

IMPROVING QUALITY OF LIFE THROUGH TRANSIT HUBS

Delivering City Value and Prosperity
with Mobility Oriented Developments

INTRODUCTION: THE ARCADIS MOBILITY ORIENTED DEVELOPMENT BENCHMARKING INDEX (MODex)



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Rotterdam Central Station

Transit hubs are no longer simply a place where the traveler arrives or departs. The facilities in and around the hub make the area a destination itself and can provide a ripple effect that encourages investment in the area, generates new revenue streams and boosts wider prosperity.

Every city is dependent on mobility. Mobility enables people, goods and ideas to move in, out and within our cities, whether on its roads or in the air. As urban centers continue to increase in size and density, mobility is becoming a more pressing issue for a city's residents. In today's cities, journey times are increasing and transport infrastructure is under greater pressure than ever.

Yet, these are only two aspects of a city's mobility story. The facilities in and around a major airport or train station make the area a destination itself. In today's urban settings, transit hubs cannot be (re)developed without regard for the surrounding area. At their best, transit hubs should provide a ripple effect that encourages investment, generates new revenue streams and improves the overall quality of life in their neighborhood.

The challenges each city and neighborhood faces differ: every city has its own unique mobility needs and every transport development has its own goals. Yet there are some considerations common to all of them. These include the need to maximize stakeholder alignment and involvement; the generation of sufficient funding and return on investment; the provision of more efficient and affordable transport; capitalizing on a transit-hub's placemaking; preparedness for new technologies and improving passenger experience. These considerations, though on different scales depending on the city and project in question, are important factors for international and city-level mobility, as well the (re) development of transportation hubs.

Developing a modern transit model requires extensive future planning and development. But, it also means ensuring that the full social, environmental and economic potential of existing transit hubs is exploited. By looking at the leading practices among transportation professionals and city planners, as well as missed opportunities observed at transit-hub developments around the world, we can gain valuable insights into approaches that will allow us to optimize multi-mode transit-hub designs.

Arcadis' integrated approach to such transit-related developments is called Mobility Oriented Development, or MODe. With MODe, we focus on the integration of four key elements that bring value to transit-hubs: connectivity, urban environment, social placemaking and economic development. By quantifying these elements, refined according to our extensive global experience and observations of developed best practices, we have created a rigorous framework by which to compare transit hubs. This allows us to see, like never before, their untapped potential.

*This report is an update to the inaugural issue, **Our Mobile Future: Delivering City Value and Prosperity Through Mobility Oriented Developments**, released in 2015.*

MODE: Evolving Transit-related Development

Mobility Oriented Development (MODE) is an evolution of transit-related planning and execution. It provides transit choices that connect and improve mobility and people's lives. MODE ensures transit hubs are maximally efficient in their main task - transporting people and goods - and generate greater prosperity for both citizens and investors.

MODE serves both public and private stakeholders. By attracting additional private investments, MODE can maximize the return on investment in both the transit hub and the surrounding areas. This in turn helps to accelerate social and economic development in the area.

Mobility oriented development aims to shift thinking from single-minded rail mobility, to providing citizens with a full range of mobility options as they live, work, learn and play in high-quality urban environments. Every option must be considered, from walking, cycling and bus transport to Bus Rapid Transit (BRT), Light Rapid Transit (LRT), metro and aviation. Whereas transit-related developments are traditionally designed to do the following:

- Induce ridership
- Reduce driving
- Increase walking and biking
- Add convenience
- Increase density
- Encourage overall transit use.



Rotterdam Central Station



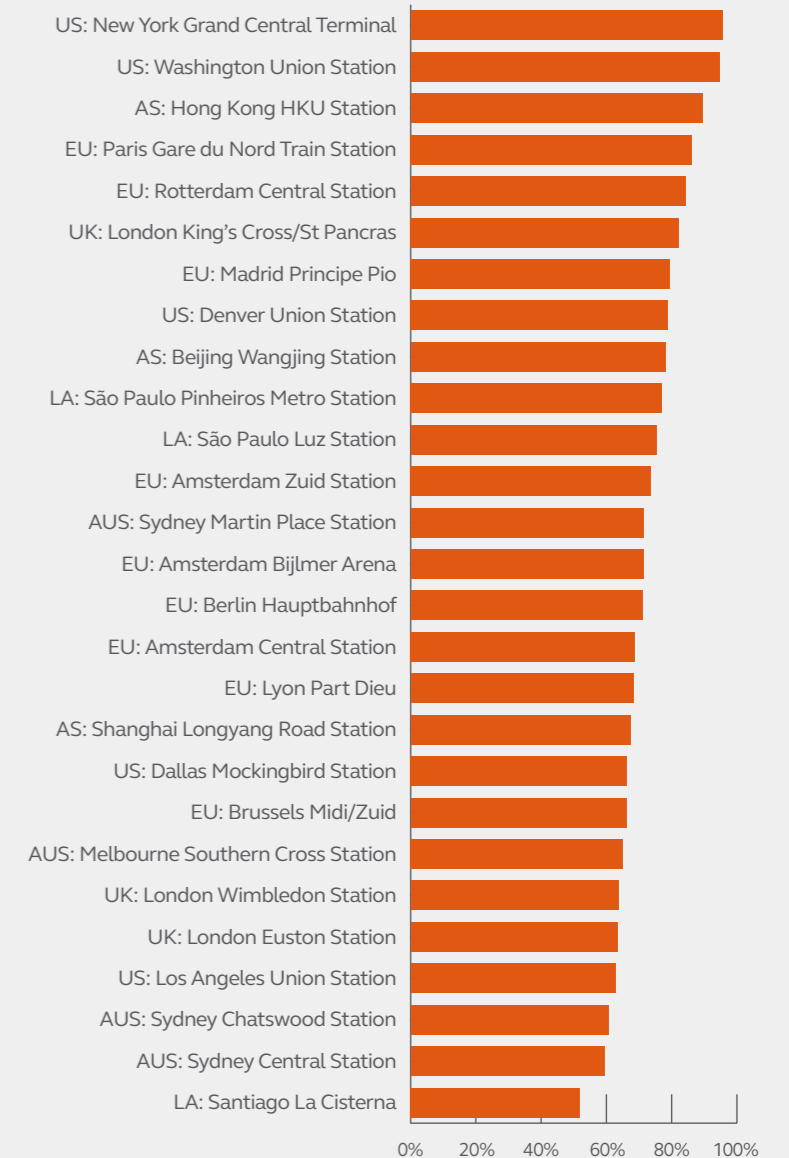
MODE contributes to looking at the bigger picture such as the following:

- Sustains ridership
- Discourages driving
- Anticipates new forms of mobility
- Makes walking and biking safer
- Adds a mix of uses
- Offers diverse placemaking
- Supports transit usage.

This way of thinking allows developers to think not only in the present, but also equips them for future changes, while also allowing public authorities to better understand how to realize a development's financial potential.



Figure 1: Overall MODex Scores





New York Grand Central Station

THE ARCADIS MODE BENCHMARKING INDEX (MODex): REALIZING THE VALUE OF MOBILITY ORIENTED DEVELOPMENT

“It’s exciting to see the private development that was sparked and continues to grow as a result of the redevelopment of Denver Union Station. The Union Station area is truly a major destination in the metro area with its vast options for entertainment and business that can easily be reached with our world-class transit facility and services.”

Dave Genova,
Denver Regional Transportation District General Manager and CEO

The Arcadis MODex Benchmarking Index assesses a transit hub by comparing it to global best practices. It defines the overall value of integrated development at and around transit-hubs. The Index has been constructed using indicators that measure the quality of the key elements that bring value to a development. In this way, a transit hub can be compared before and after its redevelopment, increases understanding of how sustainable multi-modal urban environments can be created and the main factors that optimize them for wider social benefit.

