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CENTRE for LiveableCities SINGAPORE

Shaping Cities *of* TOMORROW

10 years of partnership with Asian Cities

Temasek Foundation Leaders in Urban Governance Programme (TFLUGP)

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Set up in 2008 by the Ministry of National Development and the Ministry of the Environment and Water Resources, the Centre for Liveable Cities (CLC) has as its mission "to distil, create and share knowledge on liveable and sustainable cities". The CLC's work spans four main areas—Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, the CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. For more information, please visit www.clc.gov.sg.

CENTRE for LiveableCities SINGAPORE

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Temasek Foundation supports programmes that uplift lives and communities in Singapore and beyond. We aim to strengthen social resilience, foster international exchange, and enhance regional capabilities, advance science and protect the planet for a sustainable world. Temasek Foundation's programmes, made possible through philanthropic endowments gifted by Temasek, strive towards achieving positive outcomes for individuals and communities now, and for generations to come. For more information, visit www.temasekfoundation.org.sg.

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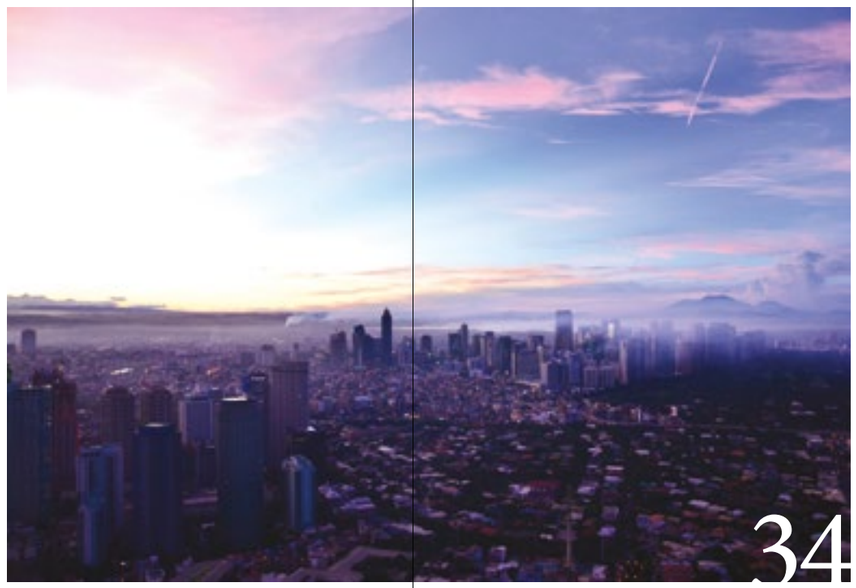

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Joint Preface

By *Temasek Foundation & Centre for Liveable Cities*

Asia may have faced much turbulence due to the COVID-19 pandemic, but we remain a region on the rise, brimming with rich potential for the future.

As partners in the Temasek Foundation Leaders in Urban Governance Programme (TFLUGP), both Temasek Foundation (TF) and the Centre for Liveable Cities (CLC) have witnessed first-hand the commitment to pursue sustainable development and the enthusiasm for innovative solutions that can meet the needs of today's fast-growing Asian cities. Many seek to provide a better quality of life for their inhabitants, but are dealing with increasingly complex and interconnected challenges common to many urban centres today, such as rapid urbanisation and climate change.

The TFLUGP has seen 10 years of meaningful partnership between TF and CLC, where we have contributed our respective knowledge and capabilities in capacity-building for cities in the region. The platform has enabled Singapore, a densely populated, resource-challenged city-state, to actively share its urban development experiences with cities around the region, while engaging in mutual learning to distil best practices in sustainable urbanisation. As a hub for urban solutions including infrastructure financing, Singapore hopes to build meaningful city-to-city relationships that can form the basis for a vibrant, dynamic network of Asian cities each with their own urban development success stories. Through the years, we have seen how the networks and mutual learnings gathered during the TFLUGP have contributed to the success of cities in tackling their urban development challenges and helped them achieve concrete outcomes in their efforts to be more liveable and sustainable.

This book celebrates over a decade of steadfast partnership between TF and CLC. We trust that this knowledge collaboration will continue to promote greater mutual learning and forge deeper ties between Singapore and other Asian cities, as we advance together as a region.

The inspiring success stories in this book hail from ten of the Programme's alumni cities, which have made significant inroads to solving their urban challenges following their participation in the TFLUGP. These success stories hold important insights not just for Singapore, but for the region and beyond; and offer a glimpse into a more sustainable, liveable and prosperous future for Asia.

We look forward to building on our strong partnership in the years ahead and recommend this book to any reader invested in the sustainable future of Asia's cities.

Hugh Lim,
Executive Director,
Centre for Liveable Cities

Lim Hock Chuan,
Head, Programmes,
Temasek Foundation

Introduction

We live in an age of cities: today, more of the world's population lives in urban centres than any other period in history. As they convene talent, capital and opportunities, cities have become bustling hubs and drivers of innovation across every sector of activity, including manufacturing, culture, technology and education.

As urbanisation continues to accelerate across the world, the challenges that cities face are also becoming more complex and interconnected. As global nodes seeing rapid urbanisation and growth, cities in Asia must increasingly deal with multiple compounding challenges related to congestion, infrastructure provision, waste and water management, pollution, socio-economic inequality, and climate change, among others, while also balancing the need for economic growth and development.

Despite these challenges, cities can overcome their prevailing urban challenges and thrive by learning from each other's experiences, exchanging best practices, and sharing effective strategies and successful innovations that have addressed these challenges in one way or another.

TFLUGP 2017 participants attending a lecture on the Singapore Liveability Framework.

Mr Phuc Huynh, Deputy Head of Architecture and Planning Division of Can Tho (Thailand), sharing the city's urban challenge and takeaways from the programme to fellow participants at the TFLUGP 2019.

In this light, the Temasek Foundation Leaders in Urban Governance Programme (TFLUGP) was designed to be a practitioner-focused and action-oriented programme that provides a platform for top office holders from Asian cities to discuss urban development challenges facing their cities.

Since 2012, 236 city leaders and urban practitioners across 65 cities in Asia have gathered at the TFLUGP to discuss and explore solutions to urban development challenges in their cities. TFLUGP is curated based on the Singapore Liveability Framework, which distils urban development principles for liveable, high-density cities, using Singapore's experiences in urban development. The Singapore Liveability Framework has served as a lens for city leaders to analyse their cities' urban challenges and outline actions and approaches with the potential to encourage the respective cities to achieve a higher level of liveability. Through the sharing of experiences and guiding principles in urban development in Singapore and Asia, the TFLUGP has successfully inspired cities to translate their plans into actions with tangible outcomes.

Officials from Johor Iskandar (Malaysia) and Preah Sihanouk (Cambodia) discussing their projects with Mr Mohinder Singh, CLC's Resource Person for Transport, at the TFLUGP 2019.

Officials from Khon Kaen (Thailand) discussing their project with Mr Loh Ah Tuan, CLC's Resource Person for Waste Management, at the TFLUGP 2019.

TFLUGP 2019 participants on a site visit to Marina Barrage.

TFLUGP 2019 participants at the sharing of their respective closing presentations and Action Plans.

To commemorate the valuable network and partnership between the CLC, TF and our alumni cities over the past 10 years, this publication aims to showcase the positive outcomes of the TFLUGP in 10 alumni cities through their successful implementation of solutions following their learnings from the programme. Aside from sharing some of the good practices in Asian cities with the world, these stories hope to inspire readers and city leaders alike on the potential and promise of addressing some of the most pressing urban challenges facing cities around the world today, and the payoffs of being a liveable and sustainable city.

City Story 1 Thimphu, Bhutan

Pedestrianisation of Norzin Lam

By: Michelle Low

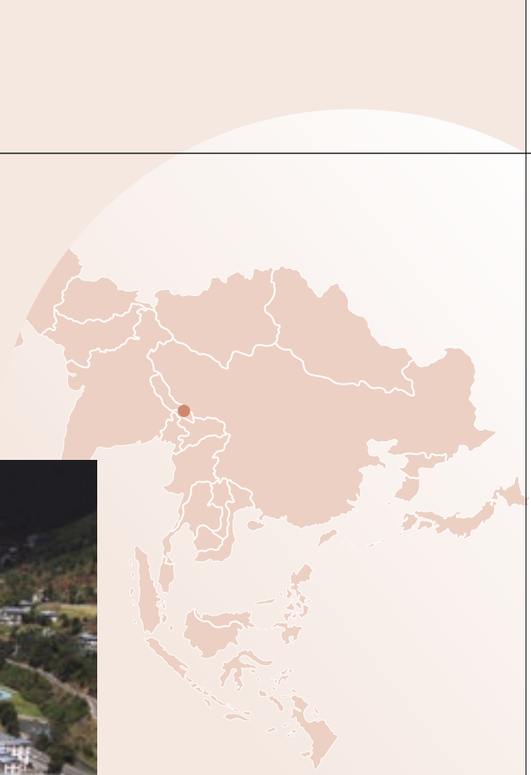
Land Area: 26.1 km²

Population: 114,551

Population Density: 4,389 people/km²

An aerial view of Thimphu city (Bhutan).

