



INDONESIA-MALAYSIA-THAILAND  
GROWTH TRIANGLE



# GREEN CITY ACTION PLAN 2035

CITY OF BATAM

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# Foreword by the Mayor

Assalamuallaikum, Wr. Wb.

The City of Batam's *Green City Action Plan* (GCAP) is an initiative that serves as a "road map" towards improving the quality of life in the city by applying "green attributes" generally known as *green planning and design, green open space, green building, green energy, green transportation, green waste, green water, and green industry and commerce*, which are all significantly based on and supported by a *green community*.

The basic reason for the City of Batam to prepare a GCAP is to help achieve a development that is sustainable, fair, and profitable at the same time because we are convinced that green development can facilitate economic and social equity as it will be able to avoid and manage conflicts between economic interests on the one side and the need for environmental preservation on the other side.

The GCAP clearly describes our priority programs which can be used as reference for citizens who want to understand our framework for aspiring to become a Green City, including external parties interested in participating in our Green City development.

The government of the City of Batam commits itself to continuing the process of capacity development for greening the city through a multi-year and multi-stakeholder rolling green action planning process led by the "Green Team." This is to strengthen the city's Medium Term Development Plan (RPJMD). The Green City Action Planing process is supported by an appropriate resource allocation based on a Mayoral Decision.

Hopefully we will all be blessed with the help of the Almighty God in transforming the City of Batam into a Green City. Aamiin.

Wassalam,  
Batam, August 2016



**H. Muhamad Rudi SE.MM**  
Walikota Batam  
Batam

**Hartanto Reksodipoetro**  
Kepala Badan Pembangunan

# Acknowledgments

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The Urban Development and Water Division (SEUW) and the Regional Cooperation and Operations Coordination Division (SERC) of the Southeast Asia Department of ADB are also in collaboration with the Coordinating Ministry of Economic Affairs (CMEA) in possibly expanding the GCAP for Indonesia and in other cities, under the Indonesia–Malaysia–Thailand Growth Triangle (IMT-GT) and Brunei Darussalam–Indonesia–Malaysia–Philippines East ASEAN Growth Area (BIMP-EAGA) programs. The Green Cities Initiative for Indonesia will be a priority program under the IMT-GT Implementation Blueprint 2017–2021 and BIMP-EAGA Vision 2025.

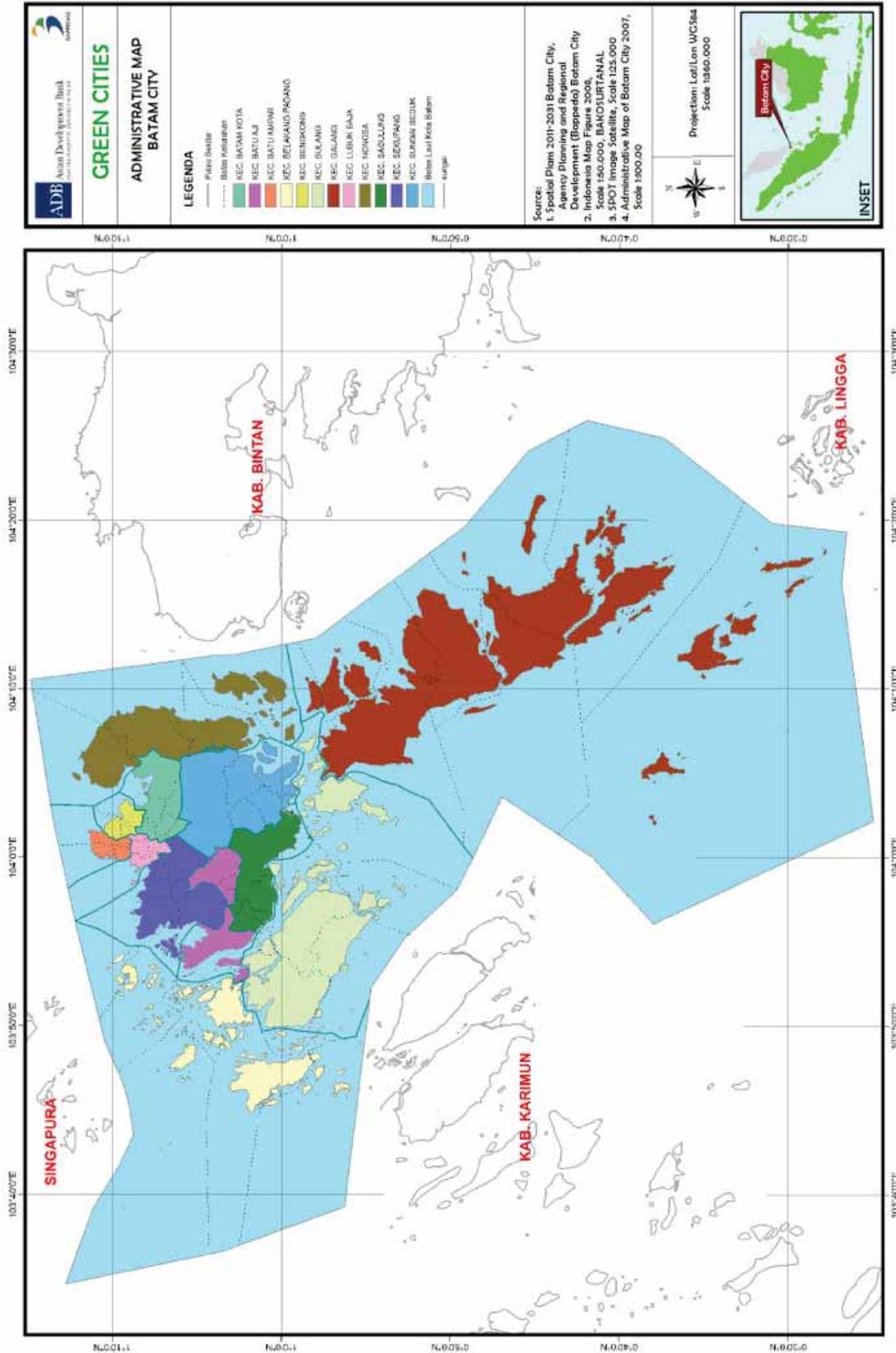
# Abbreviations

ADB	– Asian Development Bank
APBD	– Anggaran Pendapatan, dan Belanja Daerah (Regional Budget)
APBN	– Anggaran Pendapatan dan Belanja Negara (National Budget)
ATB	– Adhya Tirta Batam
BAPPEDA	– Badan Perencana Pembangunan Daerah (Regional body for planning and development)
BAPPENAS	– Badan Perencanaan Pembangunan Nasional (Ministry of National Development Planning)
BDA	– Batam Development Authority
BDT	– Batam Department of Transportation
BIMP-EAGA	– Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area
BLH	– Badan Lingkungan Hidup (Environment Agency)
BLUD	– Badan Layanan Umum Daerah (Municipal Public Service Company)
BOD	– biological oxygen demand
BOT	– build-operate-transfer
BP Batam	– Badan Pengusahaan Batam
BPTC	– Batam Public Transport Company
BRT	– bus rapid transport
BTD	– Batam Transport Department
BUMD	– Badan Usaha Milik Daerah (government-owned enterprise)
COD	– chemical oxygen demand
CSR	– corporate social responsibility
DED	– detailed engineering design
DKP	– Dinas Kebersihan dan Pertamanan (Municipal Sanitation Agency)
DPRD	– Dewan Perwakilan Rakyat Daerah (Regional People’s Representatives Assembly)
GCAP	– Green City Action Plan
GCP	– Green Cities Program
GIS	– geographic information system
GWh	– gigawatt-hour

ha	– hectare
IMT-GT	– Indonesia-Malaysia-Thailand Growth Triangle
ITDP	– Institute for Transportation Development and Policy
km	– kilometer
km <sup>2</sup>	– square kilometer
lps	– liters per second
MCA	– Multi-Criteria Analysis
MW	– megawatts
m <sup>2</sup>	– square meter
m <sup>3</sup>	– cubic meter
O&M	– operation and maintenance
NMT	– nonmotorized transport
MSW	– municipal solid waste
PDAM	– Perusahaan Daerah Air Minum (Water Supply Utility)
PIP	– project implementation plan
PLN	– Perusahaan Listrik Negara (National Electric Company)
PMU	– project management unit
PPP	– public-private partnership
RPJMD	– Rencana Pembangunan Jangka Menengah Daerah (Regional Medium-Term Development Plan)
RPJMN	– Rencana Pembangunan Jangka Menengah Nasional (National Medium-Term Development Plan)
RTH	– Ruang Terbuka Hijau (Green Open Space)
RTRW	– Rencana Tata Ruang Wilayah Kota (Spatial Development Plan)
SMART	– Specific Measurable Assignable Realistic Timebound
SOP	– standard operational procedures
STP	– septage treatment plant
SWM	– solid waste management
TBD	– to be determined
TOR	– terms of reference
TPA	– Tempat Pembuangan Akhir (sanitary landfill site)
TPS	– intermediate waste collection points
UDFC	– Urban Drainage and Flood Control
WTE	– waste-to-energy







# Introduction

The Green City Action Plan (GCAP) supports the National Urban Development Policy and Strategy for the period 2015-2045. The long-term vision is to realize sustainable and competitive cities for people's prosperity based on physical characteristics, economic advantages, and local culture by 2045. This vision will be achieved in three phases: (i) creating a national urban system; (ii) having urban areas meet national service standards and creating sustainable cities that are green, livable, smart, and competitive; and (iii) strengthening governance and government institutions.