The Benchmarking Index, MODex, reveals the potential of existing or future developments by providing the following:

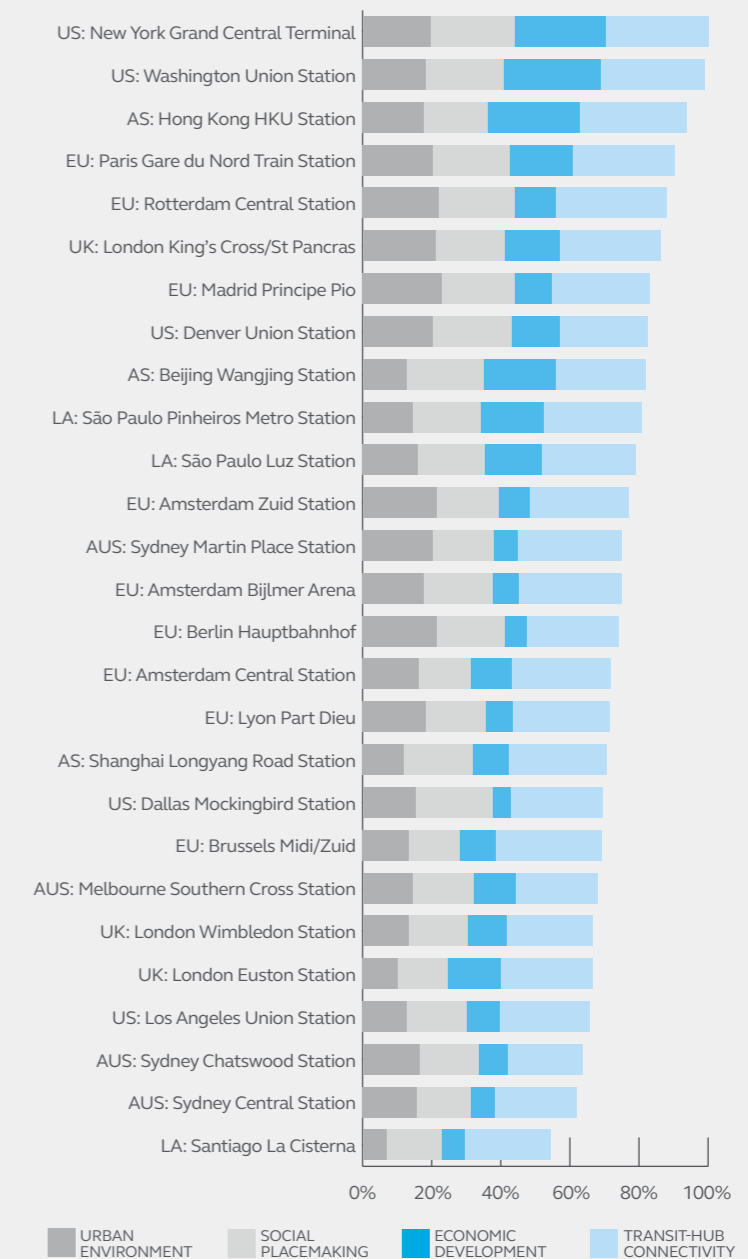
- The ability to investigate how far investment in a transit-hub contributes to the success and added value of the multi-modal urban environment, including higher property values, public spaces and increased revenue for local businesses
- The ability to find out where there is room for improvement
- The quantification of qualitative measures
- A global performance comparison of multi-modal urban environments according to a range of transit-hub key values.



Courtesy: Denver Union Station

Denver Union Station

Figure 2: Score by Indicator





Liverpool Street Station

MODex addresses four key indicators, each built from several specific variables. Each variable has its own set of values to measure the score of the development and compare it to others:

1 Transit-hub Connectivity

Describes the quality of the transit hub in relation to the variety and quantity of transit modalities, its proximity to other important locations and facilities, and its provision of comfort to the traveler.

2 Urban Environment

Assesses the urban form of the environment and how sustainable it is. Urban form is determined by variables such as an area's density and whether a development is mixed-use.

3 Social Placemaking

Weighs variables that contribute to a vibrant and multimodal urban environment. These include factors such as the quality of the public space and the variety of public facilities within the transit zone. A new parameter to this indicator has been added, safety and security, to assess the resilience of a transit hub to climate change impacts, intentional undesired events as well as traffic and passenger safety and security.

4 Economic Development

Evaluates the prosperity, economic activity and property value of the urban environment within the transit zone, relative to the national average.



Using these values, we assessed a selection of transit-related stations around the world, of which we show the performance of leading developments.

This year, we've evolved the benchmark data set to provide an even more comprehensive assessment of the value of transit-hubs. In addition, we've increased the number of transit hubs in the benchmark to include additional, recently developed, regional or iconic stations around the world. The transit-hubs considered are in various stages of evolution towards a mobility-oriented approach. Importantly, the purpose of the Arcadis MODe Benchmarking Index is not to create a hierarchy of transit hubs, but to indicate areas of opportunity. As the world continues to become more reliant on its urban centers, we hope that city leaders and transit agencies find this a valuable tool to assess their progress and align priorities for an improved quality of life for all.



Main Findings

- Like the previous release, New York Grand Central has the highest total benchmark score in overall performance. The high number and types of transit connections in a relatively dense area, and a densely developed metropolitan surrounding it, strongly contribute to its benchmark. New York is closely followed by Washington D.C. Union Station for similar reasons.
- Hong Kong University station scores high on connectivity, mainly for the number of bus lines connecting with the metro station in a relatively small area and linking to a large number of urban centres within sixty minutes travel time.



Figure 3: NYC Grand Central Terminal

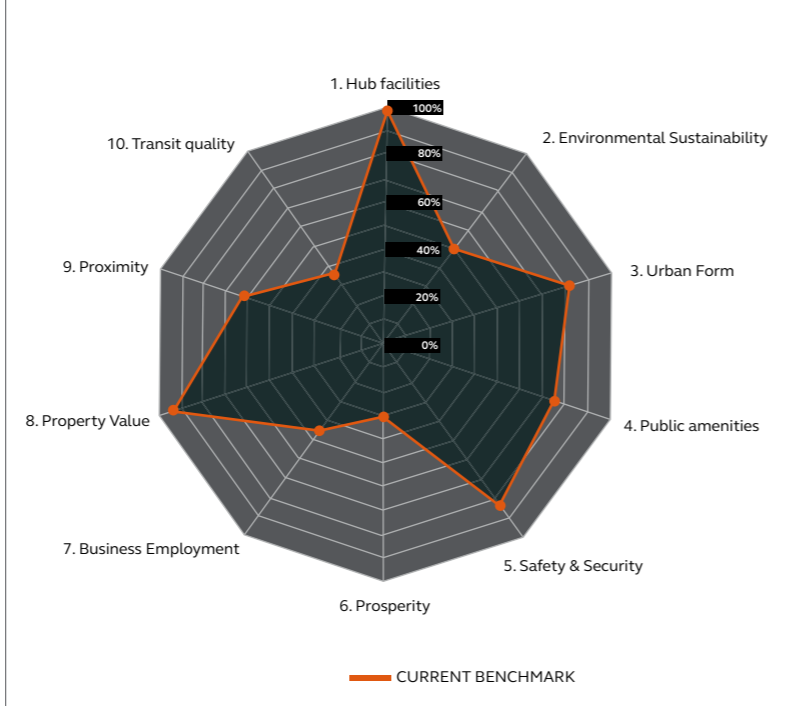
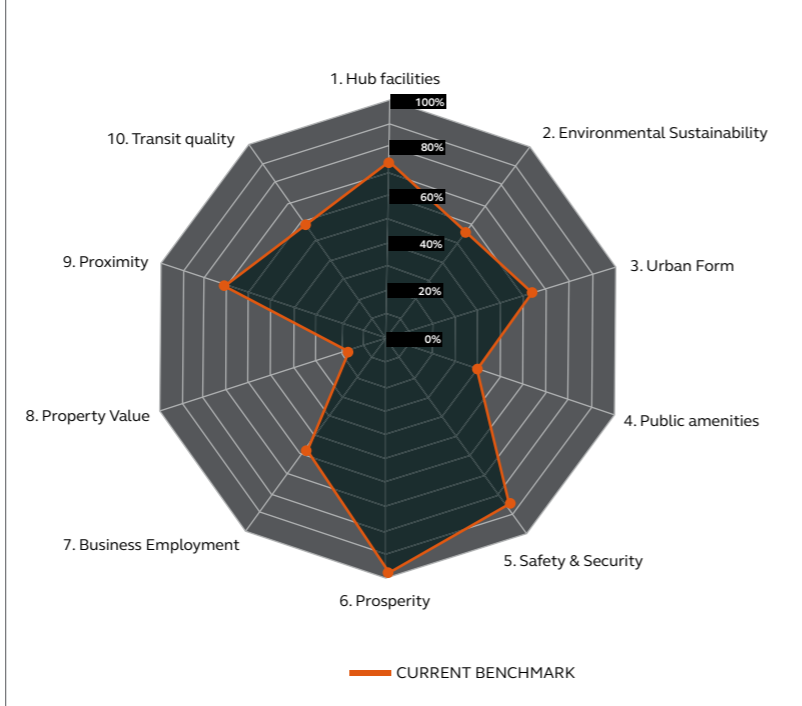