Image: Gerd Eichmann on Wikimedia Commons



A view of Norzin Lam, the main thoroughfare of Bhutan's capital city Thimphu.

Image: Centre for Liveable Cities

Norzin Lam is the main thoroughfare of Bhutan's capital city, Thimphu, that connects the retail and hotel district to the financial district, and onwards to the civic district. For many years, the 1.5-kilometre-long street has been one of the busiest and most congested roads in the city. In 2015, a traffic volume and speed survey for Norzin Lam noted that taxi movements in Norzin Lam account for about 50 per cent of the traffic movement.[1]

First proposed in 2000, the plan to pedestrianise Norzin Lam was raised as one of the strategies to rejuvenate the urban core as part of the Thimphu Structural Plan 2002-2027. The plan to pedestrianise Norzin Lam was hindered by the absence of pedestrian-friendly footpaths, a steep slope gradient, under-utilised public spaces, reduction in traditional heritage buildings and urban decay. Committed to transform the plans into reality, Hasatabahadur Sangpang, Chief Administrative Officer of Thimphu Thromde, Officer of Thimphu Thromde and his team participated at the TFLUGP 2016, to exchange ideas on potential solutions.

Haji Lane

Haji Lane is one of many streets in Singapore's Kampong Glam historic district that is closed to traffic during specific timings on Fridays and weekends. When closed, it transforms into a lively car-free street for the public to enjoy and doubles up as a pedestrian connector between city blocks. The stakeholders of Haji Lane play a part in building the vibrant street life by proactively working with government agencies to close the street and organise activities for visitors.

Visitors enjoying the car-free street when Haji Lane is closed to traffic.

Image: Centre for Liveable Cities

Development of Urban Design Guidelines

After the five-day practitioner-oriented mayoral workshop, Thimphu Thromde officials invited CLC to the capital to brainstorm ideas and review the progress of their plans to pedestrianise Norzin Lam. Together with Singapore's urban planners, Thimphu Thromde's chief urban planner, chief engineer, and other urban planners took part in a workshop discussion to formulate recommendations for further action. During the discussion, a structure plan of Norzin Lam was drafted for further assessment.

Officials pointed out that a shift in planning, from a vehicular-centric to pedestrian-centric perspective, would require the acceptance and shift in mindset of locals. To engage the public on these proposals to pedestrianise Norzin Lam, public consultations and trials were conducted, including organising car-free Sundays and festivals that drew people to Clock Tower Square.

Successful Implementation of Strategies to Pedestrianise Norzin Lam

To transform Norzin Lam into a pedestrian-only thoroughfare, on-street parking would need to be relocated to alternate off-street locations. Having worked with the various urban stakeholders, including people, business owners and other government agencies, Thimphu Thromde sought to create a pleasant walking environment by reclaiming roads and car-parking spaces to be used as pedestrian malls and cycle paths, building kiosks for street and food and beverage activities.

One of the strategies to reclaim the roads and car-parking spaces involved building two multi-level parking facilities via a public-partnership agreement with the International Financing Corporation.[2] The project entailed developing 550 parking spaces on two sites within the city centre to augment off-street parking supply, improve traffic conditions and facilitate the development of mass public transportation, which is essential for the growing city.

Workshop discussion with the urban planners of Thiumphu Thromde (Bhutan).

Image: Centre for Liveable Cities

To enhance road safety, line marking, road signages and pedestrian crossings have been centrally located to improve traffic flow, by facilitating a change in pedestrian and motorist behaviour.[3]

The Future of Norzin Lam

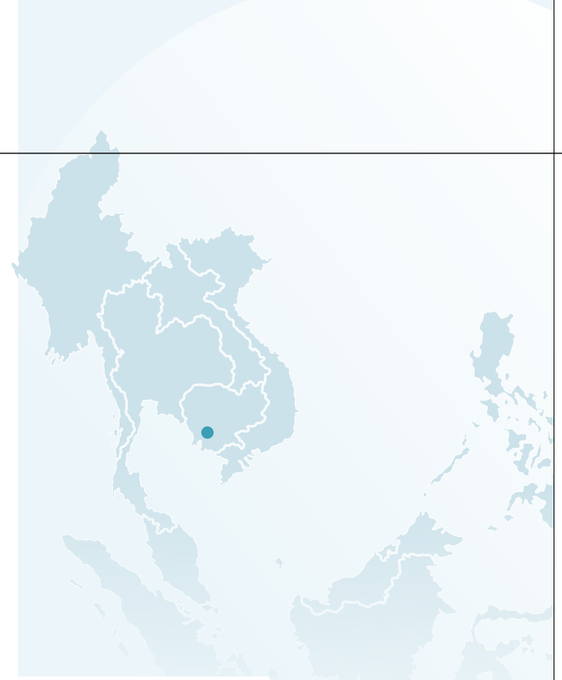
Recognising the importance of an integrated master plan, Thimphu's plans to pedestrianise Norzin Lam have been integrated as part of the Royal Government of Bhutan's long-term strategy for urban transport, the "Bhutan Transport 2040 Integrated Strategic Vision".[4] In the document, Bhutan committed to creating a vibrant, functional, and liveable "green" city. This placed a large focus on providing attractive public transport services and facilities for pedestrians, with a view that these may become the dominant mode of transport in the central area of the city and for short trips. A national consultant was hired to implement the design work based on the outcomes of discussion with the CLC. The design has been finalised and approved, and Thimphu Thromde has secured a budget for its implementation.

As part of the wider strategy to promote public transport and walking as the dominant transportation mode in Thimphu, Thimphu Thromde is also planning to build an Integrated bus terminal.[5] As a mixed-used building, the terminal would comprise public and private parking as well as commercial and retail space. It will also ease the tragic congestion of buses through the city centre, further enhancing the pedestrianisation of Norzin Lam.

City Story 2
Phnom Penh, Cambodia

Towards the Urban Transport Master Plan 2035

By: Grace Lau



A Rapidly Growing Metropolis

Phnom Penh is the most populous city in Cambodia and attracts some three-quarters of the country's industrial investment and houses a similar share of its transportation network.

Land Area:
679 km²

Population:
2,281,951

Population Density:
3,361 people/km²

The Royal Palace in Phnom Penh (Cambodia)

Image: Jakub Hałun on Wikimedia Commons

Rapid motorisation has accompanied rapid urbanisation, resulting in growing congestion throughout the city. This problem is exacerbated by new residential development projects in the peripheral areas that has created more traffic bottlenecks at trunk roads. Furthermore, much of the suburban roads remain unpaved and lack proper drainage systems.

A preference for personal vehicles remains strong in Phnom Penh due to weak public transport alternatives and the lack of a pedestrian-friendly environment and first- and last-mile connectivity. As a legacy of French colonial development, many sections of the Phnom Penh Central Business District have relatively wide sidewalks,[6] but most of them have largely been co-opted for parking and commercial activities. Moreover, these alternative uses of sidewalks have contributed to the deterioration of pavements and uneven surfaces, forcing pedestrians to walk on the road.

To address these stressors, the Vice-Governor of Phnom Penh, Mr Eing Aunny, together with the Deputy Chief of the Urban Planning Division, Mr Seng Vannak, attended the TFLUGP in 2017 to brainstorm ideas on reorganising Phnom Penh's sidewalks and revitalise the city's public spaces. Based on Singapore's experience, a series of strategies were devised to alleviate the congestion problem: enhancing the public transport network, and improving pedestrian infrastructure in the city.

Vice-Governor of Phnom Penh (Cambodia), Mr Eing Aunny, and Deputy Chief of the Urban Planning Division, Mr Seng Vannak, sharing their takeaways from the TFLUGP 2017.

Image: Centre for Liveable Cities

Improving Connectivity

As part of the city's focus on reducing road congestion and improving connectivity with new modes of transport, two water taxi services have been introduced since April 2018. To support the use of the water taxis, Phnom Penh's waterfront along the Mekong Delta has correspondingly been transformed into a lifestyle district—the boat people who used to live there have been relocated to another section of the river and several food and beverage establishments were introduced to inject vibrancy to the area.

A water taxi that now travels along the waterways of Phnom Penh (Cambodia).

Image: Centre for Liveable Cities

In addition to water taxi services, there are now public buses plying 13 routes around Phnom Penh. As of 2018, bus fares are fixed at USD0.37 per trip and are free for the elderly, students, monks, and factory workers. While newer buses serve the inner city, older buses ply the periphery, so they would not cause a traffic jam should they break down.

