwealth Government of Australia to produce a Masterplan for the City Centre of Darwin. The purpose of this plan is to provide a road map for development of the city for the next twenty years. To accommodate growth, the City Centre needs to be extended and reinforced.

Space Syntax was asked to join a design team led by Design Urban. Our role was to provide comprehensive urban analysis and strategic design input to support the creation of the Masterplan. A key aim of the project is to facilitate private sector investment and population growth through the production of high quality public realm.

Space Syntax © 2026

Case study | **Reference plan** Darwin, Australia

Our contribution

Space Syntax provided an evidence-based platform for the creation of a spatial strategy. Our input had five workstreams:

Urban Data Collective
Data related to Urban Form (e.g. land use, transport and spatial form) and Urban Performance (e.g. pedestrian and vehicle movement, land value) were collected and analysed using Space Syntax software.

Urban Performance Model
Associations between Urban Performance and Urban Form were analysed in order to provide an Urban Diagnosis from a number of perspectives; spatial, physical, economic and human behavioural.

Spatial Design Strategy
Opportunities and constraints analysis was undertaken using the Urban Performance Model to develop a Spatial Design Strategy. This strategy, including as set of design objectives and principles, has guided the development of the Masterplan design.

Option testing using Spatial Accessibility Models played an essential role in the design development process not only to assess design outcomes quantitatively but also to generate new design ideas and options. Frequent and direct communications with the design team, including attendance at workshops in Darwin were key to maintaining a dynamic design process and ensuring an integration between the baseline analysis and the development of the Spatial Design Strategy.

Urban Forecast Model
Forecast models for pedestrian movement and for land value were constructed to quantitatively evaluate the impacts of the proposed designs. The outcomes provided useful indicators of the social and economic performance of the Masterplan.

Urban Design 3D Modelling
3D visualisation of the Masterplan in static and animated formats were created by Space Syntax and used in the stakeholder engagement process. Such visual representations of the Masterplan were effective in engaging the widest possible audience.

The outcome

Space Syntax's work has underpinned the creation of the Darwin City Centre Masterplan. Quantified indications of its social and economic impacts have facilitated meaningful discussions between different disciplines, bringing architects, transport engineers, planners and politicians together with a wide stakeholder base.



A. *Darwin City Centre Masterplan © Design Urban (previous page).*

B. *Spatial Accessibility Modelling of the proposed Masterplan.*

Case study | **Reference plan** Almaty, Kazakhstan



A vision for a walkable, human-centred urban extension that blends learning, living & public life to unlock opportunities for interaction.

Client
Private Developer

Year
2023

Role
Lead Designer

Team
Space Syntax

Key Features
Strategic Design
Urban Baseline Study
Option Testing
Reference Plan

The opportunity

This strategically located site offers a rare opportunity to link two key urban centres at the edge of Almaty.

Anchored by Higher Education and R&D, the project envisions a vibrant mix of Academic, Residential and Commercial uses designed for long-term adaptability to evolving patterns of work, learning and city life.

Natural features and infrastructure—such as topography, biodiversity corridors and flood zones—are treated not as constraints but as assets shaping a resilient, characterful urban form.

The ambition is to create a walkable, well-connected place where design supports informal knowledge exchange, social cohesion and embedded sustainability. Phased development allows the district to grow incrementally with shifting institutional and economic needs.

Space Syntax © 2026

Case study | **Reference plan** Almaty, Kazakhstan

Our contribution

Space Syntax's aim was to create opportunities for innovation and new business by encouraging the different research, university and commercial building users to mix in the same set of public and open spaces. We developed a Reference Plan around a set of different-sized public spaces, clustering uses together in a way that creates opportunities for chance interaction between different users.

Spatial analysis was undertaken to design a street network that integrates with surrounding development and works with the existing topography. A generative design algorithm was then applied to subdivide this network into urban blocks and building plots. Land uses, densities and massing typologies were then allocated on the basis of fine-grained spatial analysis and generative design.

An open and green space strategy created looped networks of different types of space, which ranged from hard urban spaces, to landscaped and programmed green and blue spaces, to more wild natural spaces.

The outcome

The resulting Urban Plan proposes a connected, walkable and inclusive urban district where streets and spaces support a vibrant mix of uses.

Green corridors enhance biodiversity and manage flood risk, whilst also structuring a ring of recreational and public space that ties the community together.

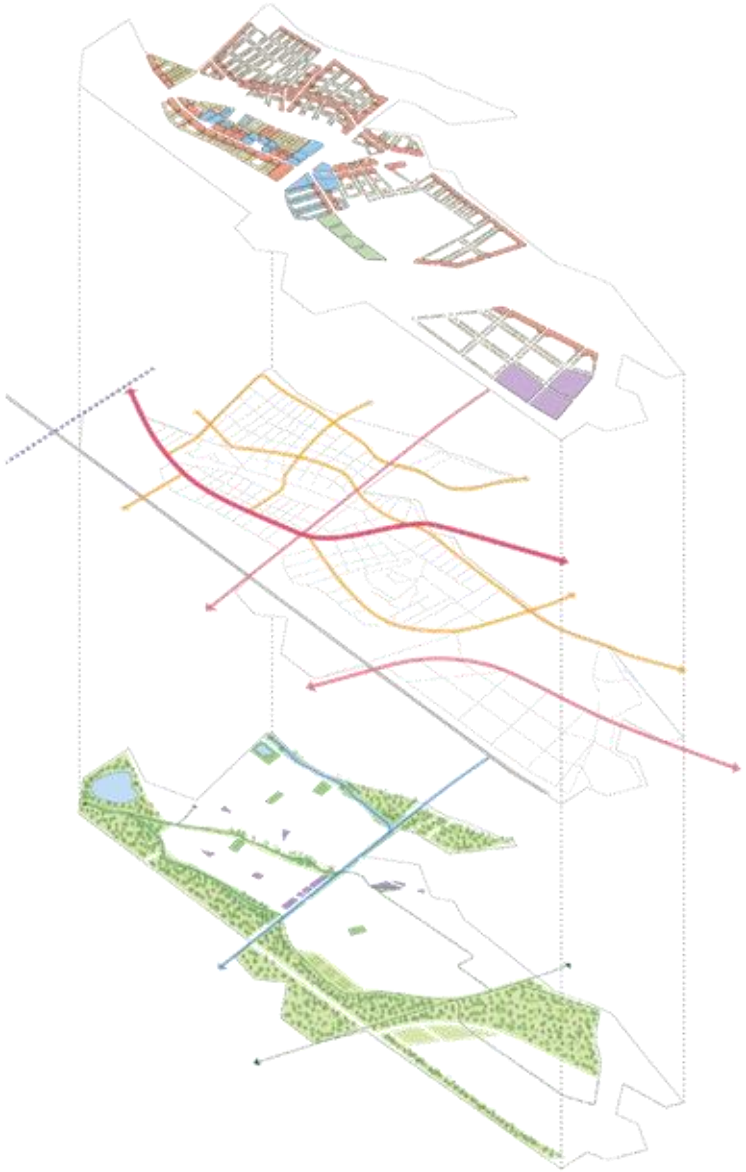
The three-phase development strategy, reinforced by a strong spatial network, enables incremental delivery without compromising urban quality.

The Campus Plan is designed to foster innovation, support sustainable growth and encourage meaningful interaction between students, researchers, residents and businesses.

A. *Massing envelope showing the design vision (previous page).*

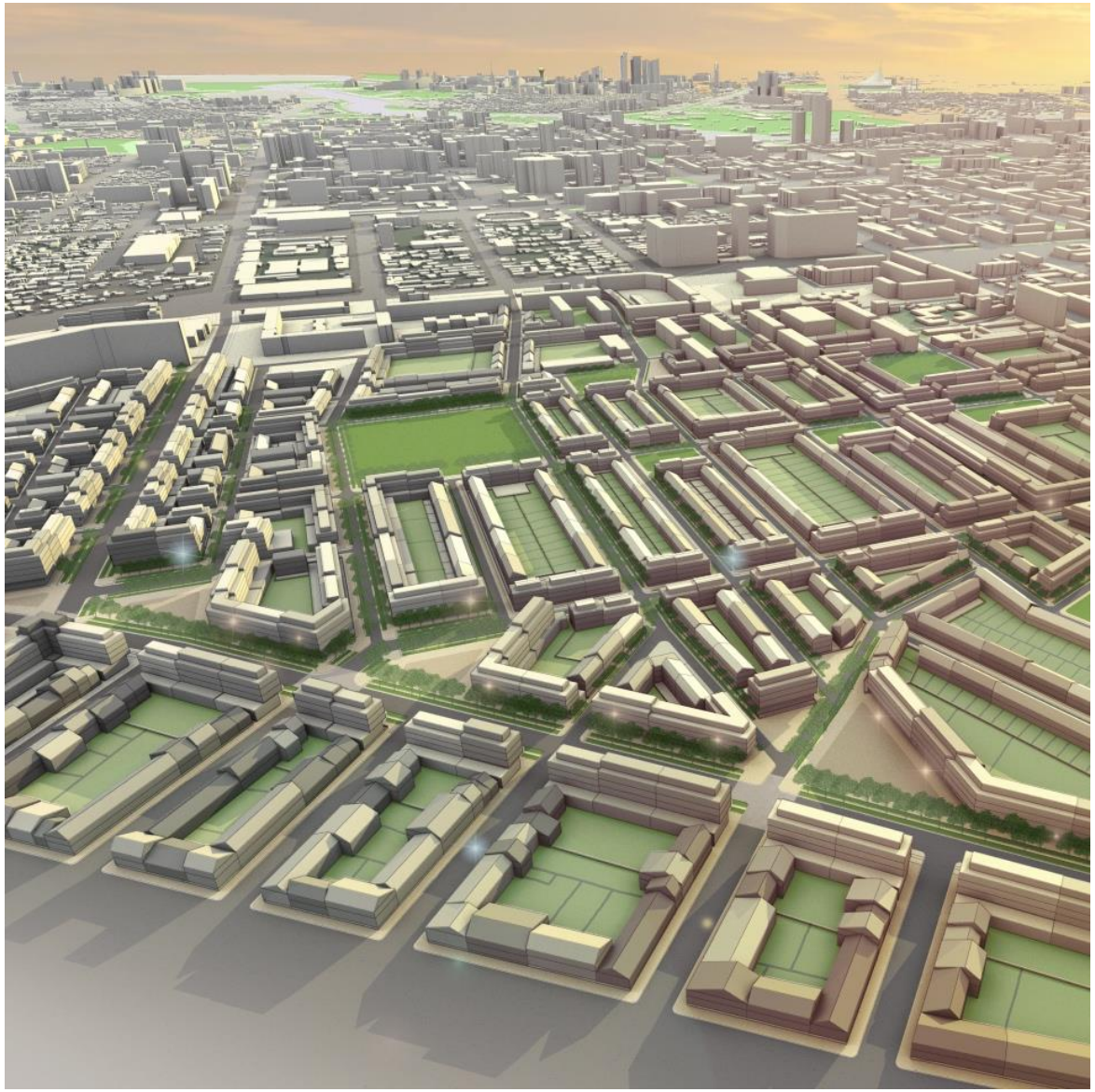
B. *Axonometric view showing the land use distribution, proposed urban spines, and green & blue network.*