Figure 4: Hong Kong HKU



- Paris Gare du Nord overall performance is high as well. Compared to London King's Cross/St Pancras station it scores somewhat higher, because not only parameters about the station itself are assessed, but also because of the surrounding urban environment. Gare du Nord profits from its surroundings, with high performance on urban environment variables such as high density, mixed-use and qualitative characteristics, but also performs high on social placemaking variables such as public amenities.
- Rotterdam Central Station has been undergoing a large transformation and development the past decade, which contributes to an improving benchmark. Property prices around the station have increased, and it performs high on qualitative and integrated urban environment, and its connectivity standards such as facilities within the station itself, multimodality and transit quality.
- London King's Cross / St Pancras scores lower on the benchmark because, unlike the 2015 MODex was assessed together with Euston Station. The latter is now assessed separately. King's Cross/St Pancras has the highest performance on transit quality and connectivity, because of the high standard of hub facilities and the high concentration of transportation lines. The future MODex score of Euston station should be interesting to follow, since this station will also undergo a major restructuring and expansion to accommodate the high-speed rail line (HS2) to Birmingham and further north.



Transit-hub Connectivity

Washington D.C. Union Station and Rotterdam Central Station are leading the group of six highest scoring stations in connectivity. These stations stand out by offering many transfer possibilities in a highly concentrated area. In addition, these stations offer a complete set of facilities to the traveler, which contributes to higher scores.

Urban Environment

Madrid's Principe Pio tops the urban environment indicator due to its high quality urban form and public space. Along with several other stations, like Washington D.C. Union Station and Rotterdam's Central Station, it also scores high in environmental sustainability for attributes like energy efficiency, climate adaptation measures and green environment. It's striking that in general, European transit-hubs score relatively high on urban environment as compared to others around the world. In general, climate resilience and ambitions in sustainability cannot always be explicitly recognized. These is one of the key challenges for the near future.

Figure 5: Transit-Hub Connectivity

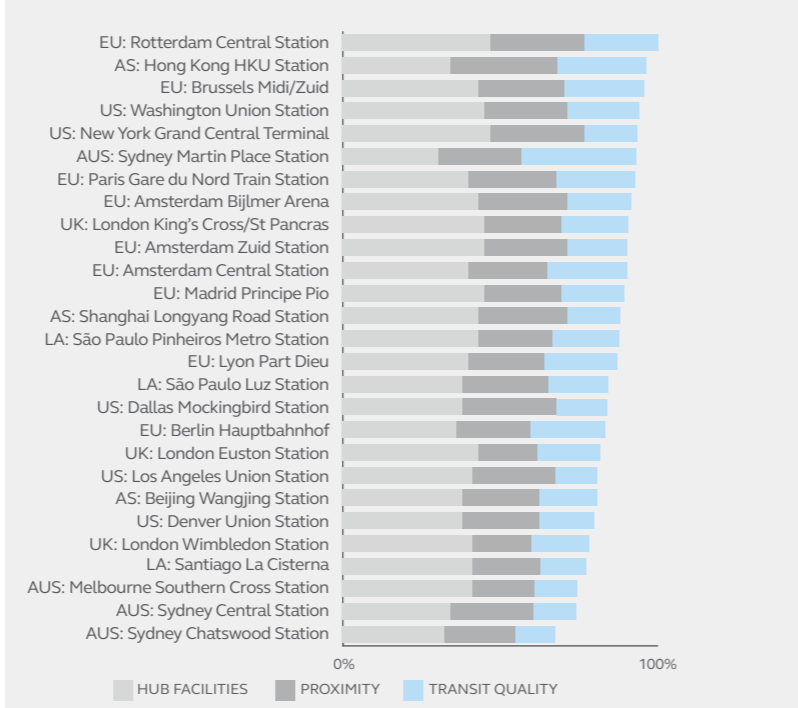
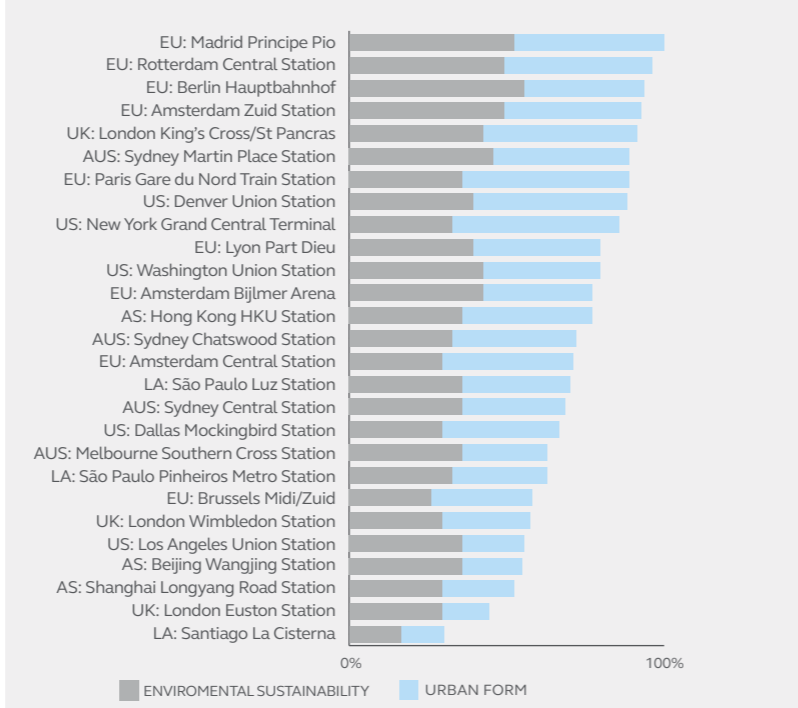


Figure 6: Urban Environment

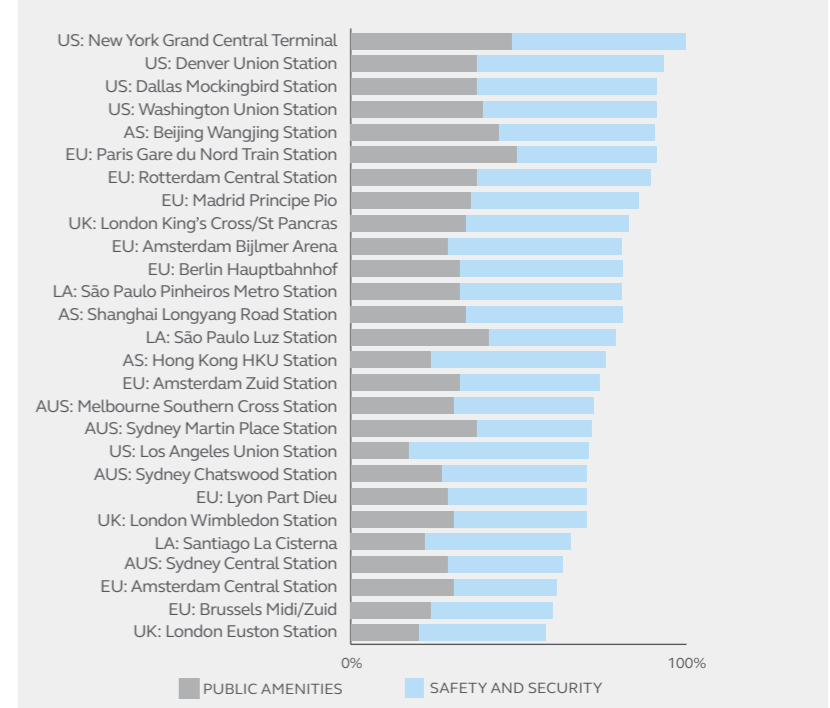


Dallas Mockingbird Station

Social Placemaking

It's not surprising that stations located in a dense urban area score high with the presence of public amenities. Regarding safety and security, it is interesting to see North America and Europe scoring the highest, followed by Hong Kong.