Besides looking to expand its public transport network, Phnom Penh also hopes to modernise its bus service efficiency with smart technology, supported by its ASEAN Smart Cities Network (ASCN) partnerships.[7] This includes initiatives such as the use of a real-time bus traffic smartphone application, smart payment through NFC connectivity, and leveraging private hailing services to connect traditional motor taxis and tuk tuks to bus services.

Singapore's Land Transport Master Plan 2040: Towards a People-Centred Land Transport System

In response to emerging new considerations, the Land Transport Master Plan (LTMP) 2040 builds upon the plans for LTMP 2013 and focuses on a land transport system that is convenient, well-connected, and fast. A series of consultation sessions with 7,400 Singaporeans was conducted during the course of developing LTMP 2040, culminating in a plan characterised by a commuter experience that is both gracious and inclusive, and contributes to better health and safer journeys for all.

A map of the bus network in Phnom Penh (Cambodia).

Image: Phnom Penh City Authority

Better Streets, Better City

For the city to reduce its reliance on private transport, improvements to its public transport network would need to be bolstered by a pedestrian-friendly environment so there is attractive first- and last-mile connectivities.

Various efforts have been undertaken to improve Phnom Penh's streets and sidewalks. Among the 11 streets being slated for rejuvenation, a major project is at Norodom Boulevard—the main street linking visitors from the airport to the city's downtown area that is lined with government buildings, embassies, and the iconic Independence Monument.

Sidewalks are being re-laid to ensure that its bricks are even. Plants are also being introduced to ensure persons with visual or physical disabilities do not bump into the trees along the sidewalks.

Ongoing works to improve the sidewalk on Norodom Boulevard.

Image: Centre for Liveable Cities

Another major rejuvenation effort is at Phnom Penh's Wat Phnom temple. This temple has existed since 1372 and is the tallest religious structure in the city as it is located 27 metres above ground. To make the areas around this popular tourist spot more accessible and pleasant, the city authorities flattened the pavement below the temple and replaced it with granite tiles to prevent the growth of moss, which made the grounds slippery. Fences have also been erected around the area and a new policy of disallowing street vendors was introduced to ensure the pavements are safe and clear for visitors. These efforts to spruce up Wat Phnom have changed the behaviour of citizens. While some once bathed along the sidewalks, they now take pride in ensuring this common space is welcoming for all.

Wat Phnom, a popular spot among both locals and tourists.

Image: Centre for Liveable Cities

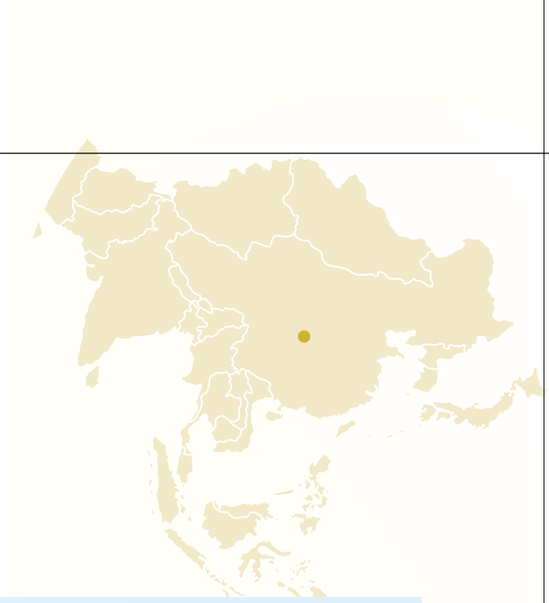
These steps leading up to the temple were retained to preserve the place's heritage. However, similar steps surrounding it were flattened.

Image: Centre for Liveable Cities

City Story 3
Chongqing, China

Urban Regeneration in Chongqing

By: Deng Mao



Land Area:
5,473 km²

Population:
8,750,000

Population Density:
1,599 people/km²

Chongqing (China): a mountainous city of history and modernity.

Image: Ming Chen on Wikimedia Commons

Urban Regeneration of the "Mountain City"

Chongqing is one of China's four Municipal Cities and among the country's top five cities by GDP. It is also a city of rich heritage, having served as the capital of China during World War II. The development of Chongqing is of strategic importance given its location as a transport node, connecting the country's vast under-developed west to the east via the Yangtze River Economic Belt, and connecting China's heartlands to the world via the Belt and Road Initiative.

However, Chongqing's urban development faces several challenges: First, rapid economic growth and population influx over the past decades have exacerbated urban sprawl, traffic congestion and environmental degradation. Second, there are large stocks of vacant and obsolete industrial sites, which require policy changes for them to be re-activated for other uses. Third, Chongqing's rough and unruly urban terrain makes redeveloping the old city centre difficult due to engineering complexity and high construction costs.

Given these challenges, the city's planners decided to look inward and worked innovatively to regenerate the city centre.

Benchmarking Through International Collaboration

In 2017, urban planners from Chongqing participated in the TFLUGP, where they exchanged insights with the CLC and other participants. Several important principles were distilled, which have been guiding Chongqing's urban regeneration journey, namely:

- An inclusive approach is necessary for multi-stakeholder cooperation.
- Connectivity is key to rejuvenating the old inner city and solving traffic congestion. Urban regeneration requires a different financing strategy to attract private sector investments.
- The provision of more greenery in the urban fabric makes the city more liveable and sustainable.
- A creative operation model is needed for the project's varied scale and function.

Liziba monorail station: a compact development integrated into a mixed-use building.

Image: David290 on Wikimedia Commons

Professor, Chongqing Institute and Principal Planner, Chongqing Planning Bureau Mr Sang Dongsheng sharing the city's urban challenges and the lessons learnt from Singapore at the TFLUGP 2017.

Image: Centre for Liveable Cities

Chongqing also embarked on the "New Urbanisation Pilot and Demonstration Project" with the World Bank in 2018–19, which connected local stakeholders to global expertise, and implemented two pilot regeneration planning projects aiming to improve the use of public space and pedestrian mobility in Nan'an and Jiulongpo districts.

These initiatives have enabled Chongqing to benchmark its urban regeneration with international best practices and to adapt planning and governance principles to its own unique context, for more sustainable and inclusive urban regeneration.

More Inclusive and Innovative Urban Regeneration

Since 2017, an 8-hectare residential precinct called Nanjing Road in Beibei district in the northwest of Chongqing's old city has been rejuvenated. The old building façades were retrofitted coherently based on the historic architecture style of the region, characterised by red-bricks and arched balconies/doorways. Moreover, the precinct's rejuvenation fits into a long-term district master plan together with the conservation of core historic areas and surrounding landscape improvements.

Kampong Glam—When Old is Also Hip

Sultan Mosque is the main attraction at Kampong Glam.

Image: Wengang Zhai on Unsplash

Kampong Glam was once a booming district with the settlers from the Malay Archipelago, Arabic Muslims, and other ethnic groups in the early 20th century. It became run-down and quiet after the resettlement of the residential population.

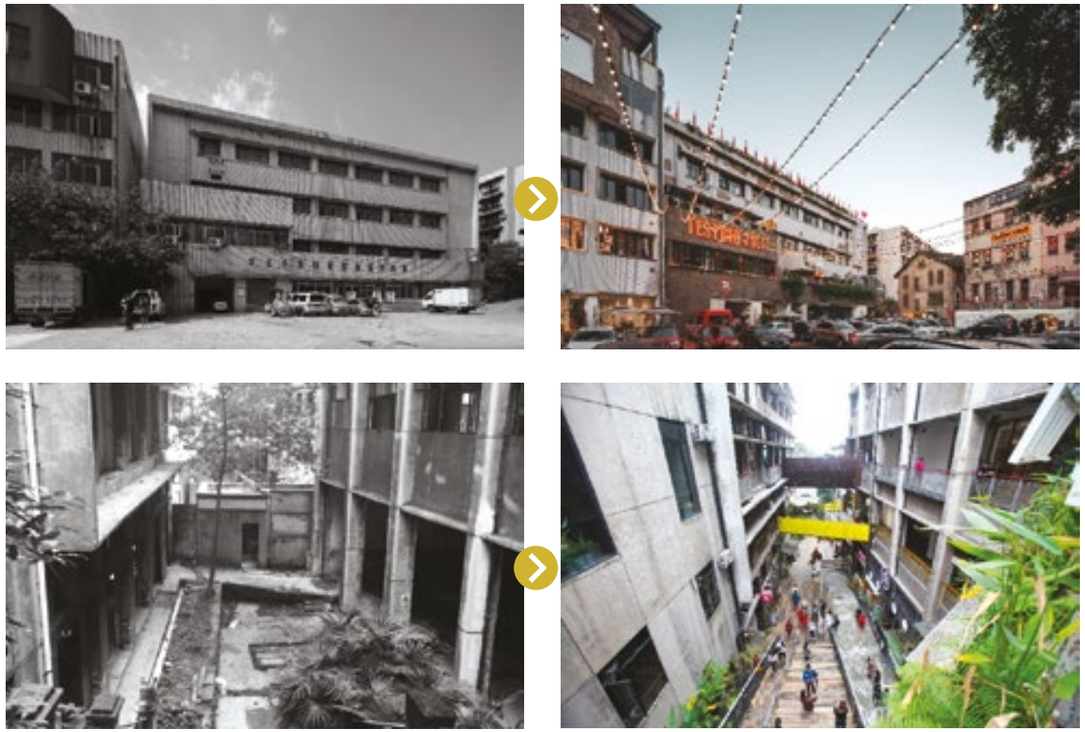
To inject a new life into this heritage district, local authorities have made concerted efforts to rejuvenate Kampong Glam, which include:

- Restoring shophouses to retain traditional activities such as textile businesses in the historic core area surrounding Sultan Mosque.
- Bringing in new businesses such as boutique cafes and restaurants to attract patrons to the area.
- Making its streets more pedestrian-friendly by introducing heritage trails and markers to improve walkability and the tourist experience.
- Working with community groups to showcase the district's rich Malay-Muslim heritage through festivals and performances.

Nanjing Road Precinct: rejuvenation based on heritage.

Images: Chongqing Architectural Design Institute Co., LTD

The TESTBED2, (aka Er-Ling 2nd Factory) was an abandoned 80-year-old printing factory cluster in Yuzhong District. It has been transformed through private investment into a cultural and creative hub, hosting about 100 modern art galleries, lifestyle boutiques, bars and cafeterias. A concept of "empowering by design" was applied through modern architecture to enable the adaptive re-use of space for local creative art events such as performances, exhibitions, and product launches. It attracted 9 million visitors in the first five years since its transformation.



TESTBED2 Project: a factory transformed into a chic and modern art space.

Images: TESTBED2 Cultural and Creative Park

At the heart of the city, a new 1.7-kilometre pedestrian promenade opened in 2021, connecting a total of 28 historic landmarks from Chaotianmen Square to the Liberation Monument. The municipal government also announced that by 2022, Chongqing would further expand its "mountain city walkway" by an additional 353 kilometres, in a network of 17 themed routes to promote healthy living.

Summary

Through these systemic explorations with both district planning and pilot projects, the urban regeneration of Chongqing will become an model to revitalise the old city into a more compact, efficient, and liveable urban form, able to adapt to the economic needs and residents' aspirations, and to meet China's commitment to reducing carbon emissions and achieving sustainable urban development.

Chaotianmen-Liberation Monument pedestrian promenade today.

Images: Yang Rong

City Story 4
Chennai, India

Creating a Pedestrian and Bike-Friendly City

By: Ranga Chinnaraj

Land Area:
426 km²

Population:
8,917,749

Population Density:
20,933 people/km²

Chennai is a port city in southern India. Rapid growth in industrial and information technology has made the city one of the biggest cultural, economic, and educational hubs in the region.

A major consequence of rapid growth in economic activity has been an increase in vehicular traffic in the city. Traditional private vehicle-oriented approaches to transportation meant that safe and accessible pedestrian and cycling facilities for public use have been largely absent.

In 2013, a team consisting of two Commissioners from the Works and Education departments of the Corporation of Chennai, Mr Brajendra Navnit and Mr Venkatesh Thirumalai Narasimhan, participated in the TFLUGP 2013 to exchange ideas on how to improve Chennai's streets for pedestrians and cyclists. Through mutual exchange with the programme's Resource Persons, city officials gleaned insights on the importance of integrated approaches to development involving multiple agencies, and stakeholder buy-in. The result has been the successful construction of multiple pedestrian and cyclist pathways.

Aerial view of Chennai (India). The city is a regional cultural, economic, and educational hub.

Image: Karl Janisse on Unsplash

Creating Streets for People

With 28 per cent of all trips in the city made by walking and cycling, Chennai sought to improve pedestrian and cycling infrastructure to support these active mobility modes.

A notable project has been the creation of wider pedestrian plazas and public spaces in Theyagaraya Nagar, a commercial centre in the heart of the city. Developed as part of Chennai's Smart City initiative, the retail street was redesigned to feature wider pedestrian areas and public spaces, landscaping and play areas, as well as organised parking. The city conducts regular events like concerts and exhibitions to enliven the public spaces along the street. To ensure the success of the project continues over its lifetime, an operations and maintenance contractor has also been brought on board.[8,9]

Building on the success of such pilot projects, Chennai announced the Mega Streets programme in 2020 to redevelop streets across the city limits with comprehensive overground and underground infrastructure. This is to ensure that streets not only meet the public's mobility needs, but sufficient provision is made for infrastructure and public utilities in the design of the public realm.[10]

From Vision to Implementation

Much of the city's transformation has been made possible through coordinated transport policies and governance reforms. Chennai became the first city in India to adopt the Non-Motorised Transport Policy in 2014. Key goals of the policy include increasing the mode share of walking and cycling trips by building safe and continuous footpaths on at least 80 per cent of all streets, and improve road safety by reducing pedestrian and cycling fatalities. The policy also calls for sustained investment in pedestrian and cyclist infrastructure with a minimum of 60 per cent of the city's transport budget allocated to constructing and maintaining footpaths and cycle tracks.[11]

Since 2019, to guide the roll-out of a comprehensive active mobility network in the city, Chennai has also started developing a Master Plan to redesign 1,000 kilometres of streets to support active mobility.[12] This master plan is supported by comprehensive street design guidelines that provide step-by step guidance to city officials, engineers, planners and consultants on creating a city-wide walking and cycling network to ensure successful translation of the policy vision down to implementation.[13]

To coordinate street design works across transportation and utility agencies at the state and city levels, the city has also set up a nodal transportation authority, the Chennai Unified Metropolitan Transport Authority. The Non-Motorized Transport Sub-Committee of this nodal body oversees the roll-out of active mobility infrastructure in the city, helps resolve issues and implements street improvement and transportation projects in a timely manner.[14]

Street performances help activate the pedestrian plaza in Theyagaraya Nagar, Chennai (India).

Images: Greater Chennai Corporation

View of the redesigned street in Thyagaraya Nagar, Chennai (India).

Dedicated cycling path, bus lanes and street furniture are included as part of the redesign of Bencoolen Street, Singapore.

Image: LTA

Singapore has been dedicating more space to active mobility and community uses as part of its car-lite vision, and one example is the redesigning of Bencoolen Street. Working with the private sector to create car-lite developments that support active mobility, Singapore rolled out the Walking and Cycling Design Guide to provide developers, building industry, consultants, and government agencies with a common set of design guidelines to develop active mobility infrastructure that supplements existing engineering and development standards.

Building on the current network of park connectors and cycling paths, Singapore is also developing a comprehensive cycling network and creating a more conducive walking environment. The proposed Islandwide Cycling Network (ICN) programme plans to expand the current 460-kilometre cycling network to around 1,300 kilometres by 2030.

Going forward, the Land Transport Master Plan 2040 envisions Singapore as a "45-minute city", comprising 20-minute towns, with Walk-Cycle-Ride modes envisioned as the preferred mode of transport.

Bringing the Community On Board

A key challenge in reclaiming street space for pedestrians and cyclists is getting community support and buy-in from stakeholders. In this regard, the launch of car-free Sundays in 2015 could be considered a major step in educating the public about the importance of streets as public spaces in Chennai. In the case of Theyagaraya Nagar, stakeholder meetings and participatory planning with residents and the shopkeeper's association of the region were carried out, to address their concerns and seek early buy-in for the project.

(Left) Mr Saidai Sa. Duraisamy, then Mayor of Chennai (India), seen cycling at the city's car-free Sunday during its launch in 2015. (Right) Residents experiencing streets as public spaces.

Images: Ranga Chinnaraj

Chennai is rolling out pilot cycle sharing systems to address the commuting needs of residents.

Image: Greater Chennai Corporation

Alongside infrastructure investments, the city has also started to encourage cycling by rolling out pilot cycle-sharing systems in early 2019 to bridge between different transport modes and provide healthier alternatives for commuters.[15] The project has been received warmly by citizens cutting across all backgrounds, and the city is also planning to introduce e-bikes as part of the public bicycle sharing system.