In addition, the GCAP is based on the "Green Vision" of the mayor of Batam as stated below:

"Actualizing Batam City as a Modern Civil World Port and Being the Centre of National Economic Growth"

This vision is a broad statement, consistent with national urban development policies and strategies, and able to accommodate a number of green development goals.

One of the pillars for implementing the National Urban Development Policy and Strategy is the Green Cities Program (GCP),<sup>1</sup> which is implemented with the National Development Planning Board (BAPPENAS) as the executing agency, and the Directorate General of Human Settlements in the Ministry of Public Works and Housing as the implementing agency. The City of Batam has been participating in the GCP since 2010. It focused primarily on the implementation of three 'attributes' (Green Planning and Design, Green Open Space, and Green Community). With the new National Development Plan period that started in 2015, the City of Batam endeavored to scale up its GCP by promoting some of the 'heavier' green attributes such as Green Water, Green Waste, etc. by preparing a GCAP with technical assistance from the Asian Development Bank (ADB).<sup>2</sup>

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<sup>1</sup> Program Pengembangan Kota Hijau (P2KH).

<sup>2</sup> TA-8518 INO: Green Cities: A Sustainable Urban Future in Indonesia - 2 Capacity Development (46380-005)

# What is a GCAP?

A GCAP is a time-scaled green investment plan for a city. It includes specific actions for preparing and implementing prioritized investments over short and/or medium term, which covers urban management and institutional aspects, capacity development, and financing. Where appropriate, performance indicators are provided to enable monitoring and updating. While 'actions' focus on the short to medium term, it also provides a strategy for achieving the City of Batam's green vision over longer-term timescales. This integrated action plan complements the City of Batam's statutory planning process, notably the Regional Medium Term Development Plan (RPJMD). Successful implementation of the GCAP would allow the City of Batam to become a 'champion' for green cities in Indonesia.

The GCAP uses the term 'green' as a metaphor for cities that are clean, healthy, safe, and energy-efficient so as to become liveable and sustainable. It also reflects efforts to balance the economy and the environment with social inclusiveness.

In 2015, the mayor issued Decision SK 800/449.k/2015 to create an inter-disciplinary municipal "Green Team" that would become responsible for preparing the GCAP and allocated a budget for its operations. The Green Team was chaired by the head of the Municipal Development Planning Agency (BAPPEDA) and intermittently facilitated by ADB consultants.

# Summary of the GCAP Preparation Process

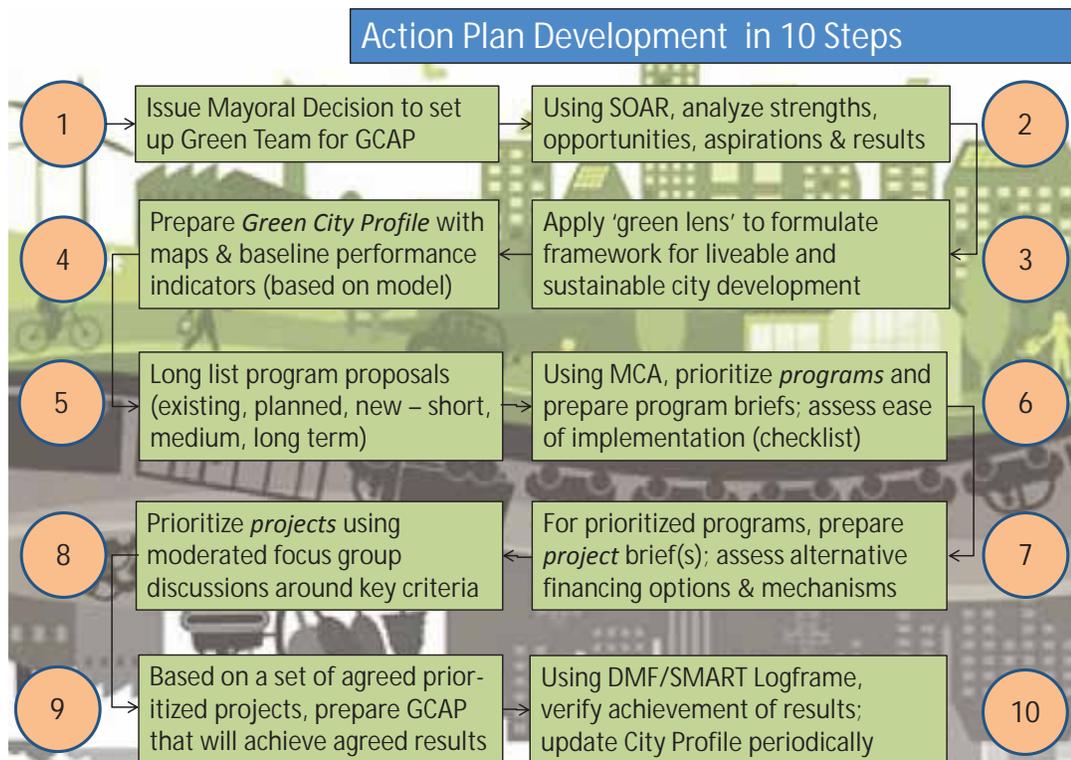
To realize this GCAP, it was essential to start with a vision for green development to guide the development of priority programs, projects, and manageable actions. The GCAP is the result of a process of identifying city development aspirations through a “green lens” to formulate a framework for sustainable development, and subsequently narrowing it down through a process of further analysis and selection that resulted in the formulation of several priority programs, which were then developed into detailed program briefs.

The programs that will help the city achieve its vision for green development are shown in the “Green Development Strategy 2035” (p.16). Based on further considerations of implementability including current capacity limitations, the Green Team subsequently shortened the list drastically to focus on three priority programs: (a) *Environmentally Friendly Solid Waste Management (SWM)*; (b) *On-site Sanitation and regular septage desludging services*; (c) *Ecotech Garden to protect Duriangkang dam water quality as the main raw freshwater source of Batam City for the short term, and on three secondary priority programs*; (d) *Bus Rapid Transit (BRT)*; (e) *Bicycle Paths and Pedestrian Walkways*; and (f) *Urban Drainage and Flood Control System for the medium- to long-term period*. Because the GCAP is a rolling plan, programs, projects, and actions may be added and modified periodically.

The six Priority Programs were used to prepare a list of actions in the form of a spreadsheet as shown in “The Next Five Years – Programs, Projects and Actions.”

The City of Batam’s Green Team will prepare annual updates of the GCAPs as a rolling plan by adding new green project proposals in order to ‘green up’ the city’s future medium-term and annual development plans, starting with the new Medium Term Development Plan (RPJMD 2016-2020).

To clarify the GCAP formulation process, the two tables below show the “10-step approach” and “toolbox” used by the Green Team to systematically prepare its GCAP. This section serves to explain the intermediate steps and products that led to the GCAP formulation.



### Toolbox for Green City Action Planning

	Tool	Format	Purpose
1	'Green Team' supported by Mayoral Decision, potentially to evolve into UMP	Multi-stakeholder, multi-year cross-sector working group	Prepare a GCAP in 10 Steps, and update it annually
2	<b>SOAR</b> (analysis of Strengths, Weaknesses, Aspirations, Results)	Powerpoint + FGD	Green City visioning as a basis for formulating SMART objectives
3	<b>Green City Profile</b> (Baseline, Index, Fiscal Profile, Performance Indicators, Road Map)	Template with Excel spreadsheets, Word files, and GIS thematic maps	Provide the city with a baseline, indicators, and road map to green development
4	<b>LCF + MCA</b> (Liveable City Framework & Multi Criteria Analysis)	Excel spreadsheets	Identify and rank priority programs
5	<b>Program &amp; Project Brief</b> (template)	Word file	Formulate priority programs & projects
6	<b>Fiscal Capacity Analysis &amp; Options for Alternative Modes of Financing</b>	Word file	For each brief, formulate modes of financing, CAPEX & OPEX as input for GCAP
7	<b>GCAP template</b>	Excel spreadsheet, Word file	Produce Action Plan
8	<b>SMART Logframe</b>	Powerpoint + accessories	Verify SMART greening targets as part of GCAP & rollover

Source: TA consultants.