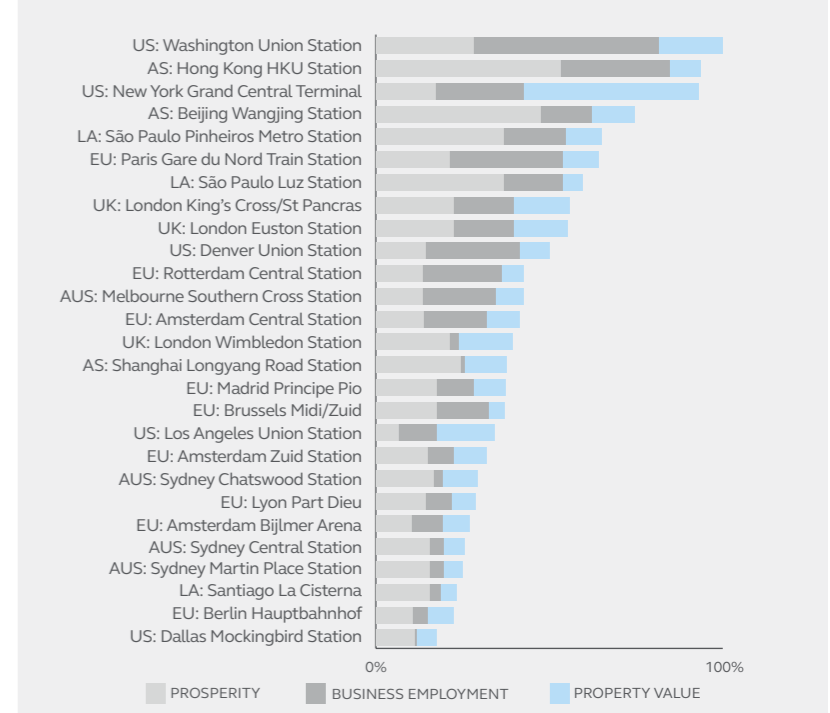
Figure 7: Social Placemaking



Economic Development

The economic development indicator sees New York's Grand Central and Washington D.C.'s Union Station leading the way, with high scores across prosperity and property values. High scores in economic development reflect the importance of transit hubs within the city, and highlights differences of these metropolises with the country average. Most striking is the significant variance with business employment. The Washington Union Station area scores extremely high due to a high concentration of federal government offices surrounding the station. With most other locations, we see fairly high employment, yet some stations show a relatively moderate score which may indicate an unleveraged potential.

Figure 8: Economic Development



MOBILITY IN THE U.S.A. AN EVOLUTION



Nate Cherry
Vice President, CallisonRTKL



Public transit is gaining popularity in North America. This is no doubt partly due to the growth in urban populations over the last 20 years. However, there are fundamental differences in the ways in which North Americans and Europeans travel: in 2010, the average American drove for 85 percent of their daily trips, whereas the average European drove only 50 percent of the time (City Lab, 2014). For trips of less than a mile, Americans drove 70 percent of the time, while our European counterparts drove less than 30 percent of the time. The average European's first impulse is to consider a variety of transport options when they need to travel. For Americans, travel almost always means using a car. There are several reasons for this disparity; some of them are foundational to the ways cities were formed, while some are more policy-driven decisions that impact recent mobility choices.

Ultimately, North American acceptance of multi-modal facilities and mobility-based development reflect issues related to its history, culture, and financial priorities.

U.S. policy responses to car travel have focused on technological innovations that make car travel more environmentally friendly. Air quality standards, safety improvements, and intelligent transportation systems have all emphasized making car travel cleaner, safer and more efficient. Even the excitement around autonomous vehicles has largely been structured as a conversation about the ways in which these vehicles will integrate into the overall mix of primarily single ownership vehicles. Some even believe investment in public transportation in America is a waste of money, because autonomous vehicles will become the preferred mobility option in the future. Conversation in America has long been rooted in the advocacy of the single occupancy car as the preferred mobility system, even in urban areas.

Nevertheless, public transit, biking and pedestrian mobility are all gaining popularity in America. It's significant that major transit networks are being built (albeit after they were largely abandoned for automobile networks) in major metropolitan areas throughout the U.S. Though American cities are fundamentally different from global peer cities, there are North American examples of robust mobility networks that have improved the quality of life for urban residents, such as San Francisco, Seattle, Minneapolis, Denver, Chicago, New York and Boston. In these cities, a mix of public transit, active transportation improvements and sensible limitations on automobile use have greatly benefited the quality of the regional environment, individual human health and social cohesion, without significantly increasing travel times.

In America, there are several major ongoing or recently completed urban multi-modal transit-hub projects. These developments suggest that world-class transport centers can be economically and socially beneficial to America's cities. A prime example is the Oculus structure at the World Trade Center transportation hub

in New York. Here, commercial mixed-use development is clustered around a highly functioning, multi-modal station. It provides retail and other services within an iconic station adjoining the National September 11 Memorial Museum. The recently completed Union Station redevelopment in Denver brings together rail, bus and bike services, all housed within an iconic station setting, combined with dense clusters of new mixed-use office, hotel, retail and residential development surrounding the station. Los Angeles' Union Station is currently undergoing a major 10 year renovation and redevelopment that promises greater multi-modal connectivity, first-class architecture and mixed-use development in the surrounding area. The city will finally have a transit-hub befitting a city of its global reputation, made even more pressing with the announcement that the city will host the Summer Olympics in 2028. Regional initiatives for high-speed rail are gaining political momentum in California, Texas and along the Eastern Seaboard.

Ultimately, North American acceptance of multi-modal facilities and mobility-based development reflect issues related to its history, culture, and financial priorities. Let's hope that each region in North America continues to "do it its own way", while also learning from best practices elsewhere.

WHAT ABOUT THE MONEY? INVESTMENT IN MOBILITY ORIENTED DEVELOPMENT

Sustained investment and dedicated capital is required if cities are to transform their transit hubs into the vibrant facilities that today's urban residents demand. However, public and private funding is not always readily available for infrastructure projects – the global infrastructure investment gap is estimated at USD \$3.7 trillion per year until 2035 (McKinsey & Company, 2017). Public-private partnerships (PPPs) account for an estimated 12 percent of infrastructure investment in some advanced economies, but the global average is just three percent (McKinsey & Company, 2016).

Around the world, both private and governmental organizations have explored a variety of innovative investment schemes to overcome the funding gap. In Rotterdam, the public transport company made itself independent of public funding by optimizing its business model. As a reward for their success, they eliminated the time-consuming bid process required for new work. For capital infrastructure projects, PPPs are used to secure funds for more significant investments, such as Transport for London's Docklands Light Rail, where railway operations were franchised to a private entity. Purely private infrastructure funding initiatives are also being encouraged for the development of electric and autonomous vehicles. This method enables medium-sized business enterprises to enter the transportation market with their services and contribute to the next generation of mobility.

Private investment is also helping to fund some of the world's largest urban infrastructure projects. CrossRail2, also in London, is aiming to attract significant private investment by advertising the positive social and economic opportunities that the rail line has brought to its surrounding neighborhoods.

Hong Kong's corporatized public company Mass Transit Railway, MTR, uses the profits from real-estate developments surrounding their rail stations to pay for future rail extensions. New York City's Hudson Yard project and San Francisco's Transbay Center have both used taxation, grants and loans to help cover the costs of these subway expansions. São Paulo uses the income from auctioned real estate development rights to fund new public transport.