While unregulated and haphazard parking and encroachments on pedestrian spaces and cycling paths continue to be an issue, the city's efforts to develop a comprehensive network of active mobility infrastructure and foster a culture supportive of active mobility will nonetheless contribute to improving safety, sustainability and liveability over the long term.[16]

City Story 5
Trenggalek, Indonesia

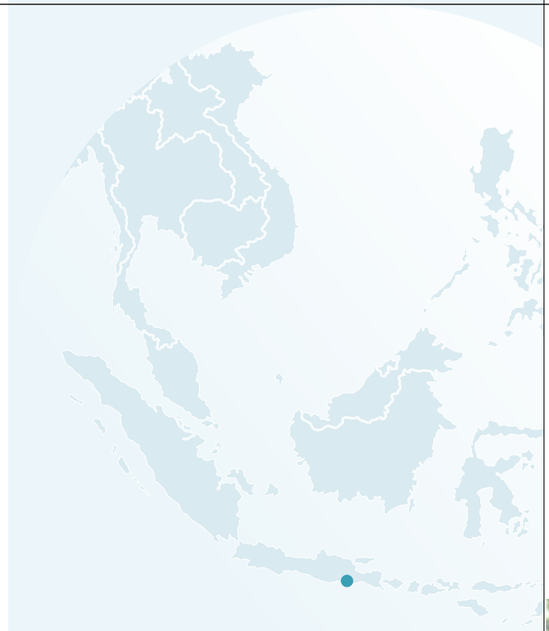
City in a Forest

By: Faizal Zulkefli

Land Area:
1,261 km²

Population:
731,125

Population Density:
580 people/km²



Trenggalek is located in East Java and stretches across an area of approximately 1,261 km², of which two-thirds are mountainous. As of 2020, about 700,000 residents live in its 14 sub-regencies and 157 villages.

Although smaller in size as compared to other cities in Indonesia, the Trenggalek regency government was determined to develop Trenggalek into a liveable city with a sustainable environment and growing economy. Led by Regent Mochamad Nur Arifin, a team from Trenggalek took part in the 2018 TFLUGP to exchange and brainstorm ideas on how this could be achieved. Through the programme, city officials gained key takeaways, such as the importance of integrated planning by involving stakeholders at multiple levels, as well as community engagement to achieve widespread buy-in.

Accordingly, the regency government initiated many policies and projects to improve the conditions of its urban slums, one of which was Kota Tanpa Kumuh (KOTAKU), or city without slums. KOTAKU was an infrastructural development strategy devised as part of the National Slum Upgrading Programme 2016-2020 to give slum-dwellers better access to basic services. It aimed to upgrade all 0.699 km² of Trenggalek's slum areas by 2019.

Involving the community

As rallying the public was key to achieve its goal of creating a sustainable environment, the regency government sought to create a culture of cleanliness by gaining public support through campaigns and community clean-up initiatives. Outreach efforts were organised in the community and schools to educate the people on the benefits of healthy living, better garbage management, and how upgrading and resettlement would improve their environment.

Additionally, the regency government also worked with communities to co-create innovative initiatives in a fun and informal way. This included community gardening, mass clean-up competitions among schools and villages, and community decoration events such as planting and mural painting, to create a sense of shared identity and collective pride.

A beach and river cleaning event at Cengkrong Beach, which drew around 500 participants from environmental groups, students, and the community.

Image: Centre for Liveable Cities

Regent Mochamad Nur Arifin with the participants of the beach and river cleaning event in Watulimo district.

Image: Centre for Liveable Cities

Successful Implementation of Programmes

The regency government took advantage of synergies between KOTAKU-related programmes and the Trenggalek Membangun development programme to strengthen implementation at the local and regional levels. An inter-agency workgroup–the Team of Housing, Resettlement, Drinking Water and Sanitation–was set up to oversee the programme at the district level, while the regency government successfully integrated its upgrading plans with the central government's Medium-Term Regional Development Plan and the Annual Development Planning.

At the grassroots level, villages were empowered to develop working groups to participate systematically, from planning to implementation and maintenance. In addition, the regency government also provided training and materials for the community to carry out improvement works, such as planting trees and decorative painting along roads and drainage networks.

Intense public interest in the fate of the Rail Corridor.

Image: URA

Adapted from Ethos, Issue 19

Co-Creating Singapore's Rail Corridor

The Rail Corridor is a former railway line stretching 24km from the north to south of Singapore. When operations ceased in 2011, much public interest was generated for its future, given the abundant greenery flanking the Corridor and its potential as a recreational space.

In response, URA commenced a public engagement exercise in 2015 to gather ideas for the Rail Corridor, which was used to refine the Concept Master Plan and Concept Proposal. Such co-creation was important to achieve consensus for the outcomes of the Corridor, and to make sure it is planned and developed well.

Decorative improvement work carried out by the community in Ngares Village.

Image: Centre for Liveable Cities

Mangrove conservation in Trenggalek regency, Indonesia.

Image: Centre for Liveable Cities

City in a Forest

With the combined efforts of the regency government and the community, all of Trenggalek's slums were successfully improved by the end of 2019. The progress, achievements and funding contributions were displayed in the different villages to communicate the collaborative efforts in a transparent manner.

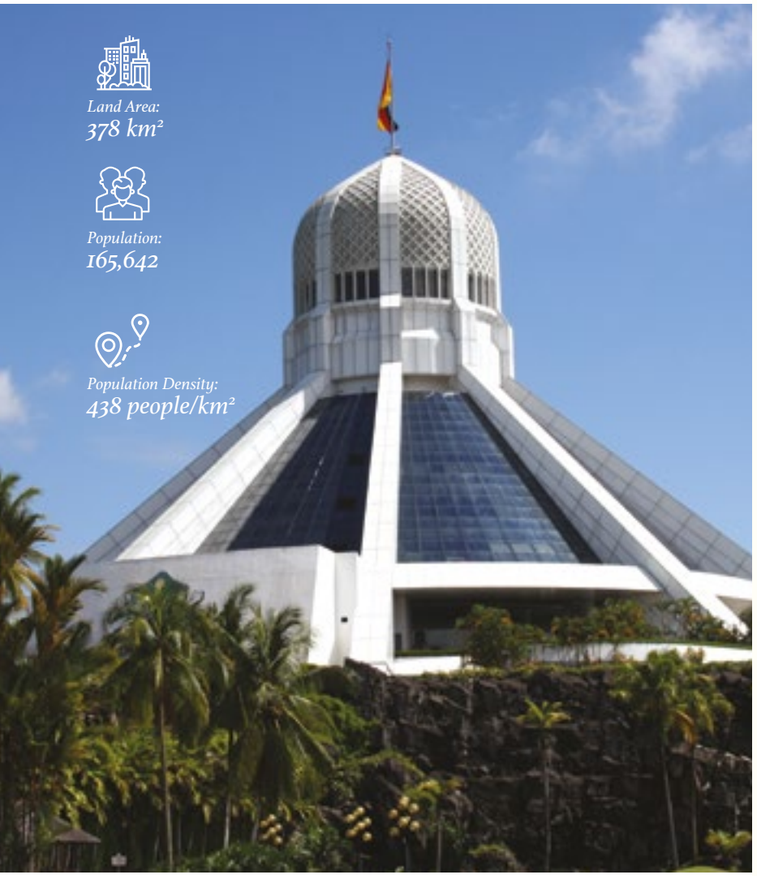
Despite these achievements, Trenggalek continues to work towards becoming more liveable and sustainable. Regent Nur Arifin aims to develop Trenggalek into a tourist attraction by turning it into a "City in a Forest", leveraging its strength and the fact that forests take up around two-thirds of Trenggalek's total area. The regency government has implemented initiatives such as mangrove conservation, cleaning up its rivers and home-stay tourism in villages.

Regent Nur Arifin is also developing a long-term strategy, including initiatives like developing fish farming in its calm bay, attracting investors, and leveraging the future regional airport in the neighbouring city of Kediri to create more jobs. These efforts will improve the physical and economic state of Trenggalek, as well as uplift community spirit and social cohesion.

City Story 6
Kuching North, Malaysia

Clean, Beautiful and Safe (CBS) Plan

By: Lim Teng Leng



Kuching North (Malaysia) city hall.

Image: Huettepe on Wikimedia Commons

As the capital and most populous city of the East Malaysian state of Sarawak, Kuching faces challenges that are typical of many large cities, such as environmental pollution and crime. When he attended the TFLUGP in 2012, Datuk Haji Abang Abdul Wahap, Mayor of Kuching North, was inspired by Singapore's Active Beautiful, Clean (ABC) Waters master plan to create a road map to enhance the city. Dubbed CBS, which stands for Clean Beautiful and Safe or "Cantik, Bersih dan Selamat" in Malay, this five-year city enhancement plan was launched in 2013.