The first (administrative) step was to establish a multi-stakeholder Green Team by Mayoral Decision. The Green Team then started visioning a green future, and used the tools from the 'Toolbox' diagram shown above to proceed from vision to aspirations and expected results.

Once the Green Team completed the SOAR (Step 2), it proceeded to 'greening up' the city's existing RPJMD by applying a 'green lens' using the Livable Cities Framework and a Multi Criteria Analysis (MCA) to develop and prioritize programs (Step 3). The purpose of this exercise was to identify areas where existing and planned infrastructure developments fell short of achieving green objectives, and could be improved by adding components that would increase their green development content. This process will be repeated to inform the next RPJMDs to sensitize decision makers and gradually strengthen the green value or 'greenness' of development plans. Although the Green Team was free to introduce new ideas (for example MRT for Green Transportation, and LED street lighting for Green Energy), it opted not to do so because of other more pressing needs that needed to be addressed first. This was a deliberate strategy because existing plans already proposed in municipal plans should have priority.

At the same time, the Green Team started working on a "Green City Profile" (Step 4) with the aim of developing a baseline for performance measurement. The Green City Profile includes the results of Step 2 and 3. It also includes a "road map" spreadsheet for green development, an environmental profile with thematic GIS maps used for integrated 'rolling' plan development, as well as an inventory of current and planned green initiatives. The Green Team used the road map to rate the city's green performance and progress towards green development objectives as part of a rolling plan process. The road map uses generic green performance indicators that the Green Team can use to formulate short (2015-2019), medium (2020-2034), and long-term (2035-2045) targets toward sustainable development. The road map's aggregate score for all indicators combined can be red, yellow, or green. By objectively rating the road map using 2015 as the baseline, the Green Team concluded that Batam's aggregate score was still in the "red" zone. The section below is a summary version of the city's environmental profile taken from the Green City Profile, including current and planned initiatives from the Green City Profile. The full Green City Profile is attached to the GCAP.

In line with Steps 5, 6, and 7, the Green Team prepared a number of Project Briefs, undertook a fiscal capacity analysis for green infrastructure investment, and scoped options for alternative modes of financing. As all four programs were adopted for action, there was no need anymore for prioritizing projects (Step 8). Step 9 has resulted in this GCAP, while Step 10 will be done to monitor performance when the next update of the GCAP is due.

# Green City Profile

This section summarizes the full Green City Profile developed by the Green Team as part of the action planning process, which is appended to the GCAP. It is shortened here to provide a brief introduction.

Batam is a group of small islands with municipal status, with Batam City located on the northernmost island near Singapore across the strait. Batam is the largest city in the Riau Islands Province of Indonesia, the third largest city in Sumatra region after Batam and Palembang, and the eighth-largest city in Indonesia after Jakarta Raya, Surabaya, Bandung, Batam, Semarang, Makassar, and Palembang.

The Batam Free Trade Zone Authority (BIFZA), also known as the Batam Development Authority (BDA) or Badan Pengusahaan Batam (BP Batam), is a national organization located in Batam with a mandate to develop Batam into an international industrial hub based on the original Batam Industrial Zone created in 1970-1971. It now has 21 industrial parks with more than 1,000 companies currently in residence.

According to its mission,<sup>3</sup> Batam is to become a leading economic region in Asia and the Pacific, and a major contributor to national economic development. Batam also aims to become a hub of export-oriented green industries, and a provider of nautical tourism, trade, and international transshipment.

Batam is an industrial boomtown, an emerging transport hub, and part of a free trade zone—the Indonesia–Malaysia–Singapore Growth Triangle, located 20 kilometers (km) off Singapore’s south coast. The 715 square kilometer (km<sup>2</sup>) main island is the core of the municipality of Batam, of which 450 km<sup>2</sup> is classified as urban. Batam administratively covers a number of scattered islands and islets totaling 2,200 km<sup>2</sup>, with Galang and Rempang islands to the immediate south connected to Batam by short bridges, collectively called *Barelang*. These two islands maintain their rural character. Bulan Island is also rural. The municipality has a population of 1,035,280 (May 2015). According to the 2010 national census, Batam is the fastest-growing municipality in Indonesia, with a population growth rate of 11% per year.

Batam feels the impact of rapid urbanization. The city is becoming densely populated with newcomers and seasonal workers. This will cause a shortage of land to build on, and a corresponding rise in land prices, which in turn has had a negative effect on economic growth as well as environmental preservation.

Urbanization and industrial growth also causes environmental problems such as insufficient housing, and water supply; industrial, commercial, and household waste management; traffic congestion; and pollution of air and groundwater.

Even though the GCAP in principle only covers the municipality, in reality, green development issues trespass administrative boundaries, and this is an issue in the case of

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<sup>3</sup> See [bpbatam.go.id](http://bpbatam.go.id)

Batam. The BDA, established in 2007, considers the whole of Batam to be an industrial development zone, whereas the municipality of Batam (which obtained its status in 1999, decades after the original Batam Industrial Zone was created) wants to manage the city according to its 'autonomous' municipal status. Because of differing views and overlapping authorities, it has been difficult to align development planning and environmental management within the municipality with the broader interests of the BDA, and recently, there have been high-level discussions about solving this problem by modifying the status of the BDA to share more authority with the municipality.

## Spatial Development

The municipal Spatial Planning Department has only partial control over land use based on the current City's Spatial Planning 2004-2014 as most allocation decisions are made by the BDA. The renewal spatial planning is still under development. The result is that the best sites are reserved for industrial purposes, whereas the municipality is left with commercially less attractive and harder-to-develop hills and slopes. As spatial planning is often associated with public open spaces, this appears to make sense, but it also prevents spatial planning from becoming inclusive and integrated by mixing land use and providing green space near housing, places of work, and public facilities.

One of the adverse effects of this is that new residents of Batam City encroach on land that is considered to be under BDA's authority, for example, water catchment areas.

Because of its geography, Batam's spatial development is uneven. There is a development gap between the northern and southern parts caused by the general lack of public services and infrastructure in the southern part and because the north is closer to the city, and therefore more attractive to investors.

## Green Open Space (RTH)

Population density is 470 people per km<sup>2</sup> (May 2015) based on total administrative land area (2,200 km<sup>2</sup>), and 2,300 people per km<sup>2</sup> (May 2015) based on built-up urbanized Batam city area (450 km<sup>2</sup>).

According to Law No. 26 year 2007 on Spatial Planning, ideally, open space in Batam shall be 30% of the total area of 2,200 km<sup>2</sup>, or equal to 7,333 hectares (ha) consisting of 20% public open space (4,888 ha) and 10% private open space (2,445 ha). According to the government's 2013 Green Cities Program (P2KH) report, overall green open space stood at 5,667 ha, but it is not clear if this low figure is based on the urbanized area on the main island only, because Batam as a whole is not densely populated and should be able to easily meet the standard. This shows that in the case of Batam, a uniform national standard is difficult to apply.

According to the Ministry of Public Works Regulation No. 5/PRT/2008, the city shall provide an open space of 250 square meters (m<sup>2</sup>) at neighborhood level (RT) (= 1 m<sup>2</sup>/capita), 1,250 m<sup>2</sup> at community level (RW) (= 0.5 m<sup>2</sup>/capita), 9,000 m<sup>2</sup> at village level (Kelurahan) (= 0.3 m<sup>2</sup>/capita), and 24,000 m<sup>2</sup> at subdistrict level (Kecamatan) (= 0.2 m<sup>2</sup>/capita). In practice, however, it is difficult to apply this standard.

There are plans to upgrade and increase public open space, mainly by developing a Batam Botanical Garden (Kebun Raya Batam) with 86 ha located at Sambau Village–Nongsa Sub-district with government funding.

Batam also has plans to upgrade the existing Green Open Space Master Plan from the municipal budget, for which the engineering design is currently taking place. According to the P2KH report, several public areas have greening potential including green ways, public parks, and sport facilities covering a total of 196 ha. Potential private areas such as gardens and golf courses can contribute a total of 3,838 ha.

However, current greening plans and programs are currently not yet integrated with cultural heritage sites that fall under the Department of Tourism.

In addition, corporate social responsibility (CSR) funds should be able to significantly contribute to developing and safeguarding green public spaces, and be able to mobilize communities to campaign for more such facilities near their places of residence.

The overall target of the Batam Green Community is to achieve 30% green open space (20% public and 10% private). Presently its primary concern is to ensure that green open area is not further reduced. It advocates for making good use of the open space for a number of social and small economic activities to reduce the chances for a possible change of function.

## Green Energy

Energy consumption (based on bill payments in 2013) was 1,993 gigawatt-hour (GWh) per year. This is projected to increase to 4,248 GWh in 2020. This target will be difficult to meet, but so far, no renewable sources of energy are available. A waste-to-energy (WTE) plant that is currently being re-tendered is planned to supply 15 megawatts (MW) of energy, and undersea cables are planned to provide electricity to the small outlying islands.

