Surabaya, Indonesia
1. Overview

Surabaya is the second largest city in Indonesia. It is the provincial capital of East Java and a regional centre for development, trade and culture. Surabaya municipality has a population of 3.15m with over 10m living in the wider metropolitan area of Gerbangkertosusila. Economic output stands at $38.4bn, growing annually at a rate of around 6%. This is driven by a majority service economy with productive retail, manufacturing and accommodation and food service sectors. The historic port of Surabaya remains a strategic asset and is the 2nd busiest in Indonesia.

Surabaya is situated in the expansive Brantas River Basin which drains over 11,800km². The Kali Mas River branches from the Brantas and flows through Surabaya City to discharge into the Madura Strait. Flooding, climate change and tackling water pollution remain key environmental challenges for Surabaya.

The City Government of Surabaya is responsible for urban administration and management. Development and waste management initiatives are then implemented through a structure of community and neighbourhood associations. Surabaya is unique in its strong system of community waste management, with individual districts and neighbourhoods collecting, segregating and processing household waste. Ambitious city development plans and a strong focus on sustainability has led to international recognition and high environmental standards compared to many ASEAN cities. Government incentives and investment has allowed the establishment of over 200 community-scale waste disposal and 21 composting sites. Closing the Loop will hope to engage this network alongside local government agencies to improve plastic waste tracking and management in Surabaya.

Figure 1. Surabaya Satellite Overview.
2. Environment

Location: East Java Province

Area: 326km$^2$

Climate System: Tropical Savannah

Average Yearly Precipitation: 1679mm (13mm to 317mm)

Natural Resources

Water

Surabaya City is situated on the Kali Mas River in the north of the Brantas River Basin. The Brantas drains 11,800km$^2$, approximately 25% of Java’s land area, and stretches 320km from the southern volcanic highlands to ultimately discharge into the Madura Strait$^1$. The Surabaya sub-basin is much smaller, around 650km$^2$, and also includes areas of the surrounding Gresik and Sidoarjo Regencies. The Kali Mas plays a key role in city drainage and during the wet season can experience high flows and flooding. This is a particular concern for informal riparian communities.

As a coastal city, Surabaya sits along the narrow Madura Strait, a shallow and very busy sea channel that separates the Madura and Java Islands. Much of Surabaya is low elevation, typically 3-6m above sea level, which has allowed for the formation of estuarine mangrove and wetland ecosystems. There is also substantial surface water reserves, present as a network of smaller streams, lakes and fishponds across the city.

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Present water management challenges include, river and coastal pollution (primarily from untreated effluent discharge and solid waste), seasonal water scarcity, and urban flooding. There are several urban planning initiatives ongoing to help mitigate these vulnerabilities.

Existing water infrastructure includes heavy damming throughout the Brantas Basin. These are mainly located upstream, however the Gunungsari and Jagir Dams can be found in south Surabaya.

**Forests**

Despite high national deforestation rates Surabaya has retained 21.8% greenspace with a target of 30%\(^2\). Following the 2007 Law on Spatial Planning there have been increasing efforts to expand park coverage and integrate nature into Surabaya City, for example through the Green and Clean Initiative.

**Minerals**

Despite having few mineral resources itself, Surabaya remains a key sea terminal for Javanese mining and trade.

**Climate Change**

Emerging climate risks include sea level rise, salt water intrusion and urban flooding. Longer term climate trends include a delayed and shorter duration for rainy season across Java, predicted to reduce annual precipitation up to 15% by 2100\(^3\).

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3. Services

Waste Management

Indonesia faces significant national challenges in scaling-up solid waste collection and management. At present, 70% of urban residents have access to waste collection, of which only 55% is handled at a formal transfer station or processing facility. Similarly the diverse geographies, development challenges and decentralised governments of Indonesia have resulted in high variability of capacity and performance between cities.

Surabaya City exhibits strong waste management practices and presents a good benchmark for neighbouring settlements. Over the course of several regional and city initiatives, solid waste generation has been actively reduced from a 2000 tonnes per day peak in 2001 down to 1512 by 2017. Most impactful include the Adipura, Green and Clean, Waste Bank, and Promotion and Implementation of the 3Rs programmes which helped facilitate the development of community-led waste management. Particularly, Surabaya’s experience with organic waste composting, community waste segregation and intracity benchmarking provide effective case studies for behavioural change and local-scale waste management.