CBS uses a range of Key Performance Indicators (KPIs) to track the city's progress in several priority areas, namely Beautiful City, Clean City and Safe City. For example, under the Clean City strategy, one of the KPIs is to increase the rate of recycling by 1per cent annually to a city-wide rate of 22per cent by 2030. Concrete initiatives, like enhancing home composting and organising recycling programmes, are created to achieve these KPIs. These KPIs are reviewed quarterly and are subject to feedback from the community.

Active, Beautiful, Clean Waters (ABC Waters)

Members of the public along a stream in Bishan-Ang Mo Kio Park.

Image: Wirbel1980 on Wikimedia Commons

To activate Singapore's 8,000 kilometres of waterways and 17 reservoirs, PUB, the National Water Agency, launched the Active, Beautiful, Clean Waters (ABC Waters) programme in 2006. This initiative aims to transform the country's waterways and reservoirs into multifunctional spaces for the community to enjoy. ABC Waters design features are incorporated to improve the quality of water in Singapore's waterbodies, beautify the surrounding landscape, and enhance biodiversity. Three years after ABC Waters was launched, PUB published a set of design guidelines that distilled its extensive research and experience to guide developers to implement ABC Waters design features in its developments. These guidelines have been continually improved over the years, with the fourth edition being launched in 2018.

CBS Version 2.0

The first iteration of the CBS plan (2013 to 2017) integrated annual strategic plans to promote sustainable development and community engagement and was assessed positively by a third-party evaluator. The current CBS plan, launched in 2019, has additional measures to leverage smart initiatives to make Kuching more sustainable, namely Smart City and Sustainable City. For example, the current CBS plan aims to install 10% of traffic lights with the Sydney Coordinate Adaptive Traffic System annually. This intelligent traffic management system can respond to the demands of the network in real time, improving city mobility and traffic congestion. Under its sustainability goals, the plan also aims to construct 2 kilometres of new bicycle lanes annually to encourage active mobility and reduce vehicular emissions.

Developing the tourism potential of stingless bee honey farms in local communities.

Image: The Borneo Post

Engaging the Community

The CBS plan is cognisant that such efforts are impossible without the buy-in of local stakeholders and focuses much of its efforts in raising awareness on how the community can achieve the city's goals. Datuk Wahap stressed the importance of working hand-in-hand with the community, and encouraging the people to take initiative, with the support of the City Commission. One of the KPIs under its Sustainable City goal is to reduce poverty by empowering communities to help boost the economy. The City Commission aims to award 45 contracts annually to community empowerment projects. This has encouraged the proliferation of ground-up initiatives that enable communities to create income, employment and learning opportunities for themselves.

By partnering with local institutes of higher learning, like the Universiti Malaysia Sarawak (UNIMAS), CBS creates opportunities for joint ventures to promote the products of community entrepreneurs. For example, UNIMAS is working with residents of Kampung Pulau Salak to help scale-up and market their artisanal kelulut (stingless-bee) honey industry and create a tourism product that can help boost incomes of the community.[17]

Partnering the Private Sector

The CBS plan also recognises the need to engage with the private sector to effectively execute the strategies for a Smart City. In 2019, North Kuching City Hall signed a memorandum of understanding (MoU) with Pestech International to roll out advanced metering infrastructure to manage and monitor energy use more efficiently. This technology allows meters to be read remotely, enables prompt and accurate billing, and allows users to monitor their own usage via mobile apps. With energy company Sarawak Energy, smart meters with advanced metering features were installed in a pilot area of Kampung Gita.[18] This effort was done with the support of local leaders and launched at a carnival that was co-organised by the community. These efforts highlight CBS' strategy of tapping on the community and private sector to achieve its goal of making Kuching the cleanest, most beautiful and safest city in Malaysia.

First engagement on the Smart Meter Pilot Project with Kampong Gita community leaders in 2019.

Image: Sarawak Energy

City Story 7
Manila, Philippines

EDSA's Transformation into a Green, Vibrant and Safe Highway

By: Thaddeus Tan

Land Area: *620 km²*

Population: *13,484,482*

Population Density: *21,749 people/km²*

Manila's skyline, the Philippines.
Image: Luca Bucken on Unsplash

Epifanio de los Santos Avenue (EDSA) is a 23.8-kilometre-long road that serves as the main ring road for Metro Manila. This important arterial road passes through six cities in the region, namely Caloocan, Quezon City, Mandaluyong, San Juan, Makati, and Pasay. Due to its central role in the connectivity of Metro Manila, EDSA has a large volume of vehicular traffic daily. Traffic congestion means the road is a major source of air pollution and its associated environmental, economic and social costs.

The Metro Manila Development Authority (MMDA), together with local government units, government agencies and multilateral organisations such as the World Bank, formulated the Metro Manila Greenprint 2030, which provides broad directions for the city to regain its economic competitiveness, enhance social inclusivity, reduce vulnerability to climate change impacts and natural disasters.19 With this vision in mind, the MMDA planned to transform EDSA into a green, vibrant and safe highway.

In 2013, a team led by Mr Francis Tolentino, Chairman of MMDA, and Mrs Josefina Faulan, Director of MMDA, participated in the TFLUGP 2013 to co-create ideas and suggestions on the Manila Greenprint 2030. From the TFLUGP, the delegation gleaned key insights on the potential of integrating vertical greenery onto urban infrastructure, and the importance of pedestrian and cycling infrastructure as an alternative to cars.

Greening Singapore

Kick-start of a tree planting campaign at Farrer Circus, June 1963.[20]

Image: National Archives of Singapore

Envisioned by then Prime Minister Lee Kuan Yew, it was imperative for Singapore, then a developing city with dirty and highly polluted streets, to transform itself into a clean and liveable city, thus making it attractive for tourists, foreign investors and talented workers. This vision bore fruit through detailed master-planning and execution by various agencies and institutions. From a "Garden City" to "City in a Garden", and now towards "City in Nature", Singapore continues to work towards further integration of nature into the city.[21,22]

As part of its greening plan, MMDA collaborated with the Department of Environment and Natural Resources to introduce trees and plants along several stretches of EDSA, to address specific issues related to pollution control and aesthetic appeal. The plant species selected were all native to the Philippines and were assessed to be able to thrive along EDSA.

Planting of trees and shrubs along Roxas Boulevard to Tramo.

Image: Centre for Liveable Cities

The city also installed vertical plant boxes along EDSA particularly on the tunnel walls.[23] These installations not only mitigated air pollution, but also beautified the area and raised environmental awareness in urban designers, developers and architects to encourage them to incorporate environmental considerations in downstream infrastructure projects.

Greenwalls installed along EDSA-P. Tuazon Tunnel.

The transformation of EDSA also included public-private partnerships. The MMDA collaborated with street artists and local paint brand Davies to create murals on the viaducts located along EDSA. Such paintings injected new life and vibrancy into the previously grey pieces of concrete infrastructure

Artwork from the project "Mga Haligi ng Kaunlaran" (Pillars of Progress) along EDSA were created through a public-private partnership between street artists, MMDA and Davies Paint.

Image: Centre for Liveable Cities

Mural paintings on structures located along EDSA. The paint is made of modified components which contain air-cleaning capabilities.

Image: Centre for Liveable Cities

In collaboration with street artists and paint manufacturer Boysen, the MMDA also embarked on an urban renewal project that incorporated street art on walls, columns, and bridges along EDSA. The murals played a role in reducing air pollution along EDSA—the KNOxOUT™ paint developed by Boysen uses contained modified forms of titanium dioxide to break down toxic fumes from vehicles into harmless substances in the presence of light, thus reducing the extent of air pollution in EDSA.[24]

The MMDA's efforts in transforming EDSA culminated in the installation of bicycle lanes along certain stretches of the highway. The availability of bicycle lanes not only increased accessibility and convenience for riders and hence reduced traffic congestion, but also promotes active mobility and healthy living amongst the community.

The city installed bicycle lanes along stretches of EDSA to encourage alternative mobilities and transport.

Image: Centre for Liveable Cities

There are continued efforts by the MMDA to execute the EDSA greening plan. In 2020, the MMDA approached the Asian Development Bank (ADB) to fund the EDSA Greenways Project, with the aim of implementing a series of pedestrian enhancements such as elevated walkways to improve walking conditions around urban rail stations along EDSA, thus encouraging the use of public transport.[25] The constructed walkways will be accessible via elevators to cater to all groups of pedestrians, including the elderly, pregnant and persons with disabilities, aligning with the Metro Manila Greenprint 2030 vision of enhancing social inclusivity. The EDSA plan will work towards ushering in a more liveable and sustainable Manila and will serve as a model for replication in other cities in the Philippines.