B.



Space Syntax © 2026

Case study | **Regeneration plan** Astana, Kazakhstan



Regeneration of a former industrial zone into a walkable, energy-efficient urban district that supports healthy living & local economic growth.

Client
Astana GenPlan

Year
2020

Role
Lead Designer

Team
Space Syntax
Expedition Engineering
Gustafson Porter + Bowman
MIC

Key Features
Reference Plan

The opportunity

Teknopark presents an opportunity to redefine how underused brownfield sites can support the city's long-term growth. In doing so, the city can create a pilot project for private sector-led redevelopment, illustrating a set of principles and processes that should be followed across other redevelopment areas to deliver the city's vision.

As part of the Astana 2030 Masterplan (created by Space Syntax) the project proposes the transformation of an ex-industrial area – currently defined by deteriorating warehouses, low pedestrian activity and fragmented land ownership – into a vibrant, mixed-use neighbourhood aligned with the city's goals for liveability, sustainability and health.

Strategically located close to the historic centre but disconnected from the rest of the city due to rail infrastructure, Teknopark sits adjacent to areas designated in the 2030 Plan for clean industry and innovation. With declining industrial uses and public realm challenges, combined with significant potential, the site is well-positioned to pilot new urban design principles.

Space Syntax © 2026

Case study | **Regeneration plan** Astana, Kazakhstan

Our contribution

Space Syntax led the design and development of an urban plan that reimagines Teknopark as a climate-resilient, socially inclusive and energy-efficient district – using a process grounded in digital modelling, land use strategy, urban morphology and implementation planning.

The design restructured the area's street network to integrate it with the wider city, while retaining existing plot boundaries, also introducing a hierarchy of public spaces and creating urban blocks that balance high density with high quality of life.

Street typologies were developed to incorporate snow storage, SUDS and low-energy infrastructure from the outset. Passive energy design and renewable energy potential were embedded in the approach – with wind and solar analysis used to shape massing and orientation, ensuring comfortable microclimates year-round. Principles for sustainable energy generation and efficient ambient loop heating and cooling were also integrated.

To support deliverability, we worked with existing land ownership, defined a phased delivery approach and provided a toolkit of typologies to follow. A plot-based structure allows for multiple developers, while public realm principles ensure coherence. A material recovery strategy also reduces waste and supports the circular economy in connection with the adjacent clean industry zone.

The outcome

Teknopark transforms a neglected industrial site into a walkable, mixed-use district that supports sustainable living and healthy urban growth. It more than doubles the existing population within a compact footprint, integrating housing, retail, green space and community infrastructure into a connected street network.

Designed for flexibility and phased delivery, the plan enables a range of developers to contribute while maintaining a consistent urban character. Energy-efficient buildings, low-carbon infrastructure and public realm improvements help reduce emissions, improve comfort and support climate resilience.

The plan includes a delivery model that balances private investment with public benefit, showing how spatial planning can support national policy goals.

As a pilot for private-led redevelopment, Teknopark sets a benchmark for inclusive, sustainable brownfield regeneration.

A. *Masterplan overview of the Teknopark (previous page).*

B. *Detailed design vision of the proposed public realm.*



Space Syntax © 2026

Case study | **Reference plan** Riyadh, KSA



A vision for a walkable, human-centred, mixed-use urban development.

Client
RIDC/PIF

Year
2025

Role
Masterplan lead

Team
Expedition Engineering
MIC-HUB
Omrania

Key Features
Reference plan
TOD

The opportunity

RIDC, a PIF subsidiary, have responsibility for developing a site in the north of Riyadh.

The site is roughly the width of lower Manhattan, with a target density of 200 people per hectare (roughly 105,000 population). It is adjacent to King Abdulaziz Park, and within sight of a 2034 world cup stadium, the Expo site as well as two universities and other major developments.

Whilst being strategically located near future urban anchors, the site is severed from its context by large highways infrastructure. An adjacent metro station provides opportunities for some Transit Oriented Development, but limited capacity impacts this.

Space Syntax were approached to first of all create a carrying capacity study which assessed the viability of the development brief, and second, to create a reference plan which showed how development could be accommodated on site within its access constraints.

Space Syntax © 2026

Case study | **Reference plan** Riyadh, KSA

Our contribution

To work within the access limitations of the site, development needs to deliver a target mode share of approximately 30% of journeys by public and active modes. Meeting this target has direct implications for local urban form, requiring it to be as comfortable and convenient as possible for people to walk or cycle local journeys, or the last mile of wider journeys.

Beginning from a larger scale, key connections across the site boundaries were identified. These served a dual purpose; to respond to access constraints by providing alternative routes in and out of the site and to integrate with as many surrounding investments as possible.

Within the site, a permeable, human-scaled street layout was designed around pre-existing infrastructure on site. This was then further developed by positioning development anchors including TOD, a retail quarter and luxury housing, within this structure. Proposals for density, massing and land use distribution, street design, plot, parcel and phasing definition were then further developed.

Throughout the process analysis was used to compare the design to places which deliver the intended development objectives, such as mode share targets, to ensure the proposal set in place the physical conditions to deliver them.

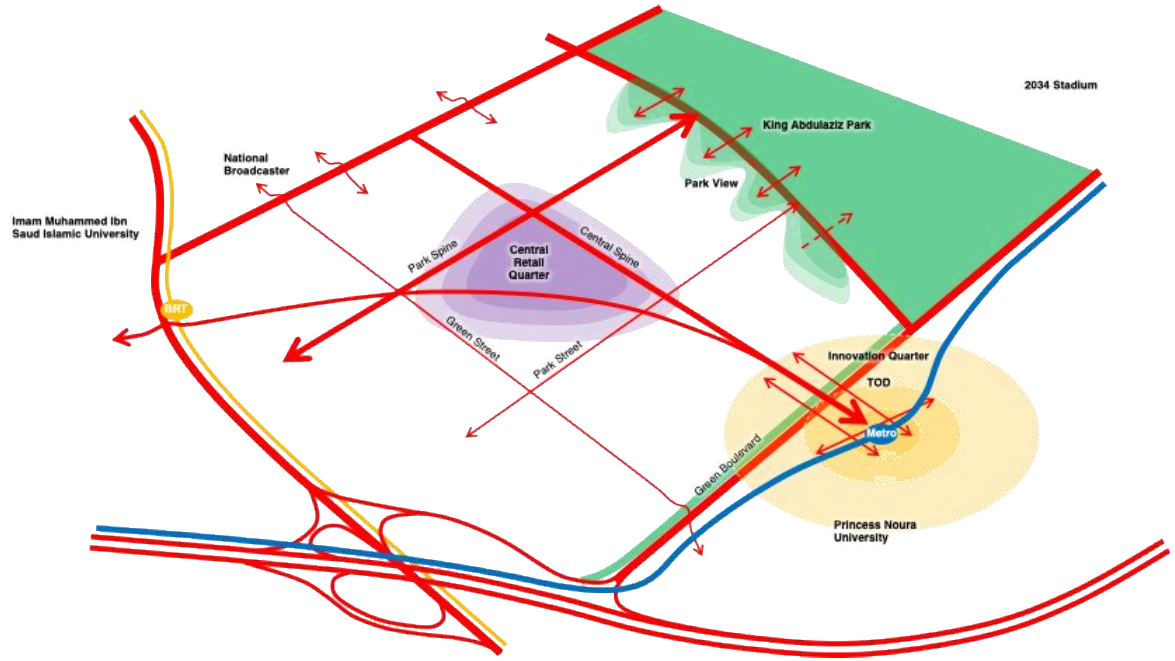
The outcome

The Reference Plan showed how it is possible to accommodate required levels of development within the constraints of the site while creating an environment which is human scaled and walkable.

