

Upscaling Values of Sustainable Infrastructure from Urban Planning Perspective

While the COVID-19 pandemic has significantly impacted the global economy, it has not stopped Asian governments from planning for the future. As Minister Indraneel Rajah, the recently appointed chair of the Asia Sustainable Infrastructure Advisory (ASIA) panel, observes, "Asian governments and multilateral development banks have identified infrastructure as an important means of achieving economic recovery through increased access to financial flows, boosting construction activity and employment". Her comments indicate that the roadmap for infrastructure development in the region remains robust.

Planning for Sustainable Infrastructure

It is heartening that Infrastructure Asia has included sustainability as an essential criterion of infrastructure development. This vision rightfully recognises the integral relationship between infrastructure and urban development, which share the common objectives of supporting livability, economic development and environmental sustainability. Further, a holistic approach to planning and infrastructure development can reinforce their value positions and unlock the doors of known challenges in attracting more investments for long-haul infrastructure projects.

Avoiding the Vicious Circle Trap of Ever-Increasing Demand for Infrastructure

In Asia, the high demand for infrastructure development reflects the continent's rapid urbanisation, which if left unchecked would lead to new urban issues, which in turn result in more demands of new infrastructure. This vicious circle is due to at least two major reasons. First is that the growth of an urbanised area has been organic and spontaneous without a proper urban plan, or ad-hoc development not following a sound urban plan (even if there is one). This would lead to ad-hoc demands of infrastructure projects to address random short-term needs and lose sight of long-term opportunities. The second reason could be that infrastructure projects were planned and implemented in silo instead of being an integral part of urban eco-system, resulting in these projects to be obsolete and outgrown by the speed of urbanisation. One can easily see such example by spotting cities with existing or phasing-out airports locating in the mid of urbanised areas. Another classical urban issue is traffic congestion being persistent in some cities, despite road widening works, new roads being added, and even elevated roads being inserted in and thus marring the existing urban fabric.

Such vicious circle trap of increasing demand for infrastructure development not only downplay the values of infrastructure projects but also turn them into environmental damages, resource wastage to the city, nuisances to the public, visually unpleasant urban images, and financial burden to the governments and stakeholders involved. These expensive lessons are something that governments and major players in urban and infrastructure development should be aware of and prevent them from happening.

Synchronising Urban Planning and Sustainable Infrastructure Development

The commonality in urban planning and sustainable infrastructure lies in the intertwining of many complexed urban systems. A developed urbanised area with the supporting utility infrastructure will have long-lasting impacts to its citizens and natural ecosystem within and beyond its boundary. Therefore, developing infrastructure in the context of a well-conceived urban plan is crucial for liveability and reducing the risk of failed investments. The following are some critical urban planning principles, which are also relevant to infrastructure planning and development:

- **Think long-term when projecting needs and demands:** This helps to avoid the catastrophic scenario where a city's population outgrows the capacity of its supportive infrastructure. This leads to many urban issues, such as traffic jam, lack of land for new infrastructure, housing, amenities, green spaces, power supply, water supply, waste management, etc. When this happens, governments and businesses have no choice but to react with ad-hoc urbanisation that takes up agricultural and/or pristine lands, and infrastructure projects would play catch up and thus not be well-integrated or even conflict with the existing and new urbanised areas, causing inefficiency in operation and resource wastage. These, once happened, would work against the original sustainable development objective. To avoid this situation, the needed infrastructure projects can be developed in the immediate term, but only doing so with a long-term urban expansion plan in place.
- **Seek Harmony with the natural environment:** New infrastructure developments should protect ecologically sensitive areas and even restore damaged ecological zones. This is achievable by planning infrastructure and buildings in less biodiverse areas, rather than infringing on them. This does not have to mean cities sacrifice economic development for environmental good. A well-planned and preserved natural environment may offer new opportunities, such as to grow the eco-tourism sector.
- **An ecosystem of economic growth:** Infrastructure is developed to support a city's economy. Therefore, cities should begin by conducting economic and industry positioning studies based on the local socio-economic context. This includes the availability of a skilled workforce and accessibility to the supply chain, customers, etc. The land use and infrastructure development can then be planned and developed to support the whole economic ecosystem. A proper eco-system would also allow for circular economy and sharing economy to thrive, leading to reduction of resource wastage and logistic demands. Furthermore, urban planning can help future-proof the city by setting aside reserved land and white sites (land with flexibility of land use types) to accommodate future new industrial or hi-tech development, such as the growing demand of data centres in digital economy.
- **Efficient in energy and resources consumption:** Thanks to technological advances, infrastructure projects can be designed to be more energy-efficient and less resource-intensive. This efficiency is further optimised when infrastructure is developed in tandem with a city's comprehensive land-use plan. Let's take the classic urban issue of traffic congestion as an example. This issue can be avoided by having carefully planned hierarchical road network in tandem with compatible land-use distribution. Firstly, unnecessary traveling needs