Extensive city investment in waste infrastructure further helped increase coverage and efficiency. Surabaya now has 21 composting centres, over 200 temporary disposal sites (waste banks), 1 medium sorting station (Super Depo Sutorejo) and 1 sanitary landfill (Benewo). The community-run waste banks are particularly effective and pay for segregated recyclables, providing opportunity for greater engagement with the informal sector. Neighbourhood benchmarking also plays a key role, with the best performing communities (such as Jambangan VII and Gunung Sari) winning prizes including cash payments, tools and trees for neighbourhood greening. These initiatives were each supported by a widespread communications and outreach campaign helping to mainstream sustainable waste management in Surabaya. In 2019 overall waste handling was estimated at 95%.

Several organisations are also utilising some more innovative waste management solutions. For example, the Jambangan Recycling centre now breeds black soldier fly larvae to compost organic waste, while the city bus network allows fare payments with plastic bottles, resulting in approximately 16,000 plastic passengers per week.

Ongoing areas for improvement include further expansion of the sustainable management system through awareness raising, capacity building, financial support and establishing policy frameworks\(^7\).

**Total solid waste generation:** 1512 tonnes

**% Plastic Waste:** 16%

**Total Plastic waste generation:** 242 tonnes/day

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Figure 5. Surabaya waste characteristics. Source: Surabaya City, 2016 via UNEP, 2017.

Figure 6. Waste management pathways Surabaya. Source: UNEP, 2017

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Digital Readiness

Since 2002 Surabaya has been pioneering an ‘e-governance’ system for city administration. This has developed into a wide portfolio of applications including e-Monitoring, e-Education, e-Health, and e-Procurement. In particular the e-Musrenbang app presents a streamlined regional development planning system and increases transparency through accessible online data. The ‘Surabaya Single Window’ provides a similar solution, allowing parallel online applications for city licencing services. The uptake of ICT coupled with widespread smartphone usage has also allowed for new mediums of democratic engagement and facilitates direct feedback from citizens to improve public trust and communications.

National Index score: 11.68/25

Global Digital Readiness Rank: 73

Global Networked Readiness Rank: 76

Water Provision

Municipal water in Surabaya is provided by the state-owned PDAM Surya Sembada Kota Surabaya and reached 98% service coverage in 2019. As 97% of this water is sourced from surface water sources (Surabaya, Kali Mas, Umbulan Spring, Pandaan Spring) reducing river pollution is very important. With the city experiencing a supply-demand deficit of around 5.5million m³/yr, improving water allocation and service efficiency will be key to secure future water security. The East Java Water Resource Services Agency is responsible for distributing water use licences among public and private entities across the city.

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4. Society

Indonesia is a highly diverse nation composed of over 17,000 islands and home to 268 million people. It is urbanising at a rate of 4.1% per year and expected to reach 68% urban cover by 2025. Much of this urbanisation is occurring on the island of Java in western Indonesia. This is the most populous island and predicted to reach 152m in 2020. Major settlements include the national capital of Jakarta in the north-west, Semarang in central java, Bandung in the west and Surabaya in the east. Population growth rates have been slowing in Java over the last decade settling around 1.1% per year. Rapid development has slashed poverty rates by more than half since 1999 down to 9.4%. Provincial poverty in East Java has followed this trend, declined over time from 6.25% in 2012 to 4.88% in 2018.

Surabaya is the second largest city in Indonesia and one of the oldest, founded in the 10th century. The city has a population of 3.15m and is growing at around 2% per year (2018). The city district is fully urbanised and wider metropolitan area has an estimated population of over 10 million. Urban land cover in Surabaya district increased by 1555ha between 2013 and 2018, primarily the result of agricultural land conversion in east subdistricts. Population density varies greatly, from 2,655

![Surabaya sub district population density. Source: Open Street Map, 2017](https://www.bps.go.id/statictable/2014/02/18/1274/proyeksi-penduduk-menurut-provinsi-2010---2035.html)

14 Ibid. Firmansyah et al., 2018.
people per km² in Pakal sub-district to around 40,207 ppkm² in Simokerto (2020)\textsuperscript{16}. Household size varies around the provincial average of 3.6 persons.

Key urban challenges include: the provision of affordable housing, tackling environmental pollution and improving urban mobility.