City Story 8
Colombo, Sri Lanka

Reviving a Lake, Rejuvenating a City

By: Ruhi Lal

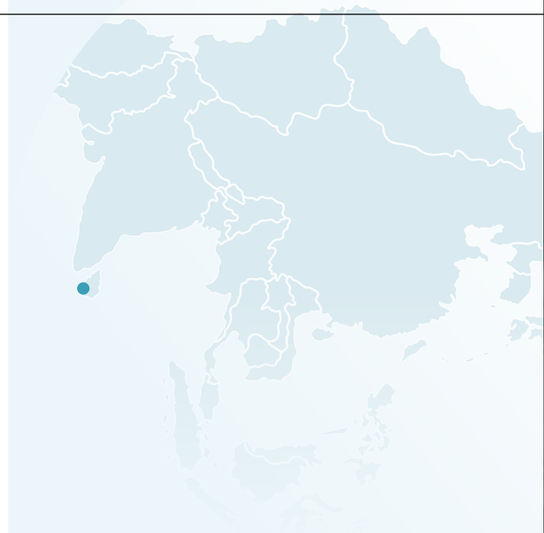
Land Area:
37.31 km²

Population:
752,993

Population Density:
20,182 people/km²

In November 2017, Colombo's then Ministry of Megapolis and Western Development (MMWD), launched the Beira Lake Intervention Development Plan, which aims to rejuvenate downtown Colombo and clean up the centuries-old Beira Lake. The plan was first incepted at the TFLUGP 2012, when officials from the Ministry of Defence and Urban Development (MDUD) attended the programme. Following Colombo's successful participation that year, other Sri Lankan officials from the Urban Development Authority (UDA) participated in the 2013 run of the TFLUGP for a deeper dive into the Beira Lake project.

Impressed by the programme and the relevance of Singapore's urban transformation experience to Colombo, the team requested for a customised capability development programme, which would benefit several Sri Lankan officials. This resulted in a collaboration between Sri Lanka and Singapore, through the tailor-made Sri Lanka Urban Planning and Governance Programme, co-funded by Temasek Foundation and the Sri Lankan government, and jointly delivered by CLC and the Singapore Cooperation Enterprise. Over a span of two years from 2015, more than 200 Sri Lankan officials participated in multiple deep-dive technical workshops facilitated by senior sector practitioners from Singapore on the themes of integrated planning and development, land use planning, land sales, water, environment management and greening. The workshops also emphasised the need to adopt an integrated systems approach for resolving complex and interlinked urban challenges. To apply the key learnings from the various workshops, it was also proposed that officials work on drawing up a redevelopment plan for the Beira Lake area, as part of the Sri Lanka Urban Planning and Governance Programme.



Beira Lake Transformation Project

Built in the 15th century, Beira Lake is a 65-hectare waterbody located in downtown Colombo. Originally built as a moat, the lake served multiple purposes before gradually turning into an urban sink. Years of intensified development and indiscriminate sewage discharge resulted in the lake becoming extremely polluted. During dry seasons, the high concentration of chemicals in the water also led to a distinct stench. The neighbourhoods in the lake's vicinity have also experienced mixed developments, with luxury developments coming up at some stretches, whereas others are dotted by abandoned warehouses and squatter settlements, among others. As a result, the lake's potential to be a versatile and vibrant waterfront site was not realised.

Bird's eye view of Beira Lake (Sri Lanka).

Image: Centre for Liveable Cities

Drawing parallels between Beira Lake and the Singapore River, which up until the 1970s was a highly polluted waterbody before being transformed into a clean river with a world-class riverfront, CLC curated a workshop focused on developing a vision and strategy that would propel Beira Lake's transformation forward. The workshop, held in September 2016 in Singapore, brought together for the first time 30 Sri Lankan officials from different urban development functions such as planning, transport, environment, land sales and greening to brainstorm and view the Beira Lake regeneration project through a whole-of-government lens. Taking an integrated approach, the officials worked with CLC's Resource Persons to develop a comprehensive set of plans and strategies to systematically plan, clean and develop Beira Lake and its surrounding areas.

Transformation of the Singapore River

Until the 1970s, the Singapore River was an extremely polluted waterbody. Decades of extensive economic activity and lack of sewage infrastructure had turned the river into an urban stink pool. In 1977, in response to a clean-up call by then Prime Minister Lee Kuan Yew, a massive effort to clean up the river was initiated. Through a whole-of-government effort, which involved the resettlement of large number of squatters, hawkers and pollutive industries, the river was cleaned up within a decade. Following this, the 1985 Singapore River Concept Plan and 1986 Conservation Plan earmarked stretches of the Singapore River, in particular along Clarke Quay, for transformation into a commercial and heritage zone. Today Clarke Quay is a vibrant entertainment and lifestyle district.

The Singapore River today, along Clarke Quay.

Image: Jiachen Lin on Unsplash

Adopting a Three-Pronged approach: Cleaning, Planning and Execution

Creating an attractive urban precinct in the heart of Colombo meant that the lake's water had to be cleaned up. Hence, a key focus of the plan was to tackle the sources of water pollution and attain recreational water standards for the lake, over a 10-year timeframe. The plan proposed to redirect sewage and wastewater away from the lake's catchment area, through rehabilitation and expansion of the existing sewage network, and installation of on-site wastewater treatment facilities at upcoming developments. Non-compatible land uses surrounding the lake were also recommended to be progressively rehabilitated to alternate sites. In parallel, the plan also recommended the city's municipal solid waste management infrastructure and practices to be improved. To raise the general quality of the water, phased dredging, prioritising locations where water circulation was poor, was proposed in addition to measures for regular monitoring of the water standards. The plan also called for the prohibition of illegal waste disposal into the lake. Recognising that improving and maintaining the water quality was a continuous process and required support from the people, the plan also suggested educational programmes and activities involving the community.

Second, to realise the development potential of the area and alleviate traffic and congestion problems, the action plan proposed a new planning strategy for the lake and its precincts. Taking inspiration from the "Five-Finger" planning concept and considering the existing land use, characteristics and infrastructure of the area surrounding the lake, a new proposal was drawn up, comprising six development corridors. Radiating out from the lake, each corridor offered diverse range of land uses comprising a mix of low, medium to high rise commercial and residential developments, institutions, hotels and multimodal transport hubs.

Left: Participants in discussion with CLC Fellow Michael Koh; Right: Participants visiting Bishan-Ang Mo Kio Park.

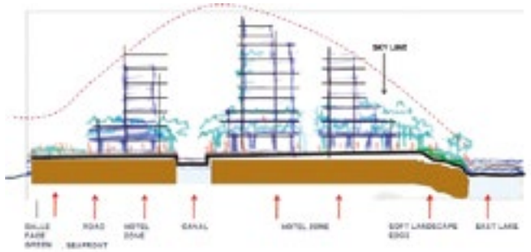
Images: Centre for Liveable Cities

The plan recommended a new density and building heights plan for the area surrounding the lake. To maintain the human scale and to safeguard vista corridors, low-rise developments were proposed near the lake front, with the building heights gradually rising for the developments furthest from the lake. Similarly, in districts with a predominant heritage character such as Fort and Pettah North, the plan proposed a mix of low to medium rise, mixed-use establishments.

Left: Proposed structure plan, with development corridors Right: Proposed density plan.

Images: Centre for Liveable Cities

The plans were injected with a layer of green and blue, pedestrian-friendly links that aimed to improve the connectivity and pedestrian accessibility to the area. The land use plan was supplemented with a transport plan, which encouraged the development of a comprehensive public transit system and laid focus on creation of transit-oriented developments with easy access to key public transport nodes.



Cross-section of building heights through development corridor 1.

Image: Centre for Liveable Cities

Third, to translate the plans into reality, officials drew up an execution plan that detailed the multi-agency urban governance mechanism required to ensure that agencies in charge of different functions coordinate their detailed plans and interventions. The plan also identified projects that could encourage the involvement of the private sector.

Developments on Ground

Several interventions have been made on the ground to transform the lake and its waterfront. In a bid to stem pollution from squatter settlements and providing them with better housing, nearly 400 families living in under-served areas were re-settled into housing projects with better amenities. The lake was also dredged to remove accumulated wastewater and authorities have harnessed bioremediation solutions such as "floating treatment wetlands" to improve the lake's water quality.[26] A variety of new public spaces have also been swiftly constructed and opened to the public to enjoy, including a new linear park lining the lake, Galle Face Urban Forest Park, and Beira Lake Open Air Restaurant. More projects integrating the green and blue spaces are underway, including the creation of an ecology park. The community has also been involved in cleaning up the lake and creating awareness of proper solid waste disposal practices. While Beira Lake's transformation is far from over, with a multi-pronged approach, the goal of a transformed lake in a vibrant downtown is well underway.

City Story 9
Bangkok, Thailand

Towards a Low-Carbon City

By: Heng Su Li

Land Area:
1,569 km²

Population:
8,305,218

Population Density:
5,293 people/km²

At 1,569 km², Bangkok, Thailand's capital city and the heart of the country's government, economy, and culture, is also its most populous city. While its registered population stands at about 8 million, this figure swells to 10 million when accounting for non-registered residents, tourists and commuters.