The plan also demonstrated that this approach to urbanism is deliverable within local policy and regulations.

The Reference Plan and the design principles that shaped it went on to become a part of the brief for more detailed Concept Masterplan proposals on the site.

B.



A. *Project Capital figure ground drawing (previous page).*

B. *Key moves diagram to embed the site in its local context.*

Performance testing

Space Syntax © 2026

Performance testing

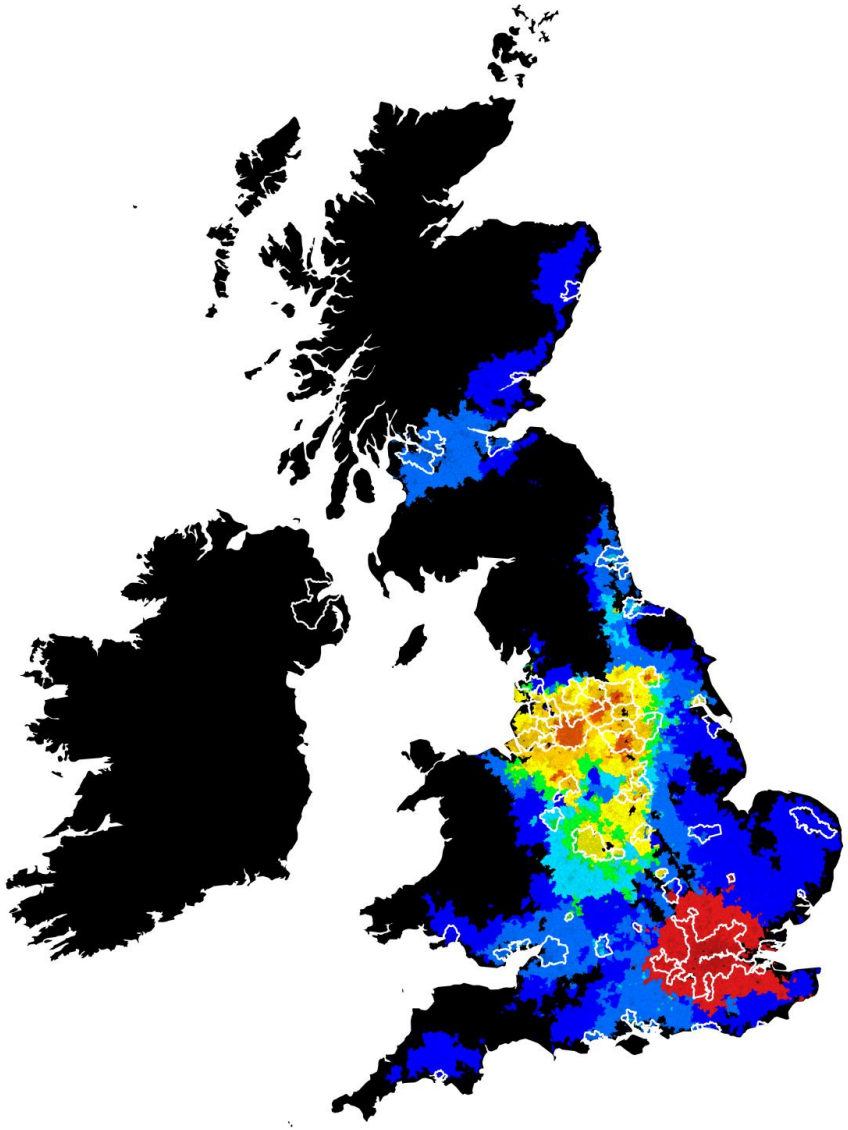
We apply evidence-based processes to de-risk development by measuring whether proposals function as required.

Our focus

- Rapid option testing & feedback
- Comparison of options and selection of preferred scheme
- Detailed impact forecasts
- Measurement of design performance against funder or client requirements
- Impact on social and environmental outcomes

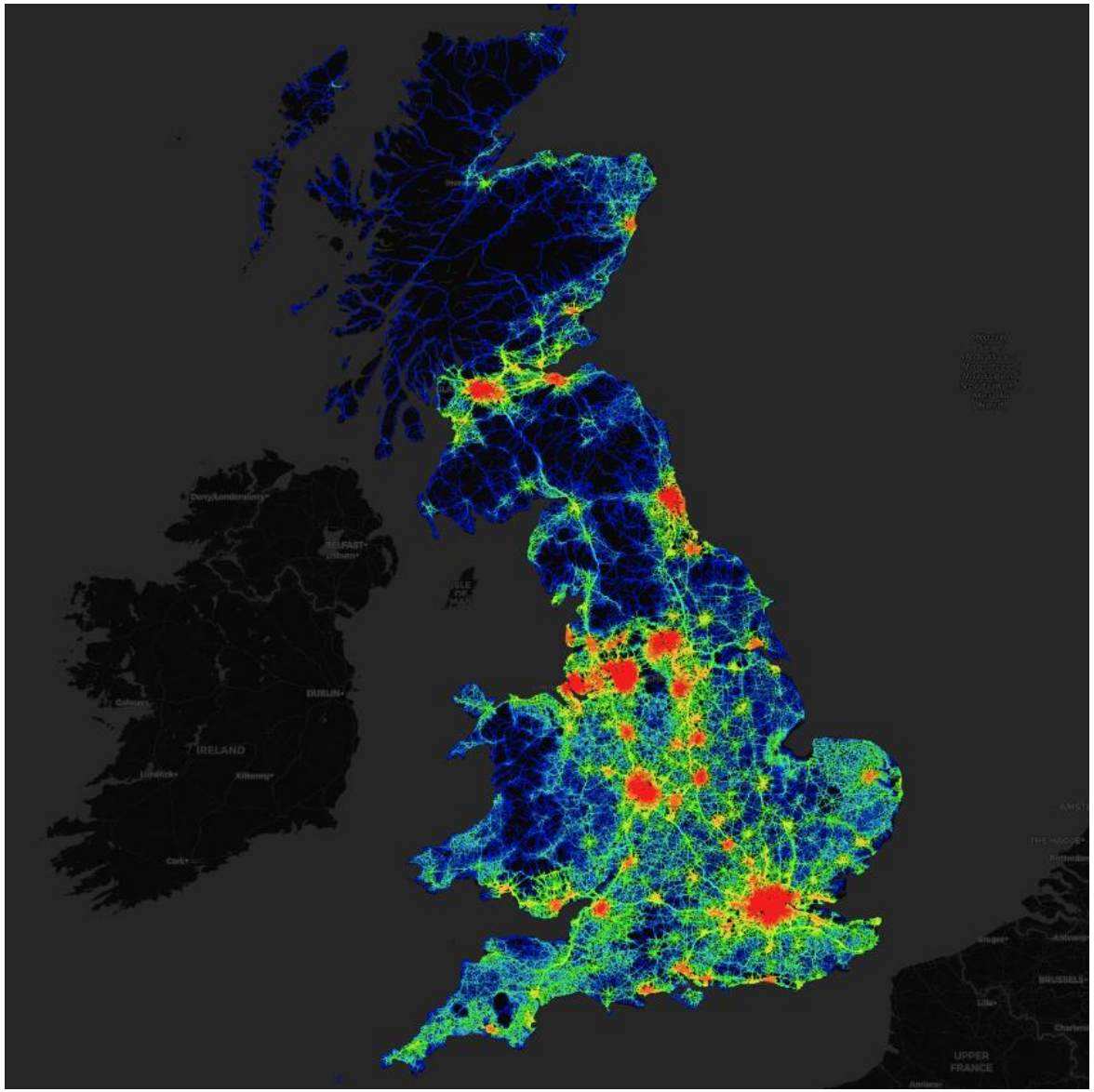
Value

- Increased chance proposals deliver development objectives
- Creation of evidence base to support design decisions & statutory approval processes
- Unbiased, quantitative design analysis



Space Syntax © 2026

Case study | **Growth and Infrastructure scenario testing** UK



Impact assessment of strategic growth and transport infrastructure scenarios.

The opportunity

Space Syntax was invited to take part in the Government Office for Science's Foresight Future of Cities project.

During the project Space Syntax were asked to consider the way that population growth figures were spatially allocated across the UK, to look at the impact of future scenarios in relation to current patterns of population and employment distribution.

Alongside this scenario testing we were also asked to assess the potential benefits of proposed high-speed rail lines linking key cities in the UK.

Client
Government Office for Science

Year
2014

Role
Spatial Strategy & Circulation Consultant

Key Features
Baseline study
Benchmarking
Integrated Urban Modelling

Space Syntax © 2026

Case study | **Growth and Infrastructure scenario testing** UK

Our contribution

We created a series of UK-wide spatial network and integrated urban models. These were used for three purposes, first to better understand existing relationships between location, jobs and population, second to see whether proposed scenarios replicated these relationships, and third to develop a spatially driven growth scenario.

Analysis of current conditions showed very strong relationships between the distribution of population and spatial connectivity at 10k, and the distribution of jobs and spatial connectivity at 2km. This indicates that to sustainably locate this growth it should consider whether locations have these characteristics.