Strategy and policy makers and private investors must decide not



just how, but where to invest. On the one hand, a growing urban population requires structured public initiatives. On the other hand, however, disruptive technologies and emerging businesses affect how a city should evolve and especially how its transit hubs will function. Policymakers need to think not only about the present factors involved in the creation of new metro lines, rapid bus corridors and networks of bicycle lanes, but they also need to anticipate future transit-related developments. A strategy is needed that takes into account, for example, the change in traffic flows that would be triggered by ride-sharing around stations and airports, as well as how fewer parking spaces and available real estate might free up the physical and legal path for a Hyperloop in the future.

Metropolitan public authorities, working in tandem with the private sector, increasingly need to co-create bold, flexible, integrated, investible and versatile strategies to fund these complex projects. Cities that take a MODE approach will generate investments from both public and private sectors and stand to benefit from the best in class practices around the globe, ensuring an improved quality of life for their residents.



Courtesy: Société du Grand Paris - Agence Kengo Kuma & Associates

Paris Saint-Denis Pleyel Station

Metropolitan public authorities, working in tandem with the private sector, need to co-create bold, flexible, integrated, investible and versatile strategies to fund these complex projects

WHAT IS MOBILITY AS A SERVICE (MaaS)?

Mobility as a Service (MaaS) is a way of integrating transportation modes (e.g. public transport, autonomous vehicles, parking, shared cars, bikes, taxi) into one digitized system. This enables a seamless exchange between different modalities.

Digital apps, like the ones on your smartphone, can easily provide MaaS by displaying travel information on how to get to a destination, make reservations for cars, rent bikes and even pay for transport services, either per use or through a subscription model. This marks a significant departure from traditional vehicle ownership and fixed transport passes and it provides a custom and turnkey transport service. This will ensure that every user travels the most efficient route, in the greatest comfort and at the lowest possible price.

Around the world, several MaaS oriented initiatives are underway. Most of them are focused on further integration of public transit offerings, and in some cases, this also includes the 'last mile' transportation options. The next step will involve larger-scale implementation and will include all public and private transport modality options.



MaaS in Amsterdam's Zuidas Business District

Amsterdam's Zuidas Business District is fully embracing the MaaS concept. The area has a huge mobility demand, as many high-profile companies are based in the area. These companies, who are key stakeholders in expanding transport options, are well coordinated, with several shared mobility options currently available to all of them, such as shared bikes and shared electric cars.

A more comprehensive strategy will require all Zuidas Business District companies to enter a joint buying process, where companies agree to bring in a minimum number of users into the MaaS platform. By combining buying powers, the procurement position becomes stronger, which helps transport providers adjust their future offerings.

Arcadis works with a MaaS solution provider to make sure the solution is tailored to the needs of the employees of the variety of companies within the district. At the same time, facilities for accommodating adjustments to the infrastructure are included in the ongoing transport-hub redevelopment program.



A VERY MODERN PROBLEM: WHY TRANSIT-RELATED DEVELOPMENT NEEDS TO EVOLVE



As more people move to cities, transit hubs will have to provide increasingly high economic, environmental and social value. To meet these demands, early planning, collaboration and a truly holistic outlook are all needed. This means prioritizing not only economic and environmental benefits, but also demonstrating that new developments have public health advantages and will benefit overall quality of life.

Rising to the challenges faced by modern cities requires a next level approach to transit-hub development. To meet the expectations of modern city-dwellers and to improve their quality of life, these hubs must be genuinely mixed mobility oriented developments, offering a range of transit modes and encouraging the use of sustainable options. Not only does this mean taking advantage of the best of today's practices, but it also means anticipating how future technological developments will provide new ways of moving people, goods and services.

Looking to the future also means cultivating sustainable urban environments. Transit-related developments must be undertaken with a care for the area in which they are built, ensuring that they provide more leisure, housing and workplace options. If this is done well, the neighborhoods created or regenerated will become destinations in themselves. Urban environments that offer a high quality of life, also have the added value of attracting new people and businesses. Businesses will be particularly attracted by neighborhoods that are easily accessible; as this means more customers and easier access for their employees.

Leveraging the value of such a development is a complex process, with a lot of stakeholders, all of whom have varying interests. In any major development, these stakeholders will include city

planners, developers, business owners, retailers, investors, transit owner-operators and community groups. Typically, each party concerns itself with the part of the development that they have direct influence over. Yet this approach limits the overall impact of a hub development and makes it difficult to fully integrate the hub into the wider surrounding area. In these cases, development of the area around the hub happens because of the hub, rather than in tandem with its development. The result is transit-served developments, rather than transit-oriented developments.

This disparate activity means that developments often do not realize their design potential: the various parts do not come together to form a cohesive whole, meaning developments fail to maximize their potential as commercial and social spaces. There are several common practices which compromise on design potential. For example, to attract investment and generate an early return, many transit-oriented masterplans predominantly focus on high-end residential elements, to the neglect of other components that also add wider social, economic and environmental value to the development. Equally, by focusing on road and rail connection plans, opportunities are missed to encourage the use of other, more sustainable transport options.

MOBILITY GOVERNANCE: GOVERNING TRANSIT AND LAND USE INTEGRATION



The integration of transit development and land-use planning provides a best-in-class example of how transit projects can be made financially beneficial and how, at the same time, they can have a regenerative effect on their communities. To be successful, an effective integration requires several important ingredients, including available property, supportive zoning, a workable institutional framework and sustainable finances. Mobility-oriented strategic visions for cities like Copenhagen and Singapore have ensured that transit investments lead to optimized outcomes for all stakeholders.

In these cities, railway operators are public entities, meaning that they are operationally and financially linked to public authorities and they mostly rely on government subsidies to fund transit development. In an increasing number of cases, part of transits value-add to affected real estate is returned to public authorities by auctioning development rights, by levying taxations or creating co-investment covenants. The developments are coordinated and managed by the respective authorities and developers.

There are other approaches to funding major infrastructure projects. Cities such as Hong Kong or Tokyo chose to fully integrate governing transit development and land-use. This allows them to produce significant revenues and capture highest value through the development of property and air rights. These fully integrated projects need to be prudently funded for the original vision to be realized; fortunately, when well-managed, the promise of significant returns on such projects attracts investment. The most appealing projects for investors are those which are undertaken in dense, congested urban areas, where accessibility is crucial and opportunities for redevelopment are rife. Hong Kong's integrated rail and property development governance made railway operations financially viable with the intensive mobility oriented built form.

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Hong Kong is one of the few cities in the world with a self-financing rail system, without the need for direct government subsidies. MTR Corporation, a semipublic entity in Hong Kong, provides for the construction and operation of mass transit railway systems, carrying an average of 5.6 million passengers every weekday. In addition, MTR engages in the development and sale of residential and commercial properties in partnership with property developers. MTR's operating profits are attributed to the Rail plus Property (R+P) business model. With R+P, MTR receives exclusive development rights to publicly owned land, granted by the government, and uses value capture to finance rail investments, operation and maintenance. MTR puts leasing rights of the land surrounding and above a transit station up for sale to private developers. It also owns and manages its own, primarily residential, properties. The success of the R+P model is attributed to the extreme urban density of the city and scarcity of land. This makes real estate highly valuable and helps R+P developments generate reasonable profits.

The Hong Kong Government (GovHK) owns all land in Hong Kong, allowing them to grant exclusive development rights to MTR at the pre-rail market prices. In collaboration with GovHK planning and transport departments, MTR provides a masterplan of the development area and sells development rights to property developers. The difference between the pre- and after-rail market price provides the means to finance the rail station and associated investments. The two sectors, transit and land-use planning, jointly develop the area, with each focusing on its area of expertise to add value to the station site. The result is a win-win situation for tenants, investors and transit users.