can be reduced by logically decentralised workplaces, commercial centres, amenities, parks and community services in a hierarchical manner throughout the city. In more details, while central business district serves the whole city, regional centres decentralise workplaces and commercial centres as alternative major urban activity nodes serving different parts of the city. This arrangement would lessen the traffic pressure leading to city centre, town centres, meanwhile bring amenities closer to where people live, and neighbourhood centres provide daily needs such as grocery shopping within walking distance for the surrounding residents. Secondly, the road network should follow a hierarchical order, of which fast-flowing traffics (such as those on highways or expressways) are separated from slow-flowing traffic (such as those on minor arterial roads or local roads), so that the slow-flowing traffic does not interfere and hinder the fast-flowing traffic, resulting in a smoother traffic flow throughout the entire road network in densely urbanised areas. Thirdly, smart technologies such as traffic operation centres, smart traffic light system, digital platform assisting in optimising wayfinding, etc. can be deployed to enhance the traffic flows. Fourthly, comprehensive public transportation network must be put in place to reduce the need for private vehicles. Public transport network comes with transport hubs, such as train stations and bus interchanges, which present opportunity for Transport-Oriented-Development (TOD) – assigning adjacent land plots the appropriate building types including commercial activities and higher plot ratio, which in turn pave way for buildings with higher building height, making public transport more appealing and enjoy high ridership.

- **Plan for climate-change-induced risks:** One logical strategy at the early planning stage is to carefully map out developable land away from flood-prone areas. This will set the scene for right site selections for infrastructure and building in preventing the destruction of biodiversity, and save costs associated with mitigating the impact of climate change, such as a flood prevention system and reduce urban heat island effects thanks to the preserved green spaces. On climate change adaptation front, combining expertises from urban planning and infrastructure engineering can result in innovative adaptation infrastructure projects addressing multiple objectives in addressing climate change and optimise utilisation of land- and sea- spaces. A case in point is to deploy near-shore floating buildings that are adaptive to sea-level rise along coastal areas of highly-densed cities. They can be floating hotels and F&B in scenic locations, floating data centres to tap on seawater cooling to reduce energy consumption, floating aquaphonic farms to optimise the benefits of circular economy principles and improve food security. Such floating structures require the supports of on-shore infrastructure such as utilities supplies and accessibility, that give the business cases for new road construction, which is in turn an opportunity for the incorporation of engineering coastal protection as an enhance protection of sea-level rise.

Making Infrastructure Projects More Bankable

It has been long known that the major barrier for infrastructure projects is the difficulty in attracting funding, due to the disparity between long-term value generation and huge upfront investment. Public-Private-Partnership (PPP) – where private investors work together with the host city/nation

governments and share the costs and risks associated with the development of infrastructure projects – has been the solution adopted in many places.

In addition to PPP, there are other type of investment strategies that have been gaining attentions. One is to make infrastructure projects bankable, which has recently been discussed at length at the Asia Infrastructure Forum 2021. From urban planning perspective, the earlier-discussed Transport-Oriented Development (TOD) is also a good example of success story for bankability. In such development, there is substantial additional land value for land plots on and around the transport hub from the enhanced real estate value. Such newly-created land value can be captured and transferred to fund part of the development of the capital-intensive infrastructure development of stations, terminals, and/or part of the transport network.

The above newly-created value capture and redistribution strategy has its limits and does not work for unpleasant types of infrastructure projects such as waste water treatment or waste management. This type of infrastructure projects can benefit from the third type of investment strategies, which apply the principles of circular economy and eco-industrial development to create an industrial ecosystem around, or even integrated with, the core utility infrastructure. Such industrial ecosystem can be orchestrated in a way that waste from one industrial activity can be the resources of the other(s). An example is the currently-under-construction infrastructure project to combine waste-to-energy plant, materials recovery facility, food waste treatment and sludge incineration plant in Singapore.

Sustainable Infrastructure for an Inclusive Society

To conclude, sustainable infrastructure can optimise valuable contributions. It can be more attractive to investments when they are planned and developed along with urban development. For this to happen, infrastructure development should follow the basic key principles:

- Integrate with land-use planning as an ecosystem for the whole city to function well
- Focus on the long-term growth of urbanised areas, both in terms of its projected population and its value of economic sector(s), without damaging the local ecology and natural environment, and
- Address real long-term urban needs (as opposed to tap onto ad-hoc investment opportunities coming along the way) and then finding means (e.g. PPP / bankability / circular economy strategies) to implement these infrastructure projects.

Sustainable Infrastructure should also aim to be a platform to bring various stakeholders together for an inclusive society. Infrastructure project should avoid promoting, creating and/or making worse inequitable societies. Such unfortunate situation would happen, if infrastructure projects were planned in an ad-hoc manner, rushed into implementation as quick-fix to short-term issues for short-term gains for selective groups of stakeholders, short-sightedly bent to meet pressures from ad-hoc business opportunities and thus compromising the overall infrastructure ecosystem. The answers to how to build sustainable and inclusive infrastructure come from the integration of urban and infrastructure plans to create an eco-system for the city / region to function as a whole, and good governance in implementation aligning with the 17 Sustainable Development Goals.