Testing current scenarios showed that they did not follow these relationships. The implication of this is that there could be an under provision of infrastructure in some places at the same time as unused capacity in others.

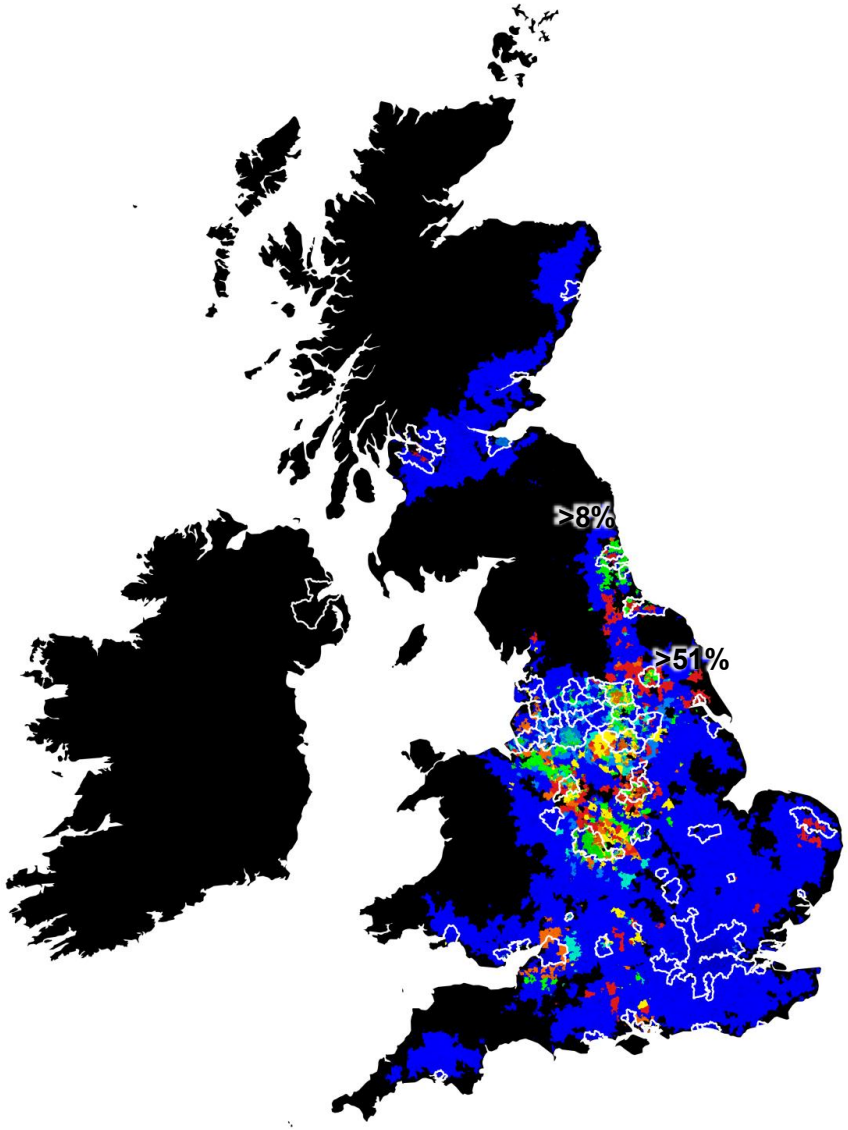
We developed a spatially driven growth scenario that identified the current capacity for housing and jobs based on their location characteristics. Population and jobs could then be increased proportionally in places with capacity until they were aligned.

More detailed modelling of rail network proposals was carried out to measure the number of jobs within one hour's travel by all modes from every part of the country.

The outcome

Our spatially driven growth scenario showed that it was able to accommodate almost 85% of 2037 forecast growth within existing cities and settlements.

This would not only locate these activities in the places that are found to already support them, but also reduce the amount of green field land required for new settlement growth or urban expansion.

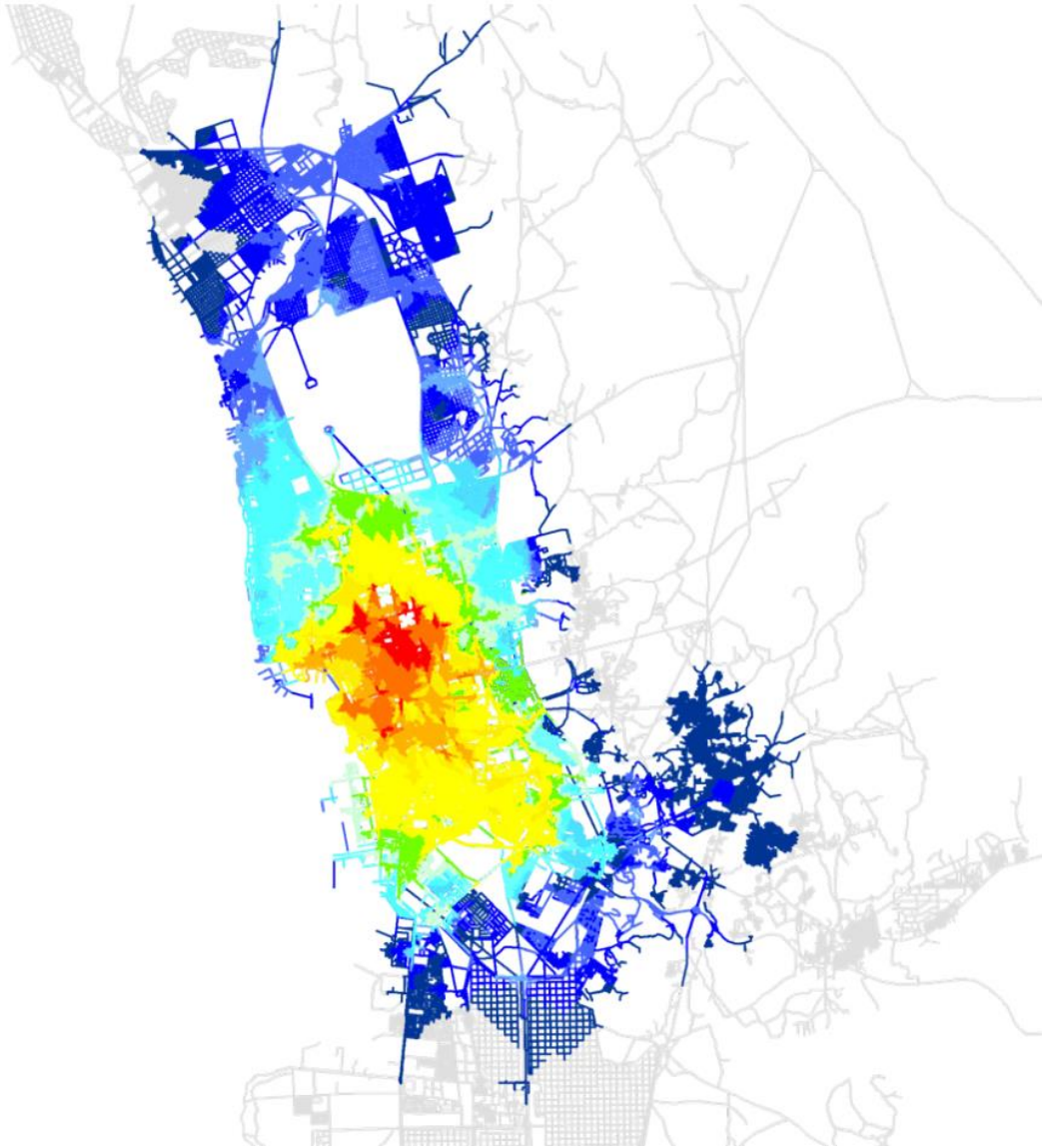


A. *Connectivity map of UK, red areas correlate strongly with distribution of population (previous page).*

B. *Integrated Urban Model showing change in access to employment opportunities within one hour. Red areas indicate higher increases, blue indicate lower increases.*

Space Syntax © 2026

Case study | **Structure Plan** Jeddah, KSA



Alignment of strategic growth, infrastructure investment and social impact.

The opportunity

The Municipality of Jeddah commissioned Space Syntax (working with Aecom), to produce an integrated suite of planning documents: the Jeddah Plans.

The Jeddah Plans co-ordinate Regional, Structural and Local Plans across the Jeddah Governorate to accommodate a population increase of around 3m people over the next 20 years.

The Jeddah Structural Plan studied how the urban structure could accommodate this growth. This included developing a Centres strategy to distribute population, employment and supporting facilities, and a Public Transport strategy.

Client
Municipality of Jeddah

Year
2014

Role
Spatial Strategy & Circulation Consultant

Team
AECOM

Key Features
Baseline study
Benchmarking
Integrated Urban Modelling

Space Syntax © 2026

Case study | **Structure Plan** Jeddah, KSA

Our contribution

We constructed an Integrated Urban Model (IUM) of Jeddah to combine the spatial network with land use, population, employment and Public Transport.

The key use of this model was to provide a base to test the impact of changes to the distribution of population and employment. It also allowed Public Transport alignments to be added and assessed.

A hierarchy of Centres was defined to distribute population and employment growth in well connected, higher density, mixed-use areas. This hierarchy ranged from the largest Town Centre, through Multi-District, District, Neighbourhood, to the smallest Local Centre.