The Government of Hong Kong and MTR retain full control over the land, and MTR develops the



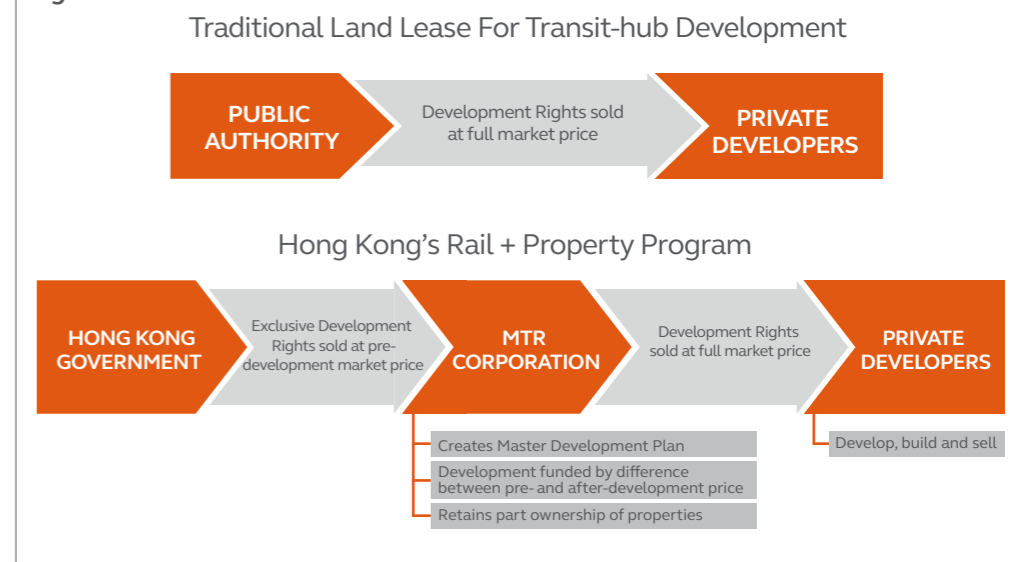
Hong Kong Station

stations and rail, with private developers building and selling the real estate units above the station.

The R+P model differs from other land value capture models, where a government will sell development rights of public land to private developers and lose control over the sites with the sale.

The R+P model benefits not only MTR, but the entire surrounding community. From 1980 to 2005, the city of Hong Kong derived approximately \$18B USD in net financial returns from land premiums, market capitalization, shareholder cash dividends and initial public offer proceeds through R+P. MTR net income over the last decade comes from property development (38 percent), transit operations (34 percent), station commercial businesses and property management (28 percent).

Figure 9



The key to success is the way it is being governed

A centralized governance model (Figure 10: Model A) is designed so that a single entity, in this case MTR, controls the implementation of the integrated development. MTR is the intermediary between public authorities and the developers, and they work to ensure that quality standards are maintained and manage the site after its completion. The semi-private is involved at all stages of development and operation, from initial planning to full-scale operation.

Other cities utilize a decentralized approach for integration of transit and land use. The decentralized management model (Figure 10: Model B) is an institutional governance approach, where the development is implemented separately: property development is realized by developers and railway construction by a transport agency.

The benefit of the centralized approach for a MODe is that it can help transform a city into a dense urban environment.

The development of high-rise buildings above and around stations is needed to bridge the funding gap of the transit investments while also helping to meet the demand for new real estate. The centralized model is one approach to the successful development of transit-hubs. Each city and neighborhood must tailor its approach to its institutional and financial conditions, while being prepared to benefit from the best practices of other governance models.



MODe: SIX KEY ACTIONS

1. New mobility increasingly important in planning for the future

At its core, mobility oriented development is about making sure current and future plans for transit (re)development are robust, while accommodating future mobility technologies and changes in the use and organization of multi-modal systems. It is likely that Automated Vehicles (AV's) and intelligent systems will continue to significantly change or disrupt the use of traditional transit systems within city centers. To some cultures, the promise of AV's can leapfrog traditional transit as a network of preferred modes of transportation.

Public transport schemes can also shape, as much as respond to, a city's future, by massively altering the sense of a city's physical and mental geography. The Grand Paris Express program contains plans for a larger metro transit ring and radial lines. With this development, a bigger area of the city will become part of the city center, bringing additional economic and urban development and providing direct connections between areas which have traditionally been viewed as suburbs.

2. Integrated planning leads to better outcomes

When developing a transport hub, it is important to plan for the complete range of transport modalities and connections, rather than just the main rail functions. In doing so, it is possible to create a more logical and compact transit-hub, ensuring greater ease of use and comfort to the traveler. At the newly redeveloped Rotterdam Central Station and King's Cross/St Pancras Station, urban and regional connections were brought closer together, making transfer between them significantly easier. In Rotterdam, this was combined with a high-quality pedestrian route to the city center and easy access to bike parking.

In contrast, the separation of taxi, bus and private vehicles at hubs in China has hindered safety and exacerbated traffic. This represents a major missed opportunity for vibrant mixed-use development. Indeed, integrated planning can only be achieved by full involvement of all key stakeholders. It seems obvious, but in practice it is rarely achieved. While the interests of stakeholders can be very different, they share a desire to reap the benefits of a successfully developed plan. An integrated approach benefits everyone, providing a shared vision, transparency and a clear strategy, all of which are crucial for aligning stakeholders and gaining public acceptance for a project.

To align stakeholder interests, a careful planning process is required, in which all aspects of the development are carefully mapped out and coordinated. In the Amsterdam Zuid Business District redevelopment, this approach considerably strengthened the business case for investment. Given the complexities of infrastructure projects on this scale, a clear, phased plan is needed so that all stakeholders can see the incremental steps required to achieve the larger vision.

Figure 10: Governance Models for Transit-Hub Development



3. Developers and investors need a clear framework

A clear framework for development is crucial for ensuring that plans are realized on time and within budget. The transit agency or station owner plays an important role in setting these parameters, but local authorities are also crucial: they provide the glue between the public space and public transport pieces of the puzzle. Their successful coordination contributes hugely to achieving the end vision. Having a clear plan lends a project predictability and acts as a great incentive to investors and developers to make the large investments required for integrated planning.

4. Hubs with international and high-speed connections are more attractive for investors

International high-speed and long-distance connections to other cities or international airports contribute to a higher level of facilities, an improved built environment and therefore, more commercial activities and revenues. Such connections, therefore, can act as an exceptionally powerful means of leveraging the value of the mobility hub. Not only the hub and its surrounding area should be of high quality, but also transit infrastructure needs to facilitate the highest achievable level of service. This requires speed, frequency, comfort, reliability and safety. This only can be done with a continuous investment in the respective transport systems.

5. Transit-hub development is often the catalyst for wider development

In many cases, station (re) development is the catalyst for other urban and economic development. The increasing need for transit capacity and new facilities or to replace aging infrastructure, leads to new aspirations and possibilities. When this happens, the additional value for the surrounding city starts to become clear and the urban development processes can begin.

Good examples are the areas around London King's Cross/St Pancras, the Grand Paris stations, Denver Union Station and the planned Malaysia High-Speed Rail stations. The potential impact on a city from the redevelopment of a station is enormous and can positively affect urban planning, housing options and businesses. Rethinking the function of a station helps us to reinvent and expand its potential. A station should be more than just a place that gets you to where you want to go; it should be an attraction, a place where people can socialize, shop and work. In Paris, for example, more than 85 square miles of land around the Grand Paris Express stations will be turned into new mixed-use districts, with up to 400,000 new housing units.

An important factor in these planning processes is the desired level of diversity of the economy. To what extent do we encourage or accept monocultures of single or few land uses, such as the area around the Washington D.C. Union Station, or will greater economic and land use diversity be the objective? Diversity can prove to become a part of long term resilience for society.

This new way of thinking about the railway station promises new opportunities in rapidly urbanizing areas and markets in the future: we can begin to think beyond just the initial system build and think about improving existing functionality and the desired optimal performance of real estate in the station area.

6. Down with commuting - up with more sustainable outcomes!

Mixed-use 'live, work, play and learn' hubs reduce the strain on urban transit systems, because more people can live and work in one place, without the need to commute. A truly mixed-use development around a station will give people the option to work near their homes and use transit to connect the other parts of their lives. Sydney has made the commitment to becoming a '30-minute city,' whereby any part of a city can be reached from any other within 30 minutes.