There is future potential for using natural gas as a source of energy supplied from Sumatra main island and Natuna island, but for the time being, it is still only for household use.

As energy supply currently is beyond municipal authority and its statutory development planning process, this GCAP has not yet attempted to specify actions to provide greener energy and reduce consumption. It is expected, however, to become a component of the next GCAP.

Baseline	Installed Capacity	Required Supply Capacity
2015	508,42 MW	1.284,6 MW (73%)

Source: PLN Business Plan, 2015–2024.

## Green Industry

According to BAPPEDA, annual CO<sub>2</sub> emissions amount to 7,375 tons for transport, and 125,811 tons for industry. So far, Batam has not yet been able to persuade local industries to reduce emissions and apply energy-saving measures such as LED lighting, efficient air conditioning, energy-efficient manufacturing, efficient water and wastewater management, clean industrial solid waste management, efficient logistics, and others. Good practices elsewhere demonstrate that this is not only meant to improve the environment, but also to “green up” industries with a view to future competitiveness and sustainability.

Due to the volume and speed of its industrial operations, Batam is in need of special measures to manage industrial development. Even though regulations for industrial management exist, they are not always consistently applied. So far, Batam has not yet been able to fully inventorize, assess, and enforce regulations on industrial management, and for that reason no actions have yet been proposed in this GCAP. It is expected that it will become an important action area in the next GCAP.

## Green Water: Drinking Water Supply

Batam has a relatively good water supply from five reservoirs covering 97% of the population on the main island at the rate of 3,500 liters per second. On the other islands, average service coverage is only 30%. The reservoirs are surrounded by fences to protect them from human encroachment. Because of its small size and salt water intrusion, Batam cannot use groundwater as a source of drinking water. The BDA has a water supply contract with a private Indonesian company—PT Adhya Tirta Batam (ATB). The shareholders of ATB consists of PT Bangun Cipta Kontraktor (50%) and Sembcorp of Singapore (50%). PT ATB has a program to supply water through kiosks to informal settlers who are not eligible for a water connection. Non-revenue water (NRW) was 23% in 2014, and PT ATB has set a target to reduce this to 20% by 2020.

Due to the limited size of the reservoirs, Batam will have to develop additional sources of water supply to keep up with increasing industrial, commercial, and household demand. In addition, the reservoirs and surrounding catchment areas need increased surveillance to prevent encroachment, pollution, and rapid shallowing. Also, it has proven difficult to stop residents from creating fisheries in the reservoirs.

## Green Water: Drainage and Flood Control

At present, flooding is not yet a critical problem, even though after heavy rains some roads can be inundated for several hours.

However, this will change in the future as a result of rapid urbanization and industrial development, so now is the time to prepare an urban drainage and flood control masterplan. This has not yet been included in this GCAP because preparatory consultations and data gathering are required between the BDA and the Batam municipality. It should, however, become part of the green development strategy until 2035 (see Climate Change on p. 12).

## Green Solid Waste

At the moment, the City Sanitation Department collects 750 tons of household waste, 140 tons of non-toxic industrial waste, and 50 tons of yard and street waste.

All wastes are disposed in a controlled and managed landfill site (40 ha) located at Telaga Punggur by the City Sanitation Department. Industries have to deposit their non-toxic waste in a special site (KABIL) owned by the BDA and managed by a private operator. Toxic industrial waste is collected and managed by another entity (PT Prasadha Pamunah Limbah Indonesia) and transported to Cileungsi in the district of Bogor (West Java Province) for treatment.

There are 101 household-operated waste banks in Batam, and 10 school-operated ones in which people can deposit and “save up” waste for money. Even though they collect about 30.5 tons of waste per month, their combined capacity so far is only 0.14% of total household waste production.

Until now, the city has not enacted a policy to force households to segregate their waste at home, which would greatly increase the effectiveness of the waste banks. According to the Ministry of Environment and Forestry, the Government of Indonesia aims to establish parent waste banks in Batam (and five other cities, i.e., Makassar, Jakarta, Surabaya, Semarang, and Surakarta) to coordinate all other subordinate banks and waste management services in 2016.

Anticipating future demand for waste disposal and green energy, a WTE plant is planned with a capacity of 700 tons/day. It is expected to generate 15 MW of power that will be sold to the Perusahaan Listrik Negara (PLN), which is the national electric company. The WTE plant is to be managed by a private operator under a public–private partnership (PPP) contract.

Even though a winning bid is already available, the project has been put on hold pending the drafting and enactment of a Local Regulation on the Tipping Fee, which is proposed as part of the actions to be undertaken for solid waste management (SWM) in this GCAP.

## Green Human Waste

Current human waste management capacity is 33 liters per second (lps), and only connects 2.3% of the population.

Industries are required by law to build their own human waste processing facilities, but so far controls are not stringently applied, and there is no mechanism to require ships passing through the Batam port to manage shipborne human waste that pollutes the coastal areas.

According to a study by Environmental Health Risk Assessment, 75% of unconnected households use private septic tanks. Based on a current population of 1,030,528 and a water consumption of 150 liters per capita daily, and assuming that 80% of water is converted into waste, daily human waste production is about 123,000 cubic meters (m<sup>3</sup>). Total waste management capacity currently stands at 14,720 m<sup>3</sup> per day or 12% of required capacity.

A new centralized system with a capacity of 230 lps is being planned, and is expected to serve 11,000 household connections or 16% of the population by 2020. The Sanitation Masterplan has identified five sites for centralized household human waste processing. The pilot project located in Batam Centre area is financed through a loan from the Republic of Korea managed by the government. For this GCAP, a number of actions are proposed to support development of an integrated off-site sanitation system.

## Green Buildings

Green buildings have not yet become an important attribute for green development in Batam, but that is likely to change in the future because of its potentially significant contribution to saving energy (see section on Green Energy) and other resources such as water, as well as improving environmental health, thus providing a safer, environmentally friendly, and more productive environment. Initially, public buildings can acquire green certification provided by third parties to help make the concept familiar. Also, the government can provide incentives for construction or retrofitting buildings to meet energy efficiency criteria, especially in industrial areas. In the future, certification should become a prerequisite for issuing building permits for any type of construction. The province of DKI Jakarta has issued the Governor Regulation No. 38 Year 2012 on The Green Buildings that can be used as an example for Batam City. So far, Batam City has no green building regulations.

## Green Transportation

Traffic congestion has not yet acquired critical proportions in Batam, but needs to be anticipated as a result of rapid urbanization.

The BDA has prepared a Transportation Masterplan. There are plans to build a monorail system starting 2017 with a length of 54 km. It will cross Batam Center from east to west and north to south. According to the director of infrastructure in the BDA, financing will be achieved through a PPP contract. Another component of the master plan is a 20 km network of bicycle paths.

Since Batam's built-up area is not very dense, it has good potential for nonmotorized transport (NMT). Shaded/canopied pedestrian walkways and bicycle paths (essential in tropical climates) can be segregated from automotive roads. It should be noted that the original 1970 design of Batam Center (by Bechtel and Nissho Iwai) was car-free.

As a contribution to traffic management in the short term, an area traffic control system will synchronize the operation of traffic lights at major intersections to help reduce traffic jams.

In addition, the GCAP strategy to 2035 anticipates the development of a BRT system.

Baseline	Number of Motorized Vehicles	% of Citizens Using Public Transport
2015	5,531,777	3.0

Source: BPS Statistics 2015.

## Green Community

Batam has a program for engaging urban residents in greening the city, among others, by planting trees in open spaces, mangrove conservation, household waste segregation, and promoting the use of bicycles for going to work. Private companies take part in this through their CSR initiatives.

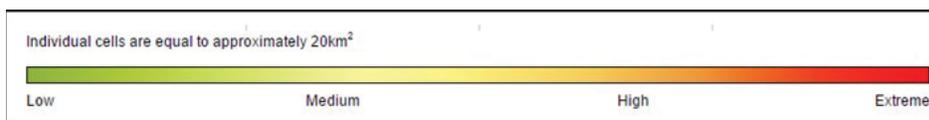
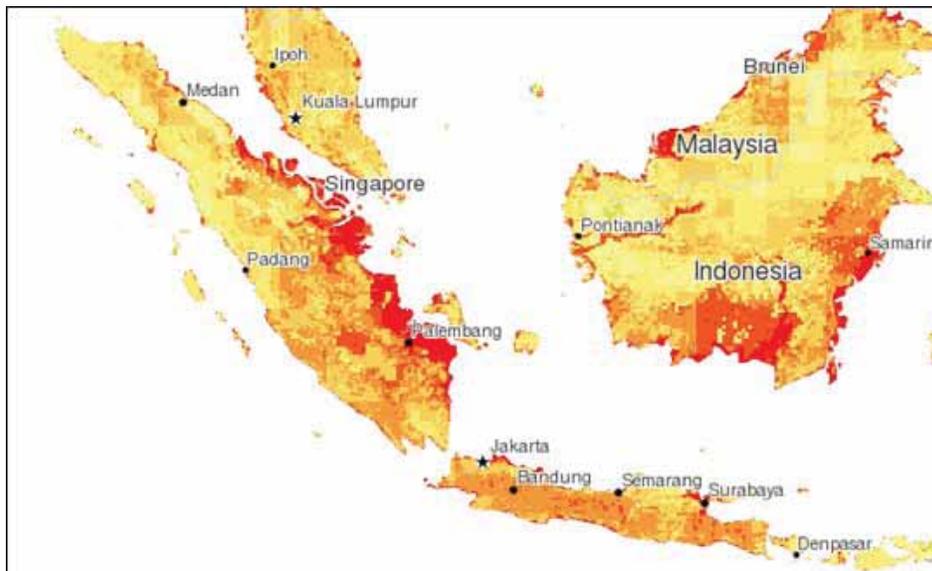
Batam's Green Community was established in 2013 in line with the government's Green City Program (P2KH). Its forum undertook a series of promotional activities that were packaged under the theme of Green Festival.