The IUM was used to identify and compare potential locations for Town, Multi-District and District Centres. This included studying how easily potential sites could be reached from the wider City, whether they provided the underlying spatial characteristics to create strong pedestrian networks, and how easily they could be developed.

The Public Transport strategy was developed simultaneously with the Centres strategy. Initially, Town Centres were linked to each other, using alignments that followed the street network for feasibility reasons. The IUM identified where the parts of the City most suitable for Multi-District and District Centres overlapped with these Public Transport alignments.

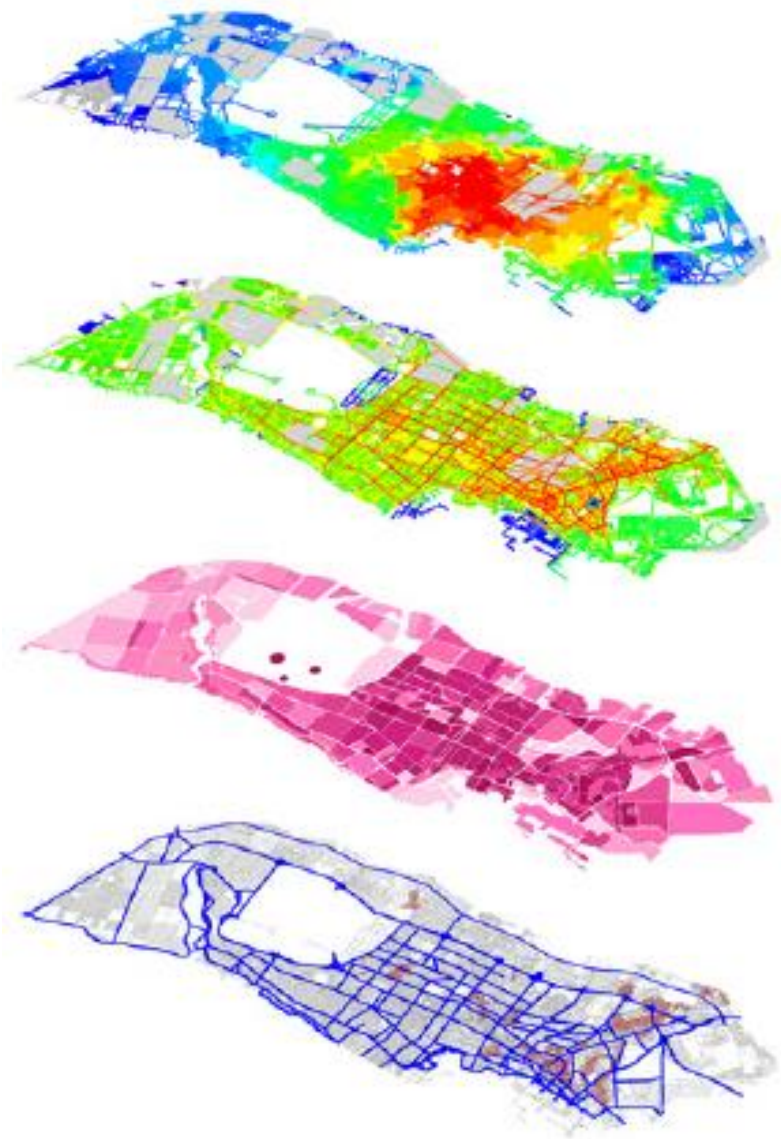
The outcome

The major consequence of this work was an integrated Centres and Public Transport strategy that created measurable improvements to the City.

The IUM was a key design tool in refining the plan and optimising the relationships between population, employment and Public Transport. It was also used to provide a benchmarking methodology to compare options. Because the model links people to employment using the spatial network and Public Transport, the performance of options can be expressed in terms of benefits to the City's population.

The preferred Structural Plan was selected as it created the following benefits:

- Around 5m people (80%) would be within a 15 minute journey (on foot, by Car, or by Metro) of a Centre, and the employment, education and health facilities they provide.
- Around 2.5m people (40%) would be within a ten minute walk of a Public Transport station.



A. *Analysis showing the number of Centres within a 15 minute journey (using all modes of transport) from all parts of the City (previous page).*

B. *Integrated Urban Model uses data on Spatial and Public Transport Networks, Population and Employment to forecast urban activity and calculate catchment populations.*

Space Syntax © 2026

Case study | **Jeddah Metro** Jeddah, KSA



Impact assessment of proposed metro network to optimise last mile access.

Client
Jeddah Metro Company

Year
2014

Role
Spatial Strategy & Circulation Consultant

Team
Foster + Partners

Key Features
Baseline study
Benchmarking
Integrated Urban Modelling

The opportunity

Space Syntax supported Foster + Partners to develop proposals for a Metro system in Jeddah.

Adding an entirely new mobility network to an existing city has potential to alleviate existing problems while also creating opportunities for new development.

The Metro network was designed to align with and implement the city's Structure Plan, which consolidated new growth in higher density, mixed use centers.

Space Syntax worked across multiple scales to refine network alignments, locate stations, and improve public realm to support last mile connectivity.

Space Syntax © 2026

Case study | **Jeddah Metro** Jeddah, KSA

Our contribution

We constructed an Integrated Urban Model (IUM) of Jeddah to combine the spatial network with land use, population, employment and Public Transport.

This was used to help fine tune decisions on station location to ensure that the maximum populations and employment opportunities were within walking distance of a station.

The implementation of the Metro brought the opportunity to address issues of severance created by the city's over-sized highway infrastructure. Where it was not possible to add at-grade crossing, stations were designed to provide bridges and tunnels that aligned with the most important surrounding streets, and which work for users of the station as well as the wider area.

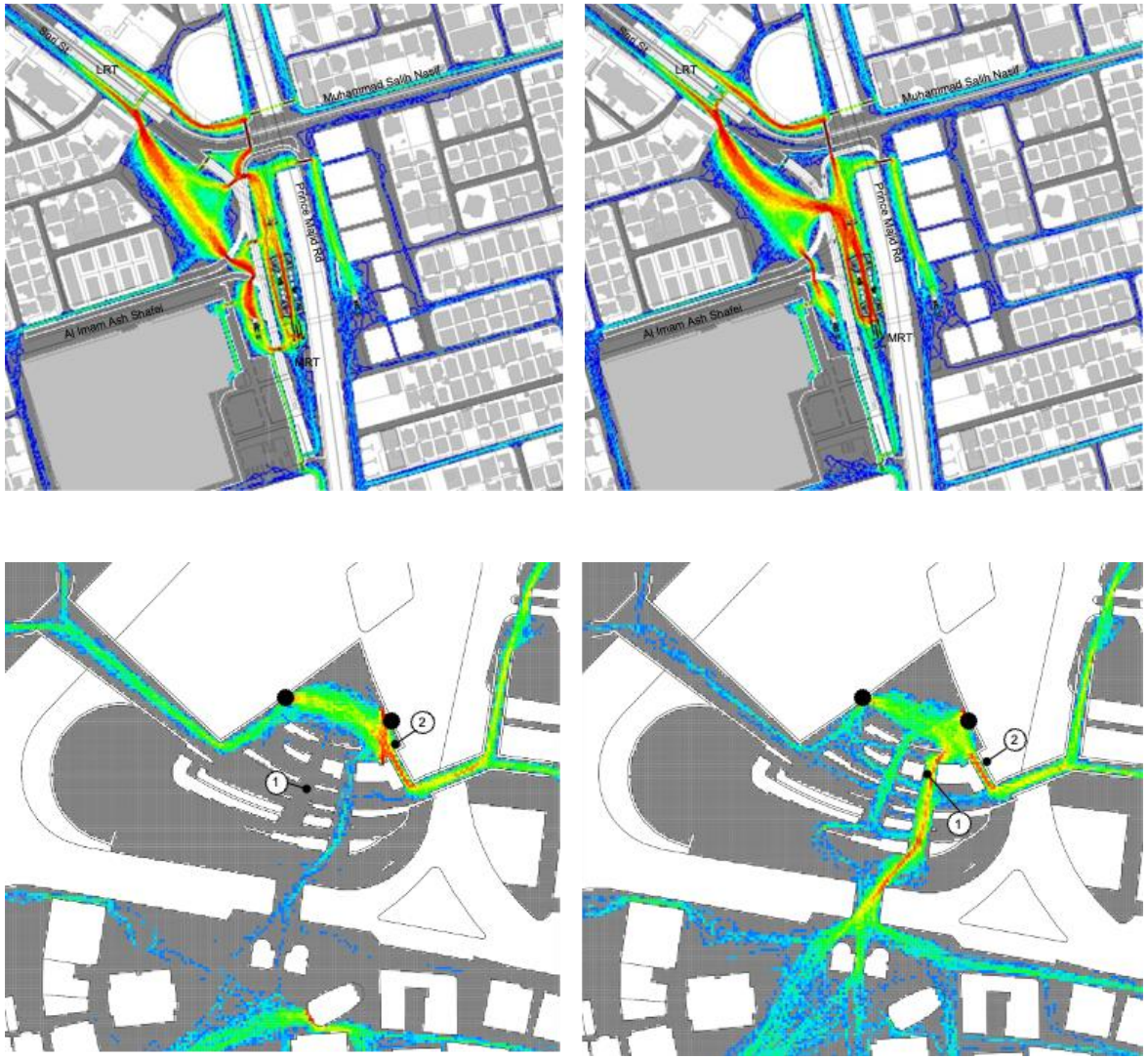
Detailed modelling of public realm proposals was carried out to make sure that stations were as easy as possible to access on foot.