Communities and countries without public transport or that traditionally do not use public transport often need to be shown the benefits before choosing to drive less. As transit hubs become mixed-use, high intensity, high interest destinations in themselves, the choice becomes easier. Added to lower household expenditures of time and money on car ownership, the benefits become hard to ignore. Even for high-scoring stations there is still a lot to gain if it contributes to a further shift in modal split and towards a more sustainable public transit. This does not only come down to an optimized mobility-oriented development but also to accompanying policies regarding costs of owning and using private cars and incentivizing the use of public transport.



CONCLUSION: TIME FOR AN URBAN TRANSITION

The Mobility Oriented Development approach can transform how we think about existing transport infrastructure and raise our aspirations for what urban mobility and its transit hubs can achieve economically, environmentally and socially. Applying this integrated approach and including best practices, we can leverage the full value of our transport and urban assets – not just for better returns, but for better lives and an improved urban future.

Cities are in part defined by their distinct urban transport systems and the transit hubs that service them. As rapid urbanization, aging infrastructure, population growth and climate change continue to challenge the world's cities, those cities that make bold moves in advancing and diversifying their urban transport systems and evolving their transit hubs will gain a competitive edge.

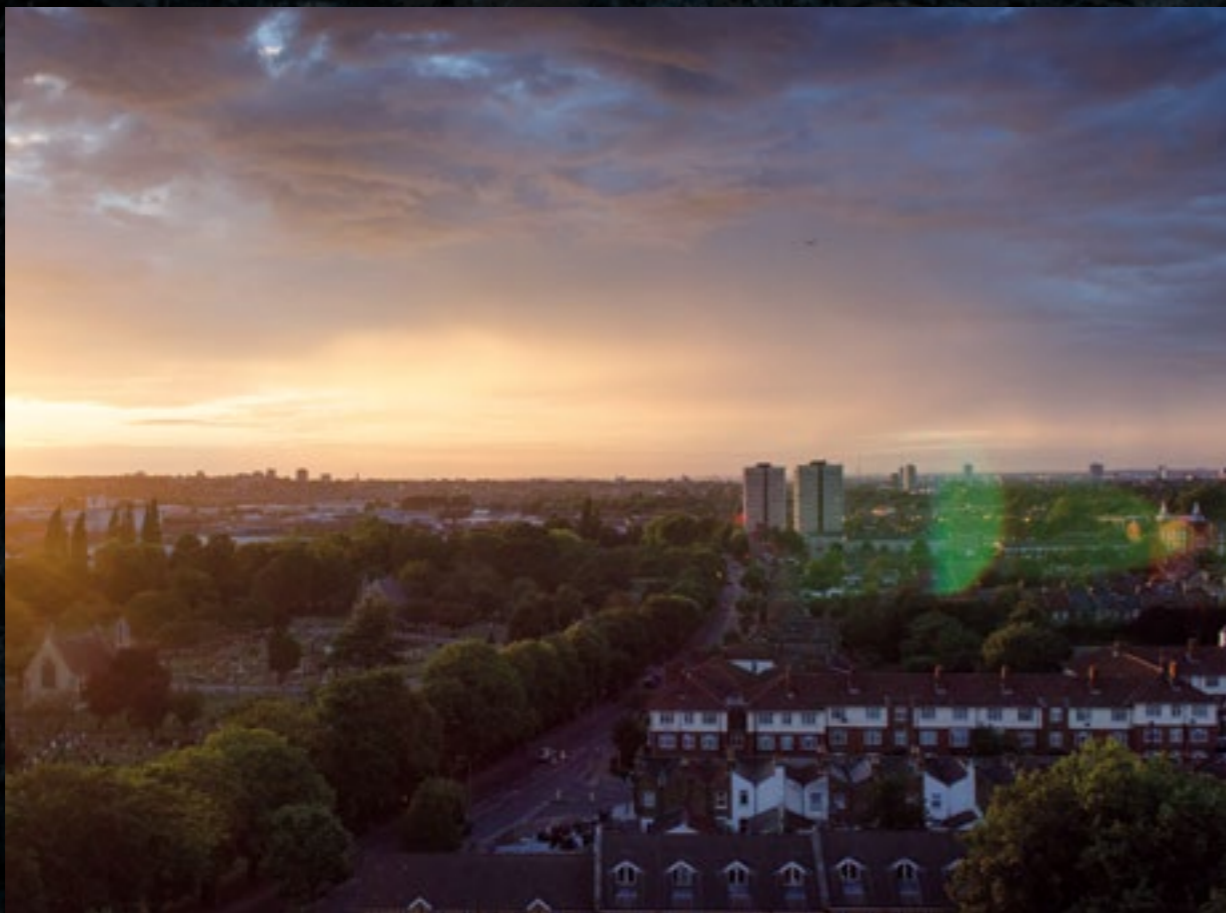
Recognizing that transportation is a crucial part of our daily lives and an area undergoing significant transformation globally, Arcadis developed the **Sustainable Cities Mobility Index** as a framework to evaluate the social and human implications of urban transport, as well as the environmental impacts and aims of a city's mobility system. Arcadis' **2017 Sustainable Cities Mobility Index** tracks the overall performance of mobility systems in 100 cities around the world. Although every city has its own distinct mobility system built to deal with its unique environment, certain key metrics are used to compare systems around the world. Read more about the **Sustainable Cities Mobility Index** on www.arcadis.com.

Clearly many of the world's developed and emerging cities still have important steps to take to become sustainable and address their mobility challenges. However, cities have a great opportunity to transform their transit hubs into areas that will generate jobs, attract new businesses and secure investment. This in turn will ensure a greater quality of life for residents. City leaders must focus on their transit hubs and additional mobility-related opportunities to create an efficient, safe, connected and adaptable mobility system, allowing their cities to thrive.

CASE STUDY

UK'S CROSSRAIL 2 AT WIMBLEDON

Faced with a soaring population and crowded transportation systems, the UK is investing in transportation infrastructure and building a new railway system, Crossrail 2. With planned development beginning as early as 2023, Crossrail 2 will link national rail networks via an underground tunnel and run north-south through Greater London. Crossrail 2 will increase London's rail capacity by approximately 10 percent and will enable an additional 270,000 people to get to London during peak hours. Its implementation is considered essential for fixing the housing crisis and for ensuring the future economic vitality of Greater London.



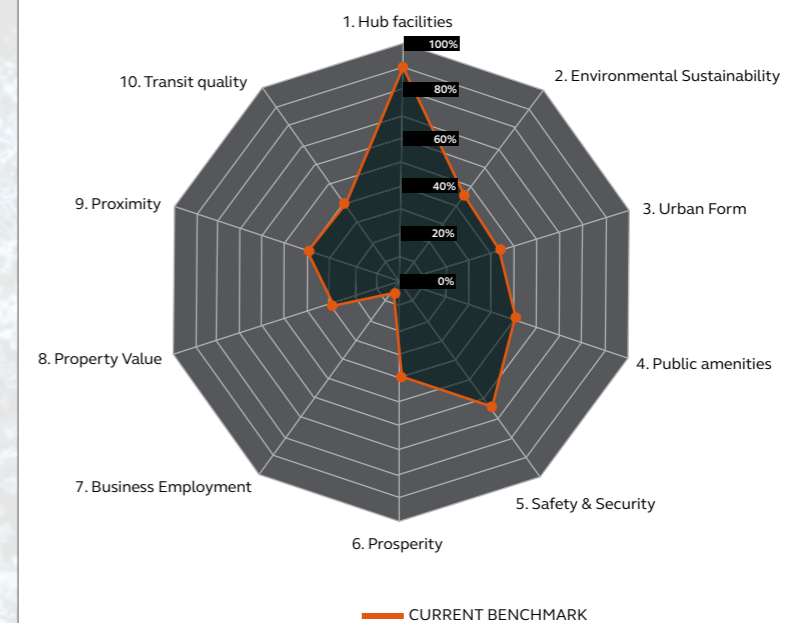
Wimbledon is just seven miles from central London and is one of the planned stops for Crossrail 2. Home to the world-famous tennis championships, Wimbledon is a thriving, charming neighborhood and home to many residents and businesses, creating a strong demand for access to nearby central London. Wimbledon Station, located in the area's center, is a key interchange between National Rail services, London Trams and London Underground District line services. The current rail station, existing Centre Court Shopping center and surrounding areas are planned for redevelopment to accommodate the new rail and the increased traffic.