## Climate Change

As outlined in Indonesia's National Action Plan for Climate Change Adaptation, the projected rise in sea levels has a strong potential to become a serious threat because of the country's many maritime and coastal activities. Around 2050, global warming is expected to raise seawater levels to 35–40 centimeters above current levels.

Based on that projection, the maximum sea level rise in Indonesia could reach 175 centimeters by 2100.

The map below (prepared by Maplecroft) with the index below it shows that Batam falls in the "extreme risk" zone that combines risks of rising seawater levels, floodings from increased rainfall, and other climate-related events. The effect on Batam needs to be modeled in more detail in order to plan for appropriate mitigation measures.



## Resources

The City of Batam currently does not have all human, financial, institutional, regulatory, and other resources needed to simultaneously address all of its green development problems, but hopes that this GCAP will adequately address some of the urgent issues that hamper sustainable development. The main resource issues are summarized below.

### Fiscal Resources

Batam is still highly dependent on high levels of government transfers to its municipal budget. Some 63% of total budgets came from transfers between 2011 and 2014. Batam spends only little over 20% of the budgets available for capital investments.

Currently, Batam's yearly budget is not enough to finance the preparation of green capital projects such as a BRT, WTE, and others. As part of this, GCAP Batam has selected ways to improve this situation by

- Increasing own local revenue;
- Attracting loans (municipal lending);
- Using available funds more efficiently towards green capital projects; and
- Attracting alternative sources to finance projects, for example by setting up joint ventures with the private sector, using build-operate-transfer (BOT) contracts, involving communities through cooperatives, etc.

### **Institutional Resources**

On attracting alternative sources of finance, most of Batam's know-how is currently vested in the BDA, and it will take some time to develop it for the municipality.

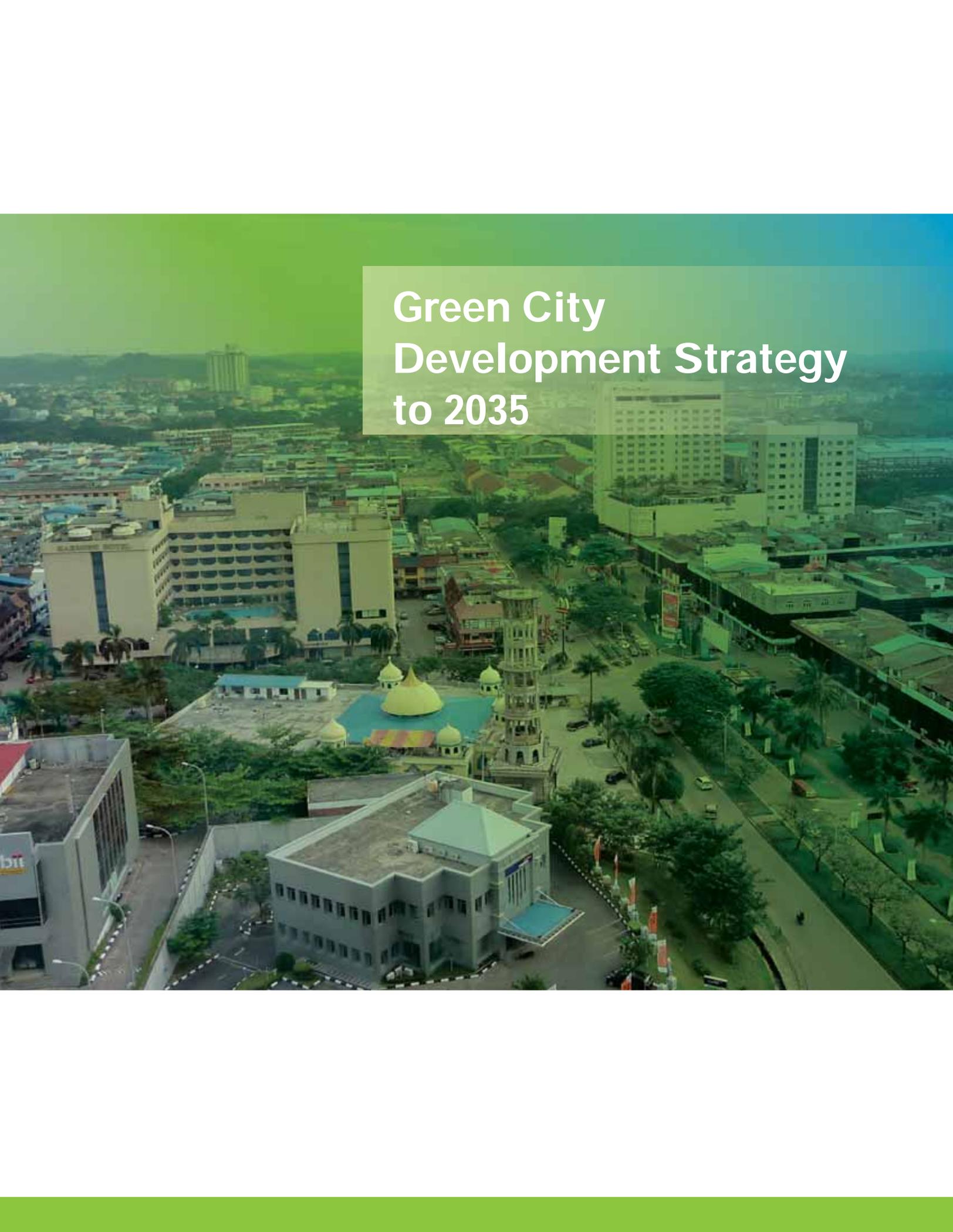
### **Regulatory Resources**

Batam still needs regulations that will allow it to effectively implement and enforce the environmental issues it wants to address, such as regulations on water management, transport management, and waste management. These will be part of the GCAP.

### **Conclusion**

Based on the City Profile, as well as agreed priorities based on the existing situation and capabilities, the City of Batam has defined actions related to prioritized programs and more generic actions focusing on the short term to make these programs and projects more achievable. In the GCAP, actions are formulated to help improve fiscal and institutional capacity, create more durable partnerships, strengthen the regulatory framework and ability to finance projects, and potentially increase the impact of such projects.

The City Profile signals that sanitation and waste management are the key focus areas for the city at the moment, and justifies the selection of these programs. In parallel, Batam should prioritize increasing the budgets they have made available for green capital expenditures and improve their institutional capacity and ability (human resources) to prepare projects so that they can be offered to involve the private sector and others (such as national government programs and development banks) to finance. This will be further addressed in the next sections of this GCAP.

An aerial photograph of a city, likely in Southeast Asia, showing a mix of modern and traditional architecture. A prominent feature is a mosque with a large yellow dome and a tall, multi-tiered tower. The city is surrounded by greenery and has a clear sky. The text 'Green City Development Strategy to 2035' is overlaid on the right side of the image.

# Green City Development Strategy to 2035

## Batam Green Urban Development Strategy until 2035

After completing the SOAR, and using 'green lensing' process, the priority programs were selected from a long list to a short list. The matrix below summarizes our green urban development strategy until 2035, showing green attributes and the rough time frame for realizing them. This GCAP specifies green development actions for the current plan period until 2019, but will be expanded and rolled over to future plan periods.