The outcome

Station locations were selected on the basis of being measurably more accessible to the surrounding population.

Detailed design of stations was optimised to respond to local urban constraints and to make the city easier for people to use without requiring a car.

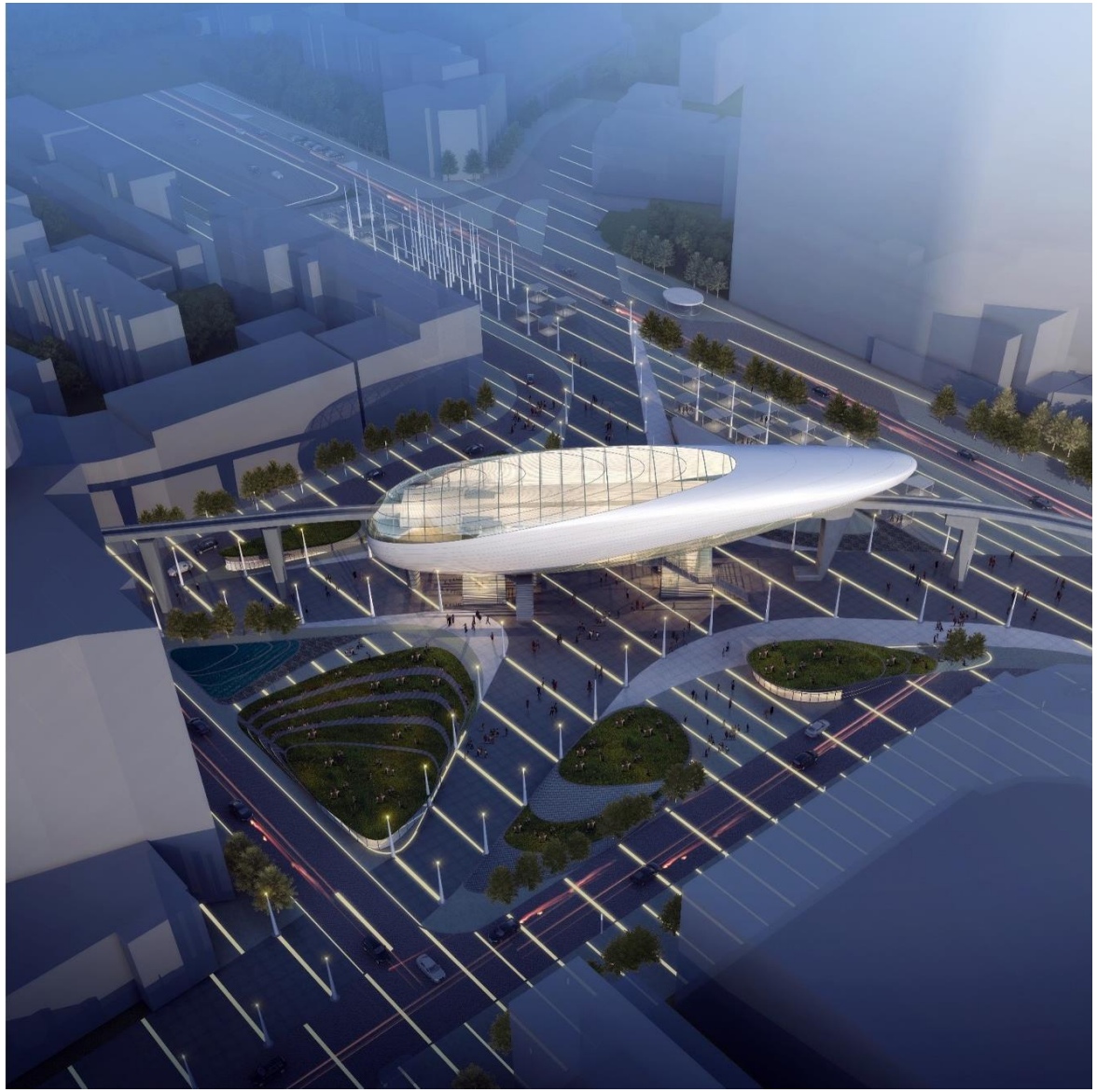
B.



A. *Analysis of station catchment areas used to measure accessible population and land use (previous page).*

B. *Detailed analysis of station proposals showing integration with surrounding pedestrian environment before (left) and after (right) design recommendations.*

Case study | **Jilin Lightrail Corridor** Jilin, China



Optimising station placement & creating connected public spaces for vibrant, accessible urban mobility.

Client
Jilin Rail Transit Construction Investment Co.

Year
2017

Role
Consultant & Designers

Key Features
Spatial analysis
Metro network alignment
Lightrail station design
Evidence-based design
Public space design
Pedestrian-focused design

The opportunity

As the city of Jilin in north-east China experiences rapid urban expansion, the development of a world-class transit system is considered essential to avoid future car-dependence.

By running metro lines between areas currently separated by high volumes of vehicle traffic, the aim is to activate underutilised spaces, boost active mobility and facilitate the integration of isolated neighbourhoods. Key to this is first, the precise location of metro stations and second, the design of the local areas around these stations, as to seamlessly integrate the new public transport infrastructure into existing as well as new urban centres. The design of high-quality public spaces around the stations provides the potentials to foster social interaction, enhance quality of life and attract property development interest.

Space Syntax © 2026

Case study | **Jilin Lightrail Corridor** Jilin, China

Our contribution

Space Syntax was initially appointed to advise Jilin Rail Transit on the alignment of the proposed metro lines and the placement of individual stations. We undertook citywide spatial analysis to test proposed alignments, then optimised these to ensure access to those parts of the city with the greatest potentials for future urban activity.

Having done so, we were asked to prepare urban design concepts for several of the new stations. The locations selected cover both sensitive historic settings as well as currently under-developed future centres, the aim being to demonstrate a range of responses to different local conditions.

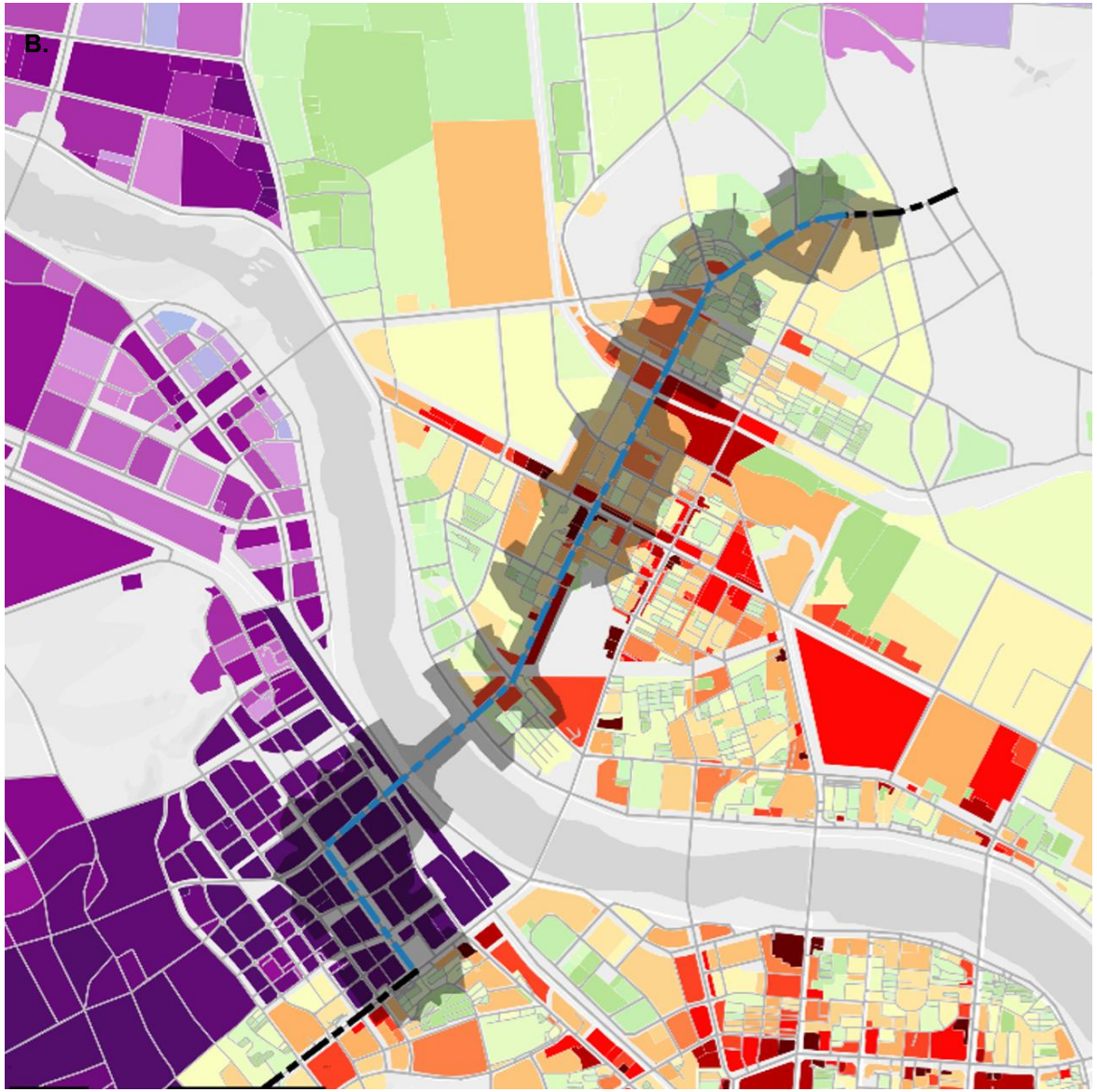
The outcome

The outcome of our work on the Jilin Metro project is a seamless integration of transportation and public space design that addresses both the functional and social needs of the city.