**City Population:** 3.15m\textsuperscript{17}

**Population density:** 9497 people/km²

**Surabaya Human Development Index:** 0.822 (0.707 national)\textsuperscript{18}

\textbf{Figure 8.} Greater Surabaya 2030 land use planning. Source: JICA, 2011.


5. Economy

National

Indonesia has the largest economy in ASEAN with a GDP of around $1tr and 5% average annual growth (2000-2015)\(^{19}\). Indonesia has been classified as a lower middle-income country since 2003 and is expecting to enter the top 10 largest global economies by 2025. Long term trends of increasing labour productivity, income, and greater access to education and essential services are expected to continue in future.

The effects of Covid-19 have cut the 2020 growth forecast to 2.5\(^{20}\), though this is likely to rebound strongly in 2021.

Key economic and development challenges include tackling economic inequality and making further gains in reducing poverty, especially among the more vulnerable islands.

GDP: $1.04tn

GDP per capita: $3,894

Economy by Sector: Agriculture – 13% Industry/Construction – 41%
(2017) Services – 45%

City

The island of Java represents about 60% of national production. As the provincial capital of East Java Province, Surabaya is a regional centre for economic growth and activity. Development has been rapid with annual production increasing 6% in 2019, and overall growth from $22.1bn in 2012 to 38.4bn in 2019. The city economy is relatively diverse, split between retail (28%), manufacturing (18%) accommodation, food and beverages (16%), and construction (9%) sectors, with smaller contributions from ICT, finance, transport and other services\(^{21}\). Surabaya also has a substantial informal sector accounting for 22% of employment in 2013\(^{22}\). Historically Surabaya has always been an important seaport and it remains the 2\(^{nd}\) busiest in Indonesia, carrying over 3.8m container units in 2018\(^{23}\).

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\(^{22}\) Ibid: Ostojic et al., 2013.

\(^{23}\) Lloyds List Maritime Intelligence, 2019, No. 43: Tanjung Perak Port. https://lloydslist.maritimeintelligence.informa.com/LL1127925/43-Tanjung-Perak-Indonesia
Unlike many cities, the commercial and business districts of Surabaya are spread over a wide area, almost 30km². Most of these commercial concentrations are also in close proximity to the Surabaya River representing a short leakage pathways.

**GDP:** $38.4bn$^{24}$

**GDP per capita:** $12,190$

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![Figure 9. Surabaya economic hotspots. Source: World Bank, 2012](image-url)
4.6 Governance

National

Indonesia’s unique geography and diverse population are administered through a decentralised government system. Introduced in 2000 this system gave greater authority, responsibility and resources directly to local districts and municipalities. Development planning and trajectories therefore vary by region but despite a lack of local capacity at first, decentralisation has not created any major political or economic problems. In total Indonesia is composed of 34 provinces which are subdivided into 514 second level districts (regencies) and cities.

National environmental policy is developed under the jurisdiction of the Ministry of Environment and Forestry while waste management is the responsibility of the Ministry of Public Works and Public Housing.

City

The Surabaya City Government (Pemerintah Kota Surabaya) is responsible for city administration. Urban management is structured in 4 tiers: 31 districts, 154 villages, 1368 community associations,

and 9118 neighbourhood associations. Each community association must bring together at least 4
neighbourhoods, while each neighbourhood association requires at least 40 households. This
comprehensive hierarchal structure allows for the utilisation of local knowledge and democratic
engagement. Similarly the establishment of Social Information Groups (Kelompok Informasi
Masyarakat) has been used to facilitate two-way engagement between the public and city
government. Progressive leadership, comprehensive development planning and strong community
engagement has allowed Surabaya to achieve among the highest environmental standards among
Indonesian cities, previously winning the UN Global Green City award in 2017. In 2019 over 20,000
civil servants were employed across Surabaya municipality\textsuperscript{26}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure11.png}
\caption{Surabaya administrative boundaries.}
\end{figure}

**Transboundary Considerations**

The wider Surabaya metropolitan areas (Gerbangkertosusila) consists of seven cities and regencies
over 5,926km\textsuperscript{2}. Hydrological linkages to the expansive Brantas River Basin means wider institutional
coordination is required to improve water quality. The Brantas transects 15 regencies and
municipalities and is managed by the state-owned Brantas River Basin Management Corporation\textsuperscript{27}
(PJT I). Responsibilities include operation and maintenance of existing river infrastructre,
implementing water allocation and promoting environmental sustainability. High flood risk means
there is already precedent for up and downstream cooperation with several community and
transboundary flood warning systems already established (CBFEWS). The PJT I also develop
decadal development master plans to provide common understanding and objectives.