GREEN ATTRIBUTES		2015-2019 (this GCAP)	2020-2024	2025-2029	2030-2034	2035-2045	
1	Green Planning, Finance, and Implementation Management	Continuous					
2	Green Open Space (RTH) (public parks, burial grounds, water retention areas, greenbelts, etc.)	To be designed in next phase of the CGAP	Program for urban forest development including mangrove areas. Program for acquisition of green open space to meet legal requirements (RTH).				
3	Green Community (Resilient Community) (includes health care and education)	Continuous (including Program for Green Schools (Sekolah Adiwiyata) and resilient <i>kampungs</i> (PROKLIM))					
4	Green Transport and Urban Mobility (motorized and nonmotorized)	BRT system development	BRT system development, including bicycle paths and pedestrian walkways				
5A	Green Waste (sanitation)	On-site and off-site sanitation system development	Program for acceleration of house connections to central sewerage system				
5B	Green Waste (solid waste)	SWM system development	Integrated SWM program, including industrial areas				
6A	Green Water (water supply)	Ecotech Garden to reduce pollutants entering Duriangkang dam as the fresh raw water source for Batam City	Integrated water management program, including industrial areas				
6b	Green Water (urban drainage and flood control)	Urban Drainage and Flood Control for Batam City	Program for normalization of streams and drains, enlargement of drainage network, construction of water reservoirs, retention areas, water absorption wells, etc.				
7	Green Building (energy efficiency, climate resilience)	To be designed in next phase of the CGAP	Program for green certification of buildings, including promotion of roof gardens, hanging gardens				
8	Green Energy (clean, efficient, and renewable)	To be designed in next phase of the CGAP					
9	Green Industry and Commerce (sound environmental management)	To be designed in next phase of the GCAP					
10	Green Air (Blue Sky) (emission reduction and control)	To be designed in next phase of the GCAP					

# From Long List to Short List

A long list of proposed programs (Step 5) was given a code number and ranked with the help of a Multi-Criteria Analysis (MCA) (Step 6) based on the criteria for liveability and sustainability developed by the Green Team. It subsequently attributed weights to the long list. The result of the weighted MCA scoring provides a ranked list of 19 programs as shown on the following page. Listed programs that could not be accommodated in this version of the GCAP will be further specified and incorporated into future versions.



## Long List of 19 Ranked Green Programs

Program Code	Program Title	MCA Weight	Ranking
9	Spatial Development Planning and Control	6,0680	1
14	Environmental Pollution and Degradation Control	5,9680	2
15	Provision of Facilities and Infrastructure for Environmental Protection and Management	5,9300	3
10	Land Use Planning	5,7180	4
16	Environmental Planning and Natural Resources Conservation	5,7000	5
12	Development, Construction, and Maintenance of Housing and Environmental Infrastructure and Facilities	5,6640	6
4	Improve quality and quantity of public green open spaces	5,2058	7
8	Develop synergy between water supply management and human waste management	5,1776	8
13	Improve construction quality and oversight of buildings	5,3010	9
11	Human resources development and oversight in the field of mining, electricity supply, fossil fuels, and gas	5,0710	10
18	Development, improvement, maintenance, and rehabilitation of public transport infrastructure and facilities	5,1420	11
19	Improve public transport service delivery	5,1630	12
5	Protect water sources, reservoirs, and catchment areas	4,9116	13
1	Reduce domestic waste production	4,9016	14
7	Develop drainage and flood control network	4,8576	15
6	Build human waste treatment plant to reduce domestic human waste	4,7114	16
2	Reduce industrial waste production	4,6664	17
17	Program to improve community safety and comfort and prevent natural disasters	4,5360	18
3	Develop ROW and median of public roads as green open spaces	4,4380	19
80%	Percentage weight assigned to green city attributes/criteria		
20%	Percentage weight assigned to ease implementation		

# Priority Green Programs

From the above long list, the priority programs ranked 2 and 3 were selected based on their strategic importance to green development (Step 6). Spatial Development Planning and Control, despite being ranked No.1, could not be converted into an action plan at short notice for inclusion in the GCAP. This one, as well as other priorities, will be considered in the next GCAP.

Ranking	Program Selection
2	Environmental Pollution and Degradation Control
3	Provision of Facilities and Infrastructure for Environmental Protection and Management

# Final Selection of Priority Programs

The Green Team reported the result to the GCAP Steering Committee, including the heads of all local government agencies (SKPD) involved (Kepala Bappeda, Dinas Kebersihan, Dinas Perumahan dan Permukiman, Dinas Pekerjaan Umum, Dinas Tata Ruang and Tata Bangunan, Badan Lingkungan Hidup, and Perusahaan Daerah Air Minum [Water Supply Utility]), and finally had a consultation with the regional secretary (Sekretaris Daerah Kota Batam) as the representative of the (previous) mayor.

As the two proposed programs are similar in the interpretation of their purpose, the Green Team resolved to adopt both as a program guide, and to use three ongoing initiatives as a project guide for the short term.

## Final Priority Programs

Ranking	Program Selection
2	<b>Environmental Pollution and Degradation Control</b> Construction of an on-site and off-site sanitation system, including intermediate and final treatment facilities Construction of an Ecotech Garden to protect Duriangkang dam water quality as the main raw freshwater source of Batam City
3	<b>Provision of Facilities and Infrastructure for Environmental Protection and Management</b> Construction of an environmentally friendly solid waste management system, including waste-to-energy technology

After final consideration of financial, regulatory, and institutional risks for implementing each project and the interfaces and possible synergies between projects, it was concluded that the three programs listed above were the most likely to be supported with clear and realistic actions, and therefore, should constitute the GCAP.

However, after the new mayor was appointed, he provided guidance to the Green Team by attaching a higher priority to developing a **BRT system** and **nonmotorized transport (NMT)** network, as well as an **urban drainage and flood control system**, with the result that these were subsequently included as priorities for the medium- to long-term plans.



# The Next Five Years— Priority Programs, Projects, and Actions

## Introduction

This section describes the prioritized programs, projects, and actions we will undertake in the next five years. It also describes the institutional set-up we will implement to ensure informed and timely decision making and careful management of the interfaces between different projects. To avoid misunderstanding, we include a short list of definitions of key terms used in this section.

## Program

This is an initiative for promoting green development, which states goals that match the city's vision and mission. A program normally comprises a number of projects that have clear interfaces, and is formulated in a Program Brief or Digest.

## Project

This is an investment in a physical infrastructure project, or the creation of a new organization, or a policy revision, or a local regulation, to be formulated in a Project Brief. If the project (such as establishing a new body or policy) is subsidiary to another project, it is understood to be a subproject or an action.

## Action

In the context of the GCAP, actions comprise one or more activities required to meet the conditions for project implementation, such as setting up a Project Management Unit (PMU), preparing a project implementation plan (PIP), preparing Terms of Reference (TOR), identifying sources of financing, acquiring land, etc.

## Project Management Unit (PMU)

This is a temporary organizational unit created for the purpose of preparing a project implementation plan, and managing the project on a day-to-day basis. A PMU is headed by the agency responsible for the project. An operational budget for the PMU needs to be allocated. Representatives of relevant *SKPDs*, other agencies, and possibly representatives of the community can also be members of the PMU. The PMU will consider whether or not alternative implementing mechanisms (BOT, joint venture, CSR, etc.) will be considered in the feasibility study, and in the actions related to changing or implementing regulations (*Perda*), issuing permits, and others.

## Project Implementation Plan (PIP)

A document that describes in detail the actions needed for implementing the project, including preparatory activities. The PMU should be in charge of preparing and managing it. It covers the project cycle—which is a sequence of events and activities usually starting with a feasibility study, project design, financing, land acquisition, tendering, procurement, construction supervision, monitoring and evaluation, as well as operation and maintenance (O&M). It clearly describes the division of responsibilities, timeline, and budgets needed. It specifies what decisions are needed, when, and by whom. A project is normally undertaken by a contractor, government department, a combination of public and private actors, a consortium, and others. Different actors can be responsible for different parts of the project cycle. The PMU will update the PIP over the course of developing the project. At the start, the PIP will focus on the activities to prepare a detailed design, feasibility study, and tender strategy. Based on the choices made related to the implementing mechanisms (traditional, PPP, joint venture, communities, etc.), the PIP can be further detailed for procurement, construction, and O&M.