Transport for London (TfL) and Network Rail, Crossrail 2's project owners, sought design options to upgrade Wimbledon Station and redevelop the area affected by the anticipated 8-year construction period. CallisonRTKL looked into alternative solutions to building the Crossrail 2 infrastructure at Wimbledon, while keeping the town center commercially vibrant during construction.

The design team viewed the station as an urban connector and wanted to integrate the transit hub into the existing Centre Court Shopping center. Their goal is to create a transit, shopping and dining destination that will form the new heart of Wimbledon's town center, improving customer experience for both transit and non-transit customers.

MODE principles were used to design the integrated hub and identify opportunities and areas of focus. More than 40 measurable metrics were captured and

Figure 11: Wimbledon Station



analyzed, encompassing urban environment, social placemaking, economic development and transportation quality. From the assessment, the investments were identified that would most effectively initiate urban regeneration, stimulate economic growth and improve mobility.

The plans for Wimbledon Station involve redeveloping parts of Wimbledon town center, including the Centre Court Shopping Center, office and residential buildings. It is anticipated that the mixed-use integrated development will also support local businesses and fuel economic growth, by adding more jobs and housing to the area. Station capacity will increase by up to 3,000 more passengers during peak hours, and journey times will be reduced by more than 30

percent for passengers heading to the West End and further north, with up to 30 Crossrail 2 trains per hour.

Applying the MODE approach at Wimbledon has shaped a bigger and better future for the city. The phased station design and masterplan illustrate a way not only to retain, but to improve commercial viability and sense of place. MODE principles and strategies are now being evaluated for application at other Crossrail 2 station sites, bringing greater socioeconomic benefits to more districts throughout London.

CASE STUDY SYDNEY CENTRAL STATION

“Central is the key gateway to Sydney and we want to unlock its potential”

Andrew Constance
NSW Minister for Transport and Infrastructure

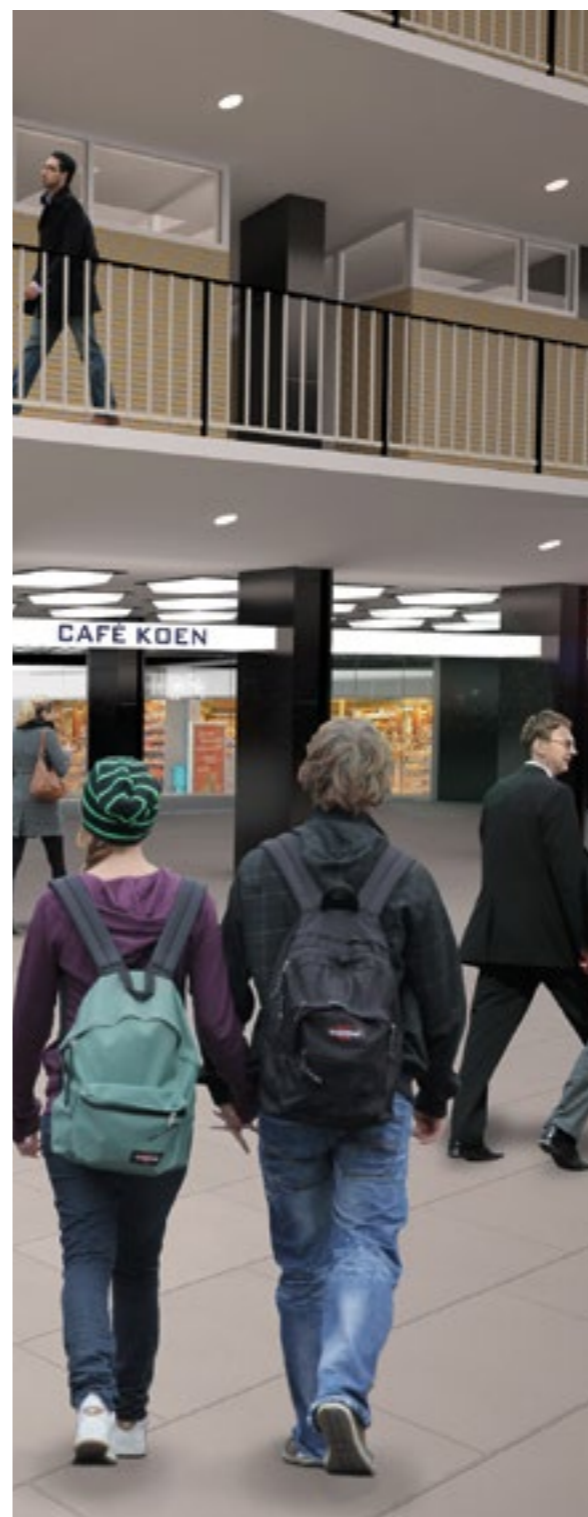
Since 1855 and the opening of the first passenger rail line in New South Wales (NSW), Central Station has been part of Sydney's story. The station has a special place in the city, evolving and growing with the city it serves. Currently, more than 270,000 people use Central, the largest train station in NSW, daily. Over the next two decades, that figure is expected to reach 450,000.



The NSW Government is planning for a quantum leap in demand for Central's role as a major rail interchange between the new Sydney Metro, the new Central Business District (CBD) and South East Light Rail, as well as existing suburban, intercity and interstate train services. The plans involve transforming Australia's busiest train station into a state-of-the-art, future-proof transport node. Central Station is intended to be a catalyst in revitalization of the surrounding precinct with a variety of uses. Design-led principles and guidelines are promoted to ensure the creation of a vibrant precinct that is well connected with the Central Station.

To learn from other station redevelopments, the NSW Government analyzed global transit-hub examples like King's Cross / St Pancras in London and Antwerp Central Station in Belgium, to examine customer experience, transport planning, engineering, commercial opportunities, sustainability, social benefits and urban design.

METHODOLOGY



The Index originates from Arcadis' original approach to transit-related developments known as Mobility Oriented Development (MODE). Incorporating insights and feedback from the first report published in 2015, Arcadis refined the benchmark process and updated transit-stations benchmarked. This provides a broader view of the world and captures changes in mobility oriented developments. As a result, it would be inaccurate to compare benchmark rankings to the first report.

Criteria used to select which transit hubs to feature in this report include factors such as heightened interest by local governments to improve mobility, or conversely, a lack of awareness in mobility oriented developments,

reputation of the transit-hub, iconic structures and well-known stations throughout the world.

MODex is a result of global collaboration between Arcadis and CallisonRTKL (a Design Consultancy of Arcadis). We worked closely to develop the benchmark and made improvements to the analysis based on our years of combined experience.

Even though most indicators of the MODex are based on theoretical concepts and scientific literature, the benchmark itself is not scientific. MODex contains both quantitative and qualitative measures. Qualitative measures are quantified where possible by adapting proven theoretical frameworks. In cases where data was not available, we made use of the expert judgement of our specialists and consultants in urban and transportation planning, economy and sustainability. For the quantitative parameters, which mainly included socio-economic and real estate data, we made use of the available sets of data.

In contrast to other global benchmarks, where data is mainly conducted on country or city level, MODex demands data on district and neighborhood level or even lower. Quantitative data at this level is not always available in every country, and when it is, often the data is based on its own local guidelines and regulations.

SOURCES

We have examined the following types of data sources, not limited to:

- International databases (GDP, average income & property prices)
- Statistical year books of cities and municipalities
- Transportation schemes
- Google Maps
- Site observation.

Depending on the indicator, the maximum score is based on two different aspects:

- Maximum points that can be achieved with a normative checklist
- Calibration of the maximum score based on the case with the highest performance.


About Arcadis


Arcadis is the leading global Design & Consultancy firm for natural and built assets. Applying our deep market sector insights and collective design, consultancy, engineering, project and management services we work in partnership with our clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. We are 27,000 people, active in over 70 countries that generate €3.2 billion in revenues. We support UN-Habitat with knowledge and expertise to improve quality of life in rapidly growing cities around the world.

To learn more about MODE visit:

<http://MODE.arcadis.com>

Or to continue the conversation, email us at: MODE@arcadis.com

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