Our spatial analysis and evidence-based approach to station placement ensured that the metro network connects high-activity areas, supports sustainable urban growth, and facilitates easy access to key locations throughout Jilin.

The public spaces around the metro stations have been carefully designed to increase pedestrian movement, enhance social life and create vibrant local economies.

By strategically designing these public spaces to link separated neighbourhoods, the Jilin Metro project improves urban connectivity, reduces car-dependence and contributes to the city's long-term development as a modern metropolis.

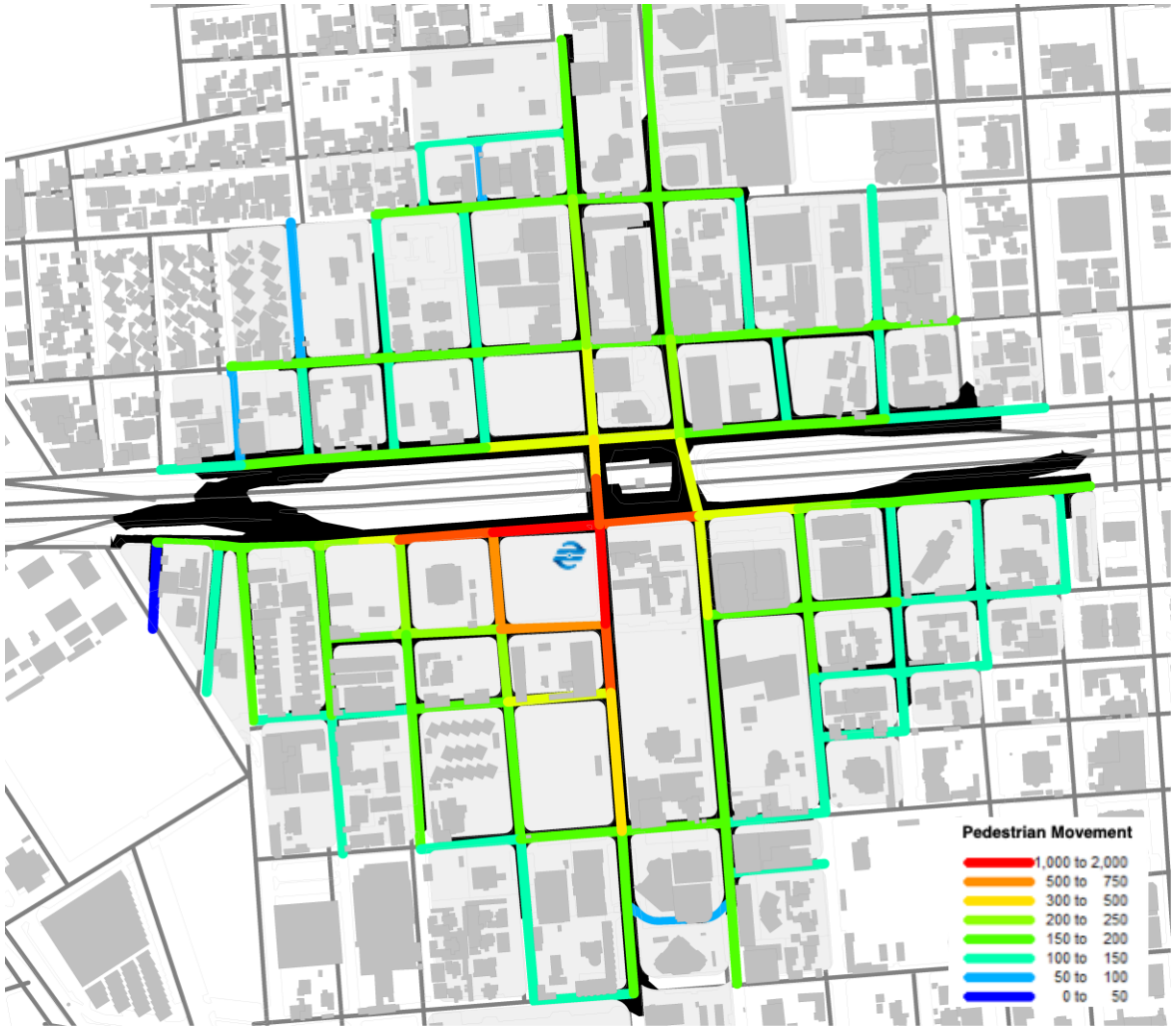


A. *Visualisation of a public space & metro station design (previous page).*

B. *Proposed metro alignment catchment overlaid on existing & proposed city spatial performance.*

Space Syntax © 2026

Case study | **Jeddah Metro TOD** Jeddah, KSA



Pedestrian movement forecasting and benchmarking to identify opportunities for Transit Oriented Development.

Client
Jeddah Metro Company

Year
2014

Role
Spatial Strategy & Circulation Consultant

Team
Foster + Partners

Key Features
Baseline study
Pedestrian Movement Forecast

The opportunity

A new metro network comprising multiple new lines was proposed for Jeddah.

The network and station locations were aligned to current patterns of activity in the city and with a recently produced Structure Plan, which aimed to concentrate new jobs and population growth in higher density centres connected to public transport stations.

Whilst locations create opportunities for TODs to respond to reasonably predictable pedestrian movement figures based on metro user projections, they are complicated by the interactions with typical everyday movement in the surrounding city.

Further complexity was added by taking consideration of the phasing of metro lines and potential ridership increases as more lines were delivered.

Space Syntax carried out studies to identify how these flows combine around stations, over different implementation phases, and identified where they reached levels required to support additional commercial activities.

Space Syntax © 2026

Case study | **Jeddah Metro TOD** Jeddah, KSA

Our contribution

We created strategic pedestrian movement models that combined station movement with movement in the surrounding area.

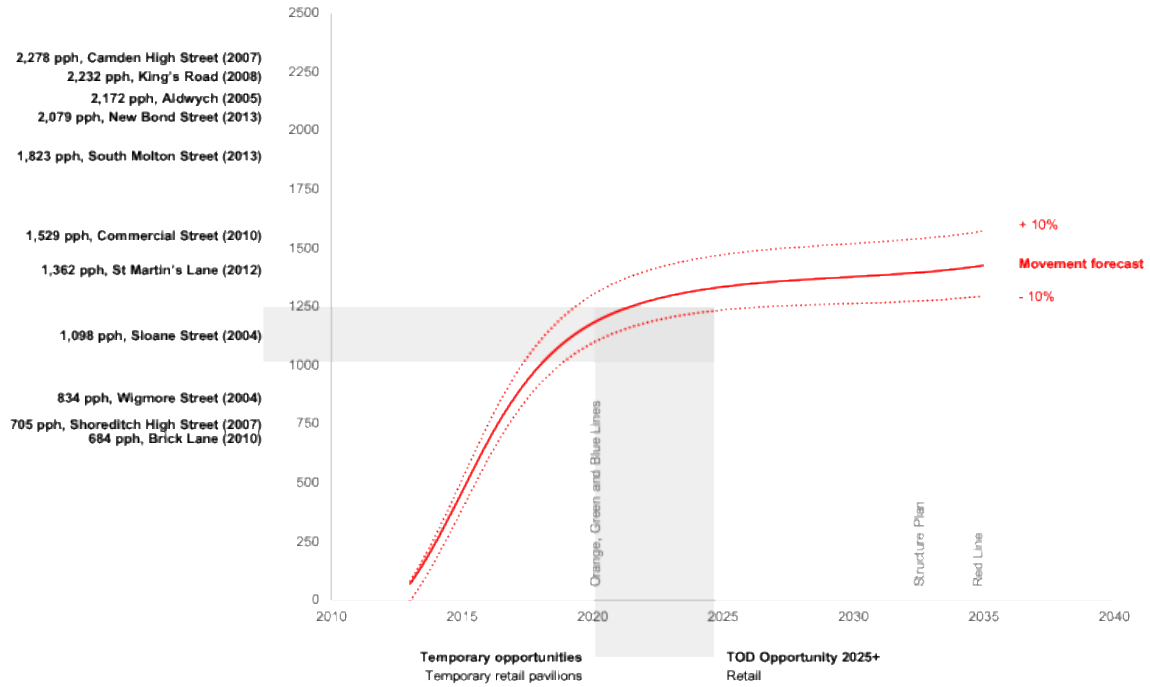
Movement was profiled within a 400 metre radius of the new station and split into ranges.

To understand whether this combined level of movement could sustain new retail and commercial uses, a profile of pedestrian movement in key streets was used to benchmark footfall.

This helped explain the levels required to support different retail types, and allowed different TOD locations, as well as different streets in the same TOD, to tailor the provision of retail and commercial space.

The outcome

The approach helps remove risk to TOD developers by using benchmarks to define suitable levels of retail provision. It helps future tenants by ensuring that only viable units are constructed, and it helps future residents by reducing the likelihood that there will be streets fronted by vacant retail units.