# Institutional Enabling Actions for the Green Team and PMUs

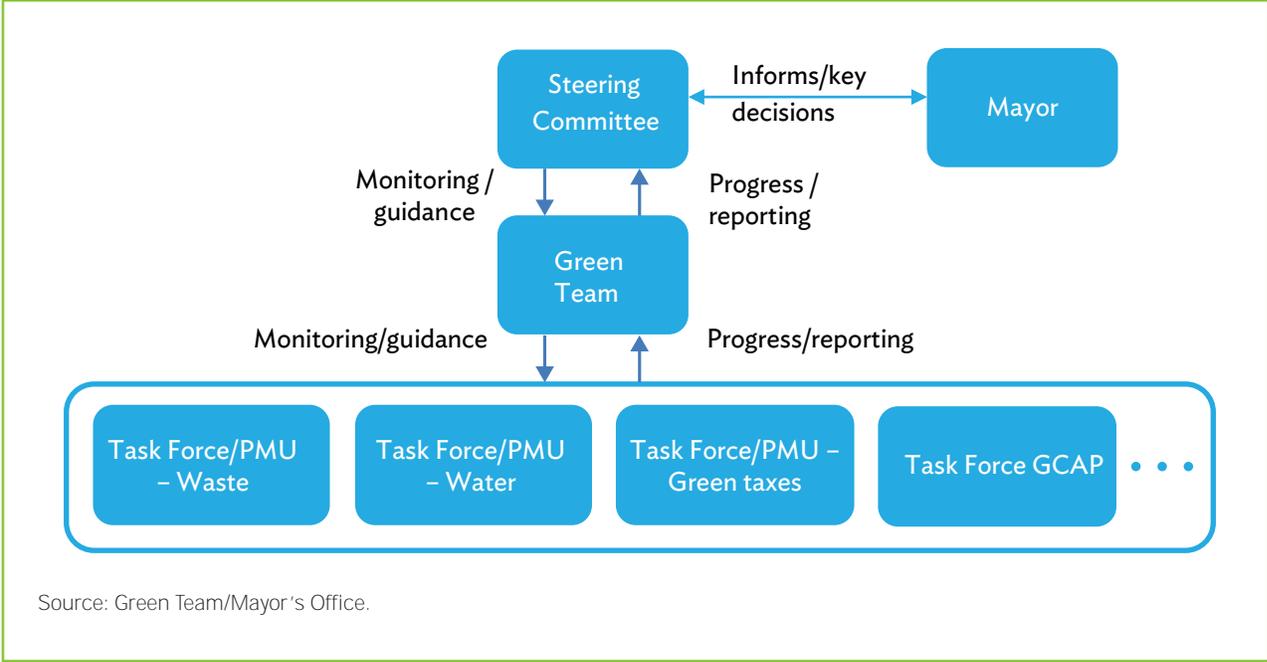
We will use the results of the Green Cities Program (ADB, Bappenas, *Kementerian PUPR*) as a starting point to further intensify efforts to transform Batam into the greenest city in Indonesia. On top of the specific actions we have formulated for prioritized programs and projects, we intend to further improve the institutional set-up needed for a well-informed and timely decision making process.

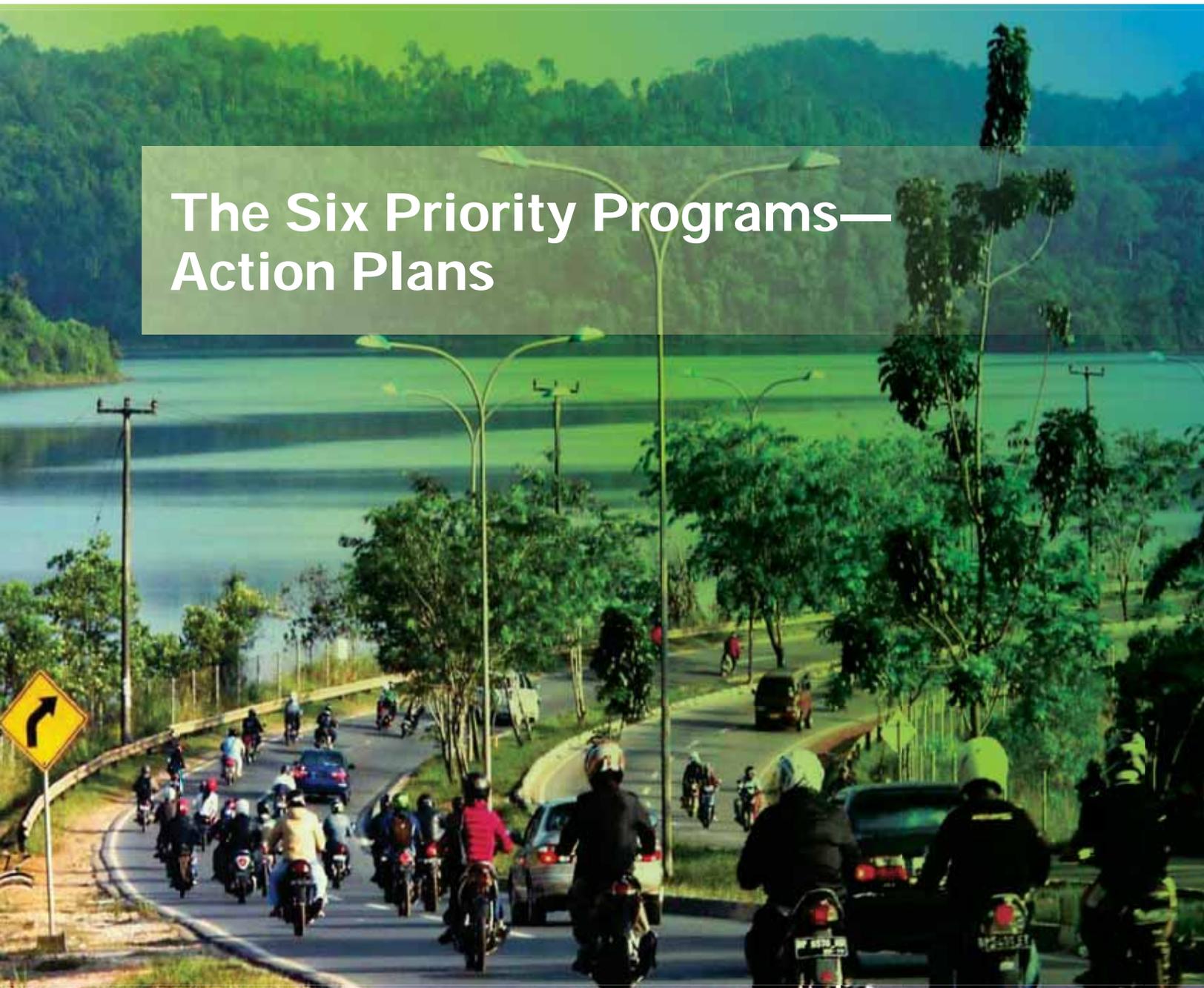
A steering committee will monitor and guide the progress on GCAP and actions on a quarterly basis. The mayor will chair the steering committee that further consists of heads of *SKPDs* in the field of green attributes, and other stakeholders. As chair of the Green Team, the head of Bappeda will keep the mayor informed about the progress to enable the mayor to make decisions when needed.

The Green Team will coordinate programs and projects and the interfaces between programs and projects. The team will also update the GCAP every 2 years. The Green Team will meet bi-weekly to monitor progress on specific projects and actions. Those in charge of specific programs and projects will inform the Green Team about their progress and specific issues, decisions, or guidance they need. The Green Team will determine the agenda for meetings with the steering committee and prepare these meetings. Specific task forces (PMU) will be set up to drive the implementation of programs and projects on a day-to-day basis. The taskforces will be made up of representatives of relevant *SKPDs* and other agencies and led by the agency/body responsible for the sector.

## Institutional Enabling Actions

What	Who	When
Mayoral Decree on the setting up and installation of the steering committee and the Green Team including description of roles, Standard Operational Procedures (SOP), membership, and budgets	Mayor	Update in 2106
Continuation of the mayor's decree, including budget allocation	Head of Bappeda	Annually
Work plan for the Green Team, including initiating the set-up of specific task forces/PMUs for agreed projects	Green Team	As and when required
Evaluation of performance of the Green Team	Steering Committee	Bi-yearly





## The Six Priority Programs— Action Plans

# Green Water—Action Plan Batam

## PROGRAM: IMPROVING WATER QUALITY IN DURIANGKANG RESERVOIR

### Why?

The Duriangkang Reservoir has been in operation since 2001. This is the largest of the seven existing reservoirs in Batam Island and is used as a source of drinking water, with a storage capacity of 78.56 million m<sup>3</sup> and a freshwater area of 23.4 km<sup>2</sup>. It provides around 75% of the freshwater supply for Batam.

Water quality is affected by industrial and human activities in the catchment, and storage capacity is also being affected by ongoing silting of the reservoir through elevated suspended solids in surface runoff due to land clearance and construction in the catchments.

The protection of this key reservoir is crucial to maintaining a sustainable water supply.

There is a need to coordinate the ongoing activities to reduce pollution in the catchments and the reservoir protected area to reduce contamination. Also, wetlands and other measures can be constructed within the reservoir protected area to make further improvements to improve water quality.

### Current Status

The current average water quality is poor as shown in the following—COD: 134.61mg/l, BOD5: 58.22 mg/l, and ammonia: 10.5 mg/l.

There is illegal activity in the water catchment protected area, such as illegal housing and fishponds. Furthermore, there is heavy construction within the drainage catchments of the reservoir and (linked with the sanitation program), and poorly constructed and managed off-site sanitation facility within the catchment area.

Annually, BP Batam clears the water hyacinth plant (*Eichhornia crassipes*) in surface water reservoirs that can cover about 25 ha of Duriangkang dams. Also, periodically, the reservoir is dredged of sediments.