As Bangkok grows as a metropolis, environmental challenges such as air pollution, wastewater and solid waste generation are becoming more complex. Climate change is also driving Bangkok's need to mitigate and adapt, while growing energy consumption by various sectors (e.g., transport and industry) can worsen air pollution and carbon emissions.

Determined to address these challenges, a team from the Bangkok Metropolitan Administration (BMA) led by Dr Supachai Tantikom, Advisor to the Governor of Bangkok, attended the TFLUGP in 2014. Following mutual exchanges with CLC's Resource Persons at the programme, the team gained key insights on their energy conservation plans. This included the importance of public-private partnerships through the example of Singapore's BCA Green Mark Scheme and educating the public on energy conservation practices through public campaigns. BMA also worked with relevant agencies to augment its energy conservation plans to develop strategies centered on energy conservation and transitioning to a low-carbon society.

Bangkok's (Thailand) skyline at night.

Image: Andreas Brucker on Unsplash

An infographic summarising the SGBMP.

Image: BCA

Singapore Green Building Master-plan (SGBMP) 2021

As part of Singapore's drive to achieve more ambitious sustainability standards, the SGBMP was launched by the Building and Construction Authority (BCA) in 2021, following consultations with industry stakeholders and the community. The SGBMP expands and builds upon the Green Mark Scheme, first introduced in 2005. It aims to deliver "80-80-80 in 2030", encompassing the following key targets:

- Green 80% of buildings by 2030, through improving energy performance in existing and new buildings.
- 80% of new developments to be Super Low Energy (SLE) from 2030.
- 80% improvement in energy efficiency for best-in-class green buildings by 2030.

Enhancing Energy Conservation

Bangkok's energy conservation strategies are undergirded by Thailand's energy plans. The 20-year Energy Efficiency Development Plan (2011–30) looks at enhancing the economic use of energy and improving energy efficiency. It outlines the plan to cut energy intensity by 25 per cent by 2030 from 2005 levels.[27] BMA followed the 10-year Alternative Energy Development Plan's framework (2012–21) to increase alternative energy consumption by 25 per cent in 2021.[28] Following a Cabinet Resolution (27 March 2012), BMA also plans to reduce energy consumption at government-owned buildings by 10 per cent.[29]

BMA has launched several projects to promote energy efficiency in Bangkok. Fluorescent lamps in 15 BMA-controlled buildings were replaced with energy saving bulbs, as were those in old streetlamps. The Building Energy Management System was also installed in all 50 district offices and the BMA developed an energy consumption database to track energy consumption.

New technologies to improve energy efficiency were also supported, such as the use of a low-velocity electricity mill project to produce wind energy and recycled biodiesel fuel from used vegetable oil. BMA has also pushed schools and markets to install anaerobic-digester tanks to convert organic waste to biogas fuel. BMA has also rolled out other alternative energy pilot projects at its facilities.

To strengthen institutional capacity in implementing projects and disseminating information on energy efficiency, BMA worked with agencies to train their officers. BMA also raised public awareness by encouraging its residents to participate in activities such as Earth Hour, tree planting and using stairs instead of elevators.

Bangkok's Low Carbon Society Network

Education is also a key part of Bangkok's energy conservation strategies. The 2012 Low Carbon School Network Project introduced the idea of a low-carbon school to Bangkok's youth and educated both students and teachers on energy efficiency.[30] Cooperating with the Foundation for Environmental Education for Sustainable Development Thailand, BMA sought to motivate students in participating schools to adopt environmentally friendly actions in their own daily activities.[31] School curricula also highlighted smart energy solutions to encourage positive behaviours towards the goal of creating a low-carbon society in schools.

Beyond schools, the Low Carbon Society Network was launched in 2014. This larger network includes department stores, hotels, office buildings, government offices, universities and more. It aims to spread awareness on how to adapt to climate change and reduce energy consumption in buildings. Through this network, involved groups can reach a common understanding and have greater understanding of the importance of energy conservation. This also encourages participation from all sectors and civil society. The project constitutes three main elements:

- Technical aspects, which include data collection and analysis.
- Campaign activities including seminars, workshops, trainings, public hearings, and a green building design contest.
- Promotional activities including a project kick-off press conference, booklet distribution, and dissemination of information through various media and the distribution of campaign promotion products.

City Story 10
Ho Chi Minh City, Vietnam

Integrated Data Systems for Urban Planning and Management

By: Clarice Chow

Land Area: 2,095 km²

Population: 9,427,598

Population Density: 4,500 people/km²

Ho Chi Minh City Hall, fronted by a statue of Ho Chi Minh in Vietnam.

Image: Christopher on Wikimedia Commons

In 2018, Ho Chi Minh City (HCMC) became one of 26 pilot cities to join the ASEAN Smart Cities Network (ASCN). Since then, its smart city ambitions have grown from strength to strength through its smart city projects and roadmap, for which the city is preparing to enter the second phase in 2021–25.[32] Even before this, HCMC's efforts over the years in the direction of data openness and interoperability helped it build a strong foundation for further smart city developments.

HIDS workshop with the Singapore delegation comprising staff from CLC, TF and SLA.

Image: Centre for Liveable Cities

The HCMC Peoples' Committee (PC) understood the importance of having ready access to geospatial information to support the planning of liveable and sustainable districts. It thus appointed the HCMC Institute for Development Studies (HIDS) to advise on matters relating to urban development, public service delivery, resource utilisation and risk management. HIDS was tasked with drawing up a long-term, sustainable Geographic Information System (GIS) roadmap and looked to learn from the experiences of Singapore and other Asian cities.

The city established the HCMGIS portal in 2008 and has been diligently refining the system ever since. However, HIDS faced the challenge of gaining buy-in from public agencies for making reliable and updated geospatial data available on the portal. In 2018, officers from HIDS met with a Singapore delegation comprising officers and resource persons from the Singapore Land Authority (SLA), Temasek Foundation (TF) and CLC as a follow-up to HCMC's participation in TFLUGP. The exchange of knowledge contributed towards the development of the roadmap, including service delivery improvements and ideas on how the city could better gain support from public agencies.

SLA OneMap

OneMap, developed by the Singapore Land Authority, is a publicly available national map of Singapore. It can be used to gather street-level geospatial information or be used for specific queries such as land ownership, nearby schools, and demographic data in the vicinity, among other features. OneMap is accessible via the OneMap mobile app and web portal (www.onemap.sg).

A feature of OneMap is finding land ownership and land lot numbers using LandQuery.

Image: SLA

HCMC's IOC will enable real-time observations including traffic conditions.

Image: Daniel Stewart on Unsplash

As of 2020, there has been significant progress made on the HCMGIS portal and a total of 93 information layers have been made available (up from 67 in 2018). The digital platform has garnered considerable public attention from the public since its establishment and reciprocated well by providing interactive elements such as story maps and open data visualisations on hot topics such as the COVID-19 pandemic.[33]

Since tackling the fundamental challenge of data integration and accessibility in the GIS space, HCMC has since continued to extend its digitalisation strategies to other practical uses across the public sector. In 2018, HCMC pitched two smart city projects for funding and collaboration at the ASCN platform—the Intelligent Operations Centre (IOC); and the Integrated and Unified Emergency Response Centre. These projects were part of a smart city roadmap that introduced the vision of attaining rapid and sustainable economic development through optimal resource utilisation and citizen-centric governance.[34] During the first phase of the roadmap from 2017 to 2020, the city's focuses included the development of cloud computing infrastructure, big data analysis and shared data platforms among buildings to enable an open data ecosystem. In subsequent phases, these initiatives will be strengthened and improved through better processing capacity and security, for long-term sustainability and an expanded scope of implementation.[35]

While many applications and processes were developed for individual domains such as transportation, security, healthcare and education, a key challenge stemmed from the multitude of datasets housed by different agencies in varying formats and systems. HCMC's two smart city projects sought to address the resource inefficiencies from these segregations and develop common platforms capable of collecting and analysing data from varied sources while availing it to city leaders seeking to make informed decisions on cross-cutting issues.

The IOC is envisioned as the "brain" of the city, aggregating real-time data from various virtual and physical sources, CCTVs for example. This enables officers to monitor a variety of scenarios including traffic conditions, urban flooding and security concerns. Similarly, the Unified Emergency Response Centre makes use of GIS and the integrated video surveillance system for automated location and resource management. These help to improve response time and communication to the public in event of an emergency.[36,37,38]

HCMC's Intelligent Operations Centre.

Image: Centre for Liveable Cities

HCMC's Traffic Control Operations Centre.

Image: Centre for Liveable Cities

Endnotes

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