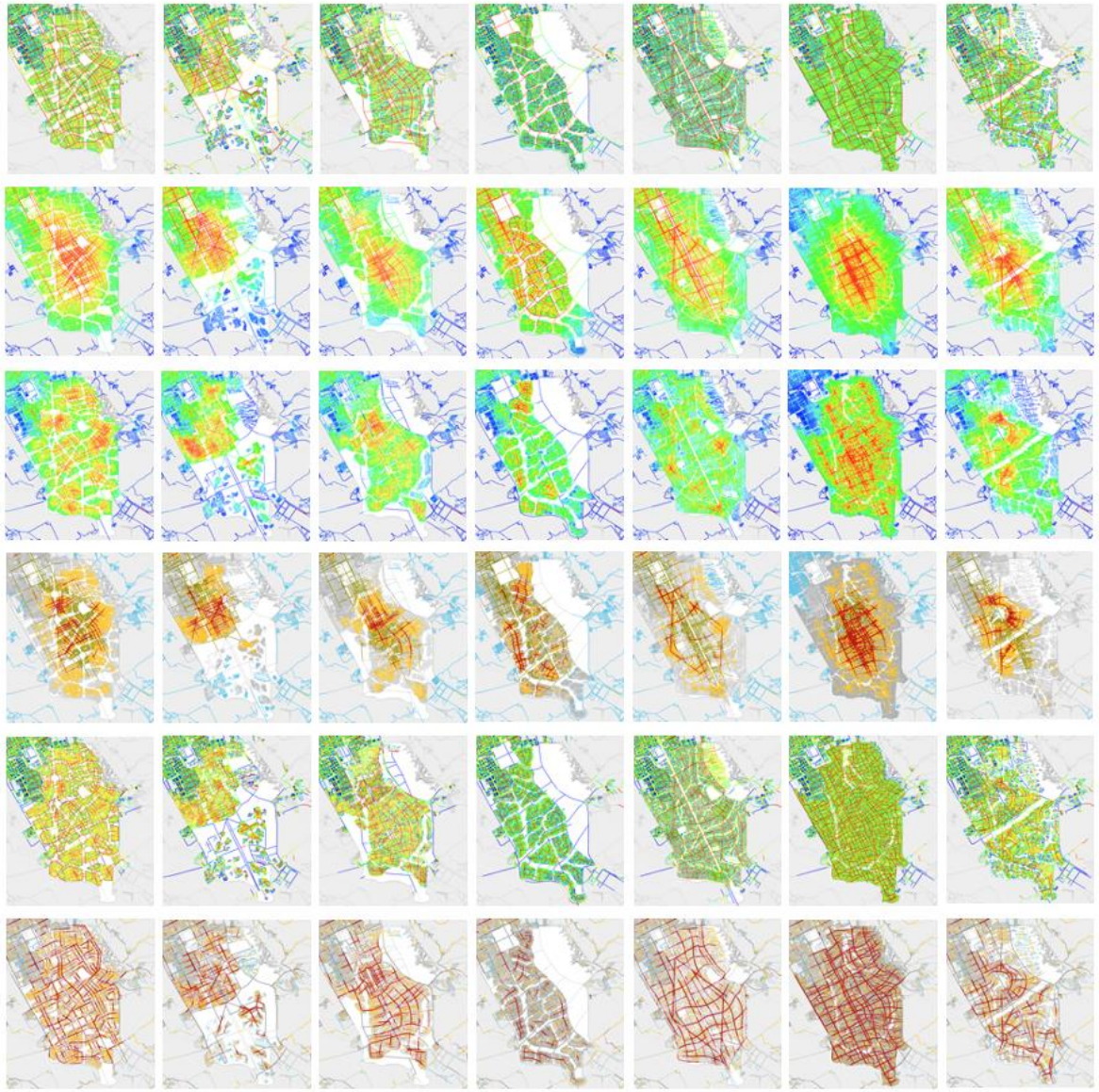


A. *Pedestrian Movement forecast showing predicted movement within 400m of a Metro station.*

B. *Graph showing pedestrian movement forecast over time as additional lines are delivered. Y-axis benchmarks footfall against retail streets to indicate scale of opportunity.*

Space Syntax © 2026

Case study | **Urban extension competition assessment** Riyadh, KSA



Assessment of competition submissions.

The opportunity

A confidential project in the Middle East aimed to extend a city and provide capacity for an additional seven million residents. Space Syntax were asked to assess seven competition submissions for a major urban extension.

Our contribution

Working with the client we identified a set of development objectives and the underlying urban conditions found in places that deliver these objectives. A number of spatial metrics could then be defined to measure these, with competition submissions assessed against these.

Based on the performance of each proposal, a design risk was assigned to each scheme with a summary showing all options.

A second element of the assessment considered how much work is required for submissions to be improved in response to their design risk.

The outcome

We provided the client and expert review panel with our assessment to consider during their final selection process.

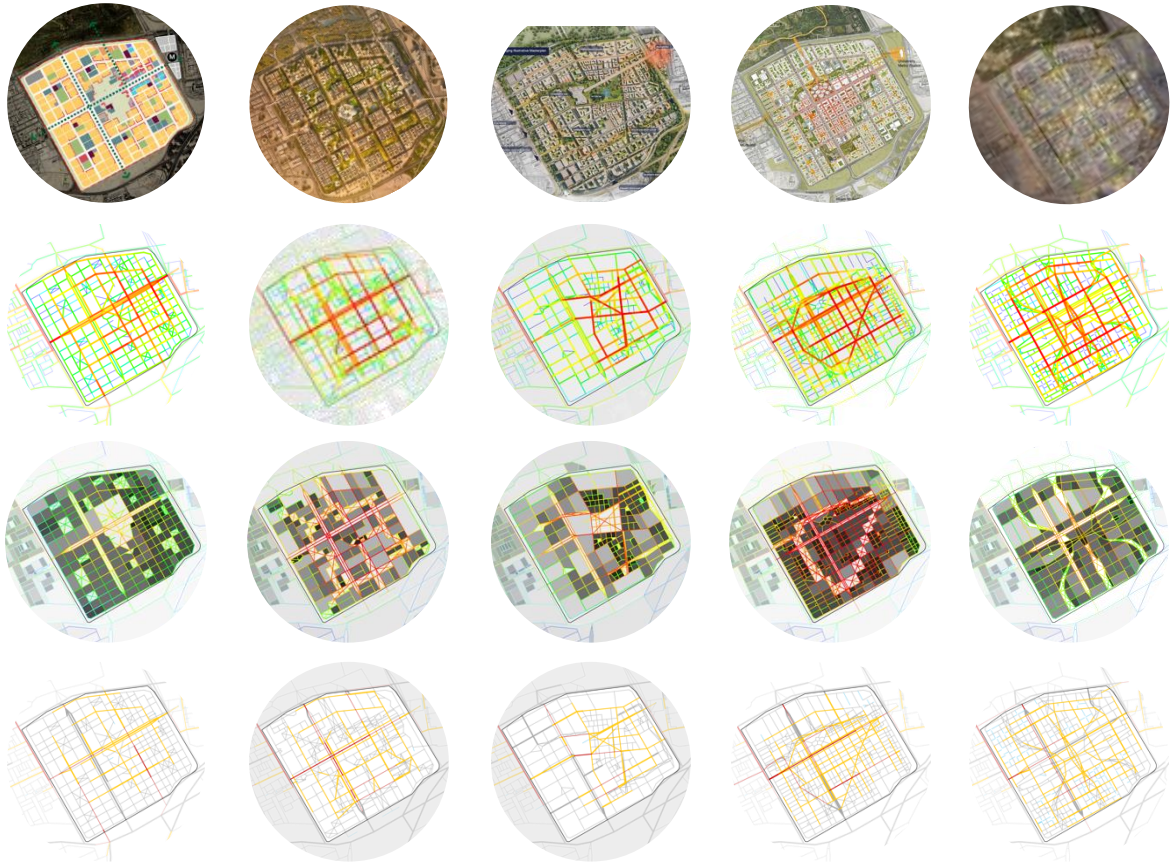
Client
Confidential

Year
2023

Role
Assessment of competition submissions

Space Syntax © 2026

Case study | **Competition assessment** Riyadh, KSA



Evidence-based assessment of masterplan design competition.

Client
PIF/RIDC

Year
2026

Role
Assessment of competition submissions

Team
Strategy&
MIC-HUB
Expedition Engineering

The opportunity

RIDC, a PIF subsidiary, have responsibility for developing a site in the north of Riyadh.Space Syntax worked on earlier stages of the project and developed an evidence base outlining the limitations of the site and design requirements to overcome these. We were asked apply these findings to assess five pre-concept competition submissions.

Our contribution

Earlier work identified that limited access to the site requires it to achieve a 30% public and active mode share to accommodate the target development population.

We identified cities and developments that deliver these mode shares, along with other development targets such as higher property values, and then identified the spatial conditions associated with better performing developments. Five designs were analysed and a range of design characteristics were compared to the findings of these studies. These results were then translated in to a design risk for each option.

A further piece of assessment considered how easily proposals could be developed to remove these risks.

The outcome

We provided the client and expert review panel with our assessment to consider during their final selection process.

Space Syntax © 2026

Contact us
81 Rivington St
London
EC2A 3AY

+44 20 7400 1320

london@spacesyntax.com
www.spacesyntax.com

Space Syntax