\textsuperscript{26} Ibid: BPS Surabaya, 2020.

7. Key Plans, Policy and Regulations

Urban Development

*National Long-Term Development Plan 2005-2025.*

Indonesia’s ongoing development plan aiming to achieve three overarching goals for: a developed and self-reliant; just and democratic; and peaceful and united Indonesia. Also defines waste sector service targets for cities and provinces.

*National Policy and Strategy for Developing Solid Waste Management Systems. 2017-2025*

A roadmap to improve national waste reduction and recycling. Key national targets include achieving a 30% waste reduction and total 70% processing rate by 2025.

*Spatial Planning of Surabaya 2009-2029.*

Developed by the city government to guide urban development. The vision statement aims to create a ‘smart, clean, and ecologically friendly’ city.

*Surabaya Drainage Masterplan 2018-2038.*

Long-term city plan for managing flood and urban drainage infrastructure in Surabaya forecasting rapid economic and population growth.

Environment

*Act No. 32/2009 concerning Environmental Protection and Management*

This regulation defines the planning, utilization, control and enforcement of environmental protections in Indonesia. Includes water and waste quality standards and a guiding framework for environmental conservation.

*Law No. 18/2008 regarding Solid Waste Management.*

The first comprehensive waste law for Indonesia. Established the principles for SWM service provision, allocation of responsibilities, incentive and disincentive mechanisms, and penalties for disobeying the law. This covers both household and commercial waste products.

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28 For a full summary of all Indonesian Solid Waste Management Policy and Regulation, see Appendix 1 of World Bank (2017) City Technical Capacity Support for Solid Waste Management Investment Preparation for Indonesia. Env&Social safeguards.
**Indonesia’s Plan of Action on Marine Plastic Debris 2017-2025.**

National scale strategy to manage plastic waste. Aims to improve stakeholder awareness, management capacity and funding to reduce marine plastics by 70% by 2025.

**Surabaya Water Quality and Pollution Management Master Plan**

A basin-wide environmental plan established between local, regional, public and private stakeholders. This provides a strong foundation for future cooperation and addressed issues including institutional corruption, regulatory compliance, and local policy engagement.

**Surabaya City Environmental Protection and Management Plan.**

Defines general environmental targets for Surabaya. Developed by the city government’s Office for the Environment.

**Coral Triangle Initiative 2009**

A multilateral partnership of 6 nations to coordinate marine and coastal resource management and conservation in the Indonesian-Philippines and Far Southwestern Pacific ecoregions. Directs action across five areas: the designation and management of ‘priority seascapes’, the adoption of ecosystem approaches to fisheries, climate change adaptation, marine protected areas (MPAs), and the protection and improvement of threatened species.

**Sustainable Development Goals**

**Presidential Decree No. 59/2017 on Implementing and Achievement of SDGs.**

Mandated the SDGs to be integrated into the national and subnational planning process. Led to the development of a National SDG Road Map which allocated targets across 4 working groups:

![Organisational structure for SDG Coordination in Indonesia](image-url)

*Figure 12. Organisational structure for SDG Coordination in Indonesia. Source: Appendix to the Presidential Decree No. 59 via U NDP, 2017.*
Social, Economic, Environmental, and Inclusive Development. The work of Closing the Loop project will progress SDG targets within the Environmental pillar which includes goals 6 and 11-15.

8. Key Stakeholders

**Governing Institutions**

Surabaya City Government

*Office for the Environment*

*City Development Planning Agency*

*Building and Land Management Agency*

*Public Works Agency*

Ministry of Environment and Forestry

Ministry of Marine Affairs and Fisheries

Ministry of Public Works and Public Housing

**International Projects and Donors**

UNEP – Mitigating SLCPs from the Municipal Solid Waste Sector

USAID – Municipal Waste Recycling Programme

**Private Sector**

The Indonesia Olefin, Aromatic and Plastic Industry Association (INAPLAS)

Packaging and Recycling Association for Indonesia Sustainable Environment (PRAISE)

Indonesian Plastic Recycling Association (ADUPI)

Indonesia Packaging Federation (IPF)

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