## Goal

The main objective of this project is to improve reservoir water quality to eventually improve raw water quality for a more efficient treatment and to provide a cleaner, healthier, and more attractive ecosystem through integrated management of the catchments.

## Results

1. Reduced pollution of the environment.
2. Improved quality of water and aesthetics of the reservoir.

## Benefits

1. Improved quality of the environment.
2. Limited operational costs.
3. Smell reduction.
4. Improved efficiency of downstream water treatment.

## Success Indicators (targets)

Area Ecotech Garden	
2010	0 m <sup>2</sup>
2019	5,550 m <sup>2</sup>
COD	
2010	134 mg/l
2019	80 mg/l
BOD5	
2010	58 mg/l
2019	50 mg/l
Ammonia	
2010	10.5 mg/l
2019	6 mg/l

Source: Green Team/Mayor's Office.

## Key Risks

Even though the projects are relatively well defined, the technology is straightforward, and the capacity is there to deliver them, the key risks are:

1. availability of management organization,
2. source of funds availability (APBD, APBN),
3. availability of regulations and enforcement, and
4. the approval of the Parliament and the local government of Batam City.

## Risk Mitigation

These risks can be mitigated to the extent possible by prioritizing the following measures and allocating sufficient resources to their implementation:

1. Implement regulatory updates as soon as possible while local political will is present (before policy and/or regime changes occur).
2. Establish a working group to coordinate this program and other activities related to the Duriangkang Reservoir.
3. Undertake a social marketing strategy to engage public awareness for environmental management around the dam and disseminate information.

Project WAT1: Preparation, including Establishing a Duriangkang Reservoir Catchment Management Unit (CMU)		
<p>Collaboration among agencies is necessary to implement an integrated project that will improve and protect water quality in the Duriangkang Reservoir. This unit will provide better coordination of ongoing activities, develop a plan to implement a project for integrated measures to treat surface water flowing into the reservoir, and develop a public awareness-raising campaign to increase the awareness of improved local environmental management.</p> <p>The Catchment Management Unit (CMU) will be developed under BP Batam, but will include or collaborate with members of</p> <ul style="list-style-type: none"> <li>• Bappeda</li> <li>• Ministry of Public Works</li> <li>• Dinas Housing</li> <li>• Dinas City Cleaning and Parks</li> <li>• Law enforcement agencies</li> </ul>		
Action	Description and Responsibilities	Time Frame
WAT1.1	A CMU will be established to be responsible for managing ongoing activities related to water quality management in the Duriangkang Reservoir, and coordinate with relevant stakeholders.	2016
WAT1.2	CMU will be responsible for ongoing activities, including annual monitoring, dredging, and vegetation clearing.	2017
WAT1.3	Evaluate and update the monitoring plan, purchase monitoring equipment, and develop a simple baseline.	2017

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Table continued

<b>WAT1.4</b>	Liase with the Sanitation Committee (see Program B) on household waste management within the catchments areas.	2017
<b>WAT1.5</b>	Review regulations related to the protection of catchment areas, and measures in place to enforce these regulations.	2017
<b>WAT1.6</b>	Work with Bappeda to develop a resettlement plan for illegal residents in the protected catchment area.	2017
<b>WAT1.6</b>	Work with law enforcement agencies to stop other illegal activities in the protected catchment area.	2017
<b>WAT1.7</b>	CMU to further develop the concept for integrated surface water treatment within the catchment.	2017
<b>WAT1.8</b>	A public campaign is required to raise local awareness and establish community support for the success of the project. It should not only be continuous and sustained but also will be necessary to promote community participation in planning, design, and implementation of any local measure.	2017
<b>Responsible agency</b>	BP Batam	
<b>Estimated costs (budget needs)</b>	Limited hardware	
<b>Implementing mechanism, funding, and financing</b>	Allocate own budgets	
<b>Other partners</b>	Bappeda Ministry of Public Works Dinas Housing Dinas City Cleaning and Parks Law enforcement agencies Local communities Illegal residents	

Source: Green Team/Mayor's Office.

### Project WAT2: Planning, Design, and Construction of Integrated Surface Water Treatment Measures (including ecotech garden)

The project is designed to reduce pollution to the reservoir from surface waters. The project is expected to integrate a number of treatment components, including but not limited to the following:

- Household ecotech garden pilot projects to treat grey water and/or septic tank effluent.
- Check dams in streams and drains to retain sediment.
- Trash screens to screen rubbish and debris with safe access for cleaning.
- Construct wetlands (large-scale ecotech garden) to remove organic and sediment loads.
- Oxidation ponds.

Planning should be undertaken to integrate the above aspects in partnership with residents within the catchment areas of the reservoir.

A combined outline design, costing, and feasibility assessment should lead into detailed design and construction.

#### Working Principle of Constructed Wetlands

A constructed wetland (or ecotech garden) is an engineered sequence of water bodies designed to filter and treat waterborne pollutants found in sewage, industrial effluent, or storm water runoff. Constructed wetlands are used for wastewater treatment, grey water treatment, or surface runoff and can be incorporated into an ecological sanitation approach. They can be used without primary treatment, or after a septic tank for primary treatment, in order to separate the solids from the liquid effluent.

Vegetation in a wetland provides a substrate (roots, stems, and leaves) upon which microorganisms can grow as they break down organic materials. Different species of aquatic plants have different rates of heavy metal uptake. Many regulatory agencies list treatment of wetlands as one of their recommended best management practices for controlling urban runoff.

Action	Description and Responsibilities	Time Frame
WAT2.1	CMU to appoint PMU and develop project implementation plan.	2017
WAT2.2	Consult communities in developing design concepts and future ownership, operation and maintenance (O&M).	2017
WAT1.3	Commission outline design costing and feasibility study to cover hydrological assessment, hydraulic design and topography, ecological design, biological treatment design and sedimentation. Design should be gravity-fed to reduce operation and maintenance costs (no pumping).	2017
WAT1.4	BP Batam to allocate and approve budget.	2018
WAT1.5	Tender detailed design and construction.	2018
WAT1.6	CMU to oversee construction.	2018
WAT1.7	Continue the monitoring and evaluation of the scheme against baseline and scale up the project to improve the ecological and aesthetic value of the reservoir.	2019

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*Table continued*

<b>Responsible agency</b>	BP Batam	
<b>Estimated costs (budget needs)</b>	<b>Preparation:</b> Rp2.8 million <b>Construction:</b> Rp2.5 billion <b>Operation and maintenance:</b> integrated with existing activities	
<b>Implementing mechanism, funding, and financing</b>	Allocate own budgets	
<b>Other partners</b>	Local community groups and residents	

Source: Green Team/Mayor's Office.

# Green Waste—Action Plan Batam

## Program: Improvement of On-Site Sanitation System in Parallel with Ongoing Wastewater Network and Treatment Project

### Why?

Batam does have an existing sewerage system in the Batam Centre, which is run down and does not operate effectively. The remainder of the island has no other significant existing domestic sewerage system.

Duriangkang Reservoir is the main source of more than 70% of Batam's fresh water supply. The dam was built in the inlet to the bay to create the catchment area. The reservoir now has fresh water and has an area of 23.4 km<sup>2</sup>. More than 50% of the city's domestic wastewater enters the Duriangkang reservoir and this drastically reduces the water quality and increases the treatment intensity required for water distribution—and this is not efficient. The reservoir water is treated before distribution to consumers but the reservoirs are highly polluted. BOD levels in the reservoirs regularly exceed the BOD standard by 50 times; levels in excess of 180 mg/L have been recorded in the reservoirs. Many parts of the city have basic on-site systems, such as septic tanks and pit latrines. These areas have been identified and management structures recommended for the safe removal of septic tank sludge, and for the design and management of improved pit latrine systems.

The Government of Indonesia has introduced the "100-0-100" program to raise the quality of life for Indonesia's citizens. The numbers symbolizes 100% of citizens having access to clean drinking water, 0% living in slums, and 100% having access to good sanitation by 2019. To meet this target, the government will have no choice but to forcefully support rapid, sustainable, and inclusive economic growth and improved access to basic infrastructure services to achieve 100%-0%-100%.

### Current Status

Currently, there is no effective regulation in place to ensure that sludge (or septage) is removed (pumped) at regular intervals, and the operation of tankers for septage pumping is not well managed. As a result of both poor construction and operation, it is also estimated that about 70% of septic tanks have contaminated the ground water. The direct relationship between diseases such as cholera, hepatitis, and dysentery and the unrestricted discharges of residential sewage is well documented and, therefore, this program aims to improve the citywide system for managing on-site sanitation. To increase coverage, the city government of Batam has already decided to develop a new citywide sanitation strategy. In 2012, the Directorate General of Human Settlements in the Ministry of Public Works and Housing

provided technical assistance through Indii (AusAid) to prepare a master plan and feasibility study for the sewerage system of Batam City. The document indicated four locations for wastewater treatment plant (IPAL), that include one in the Kecamatan of Batam Centre (capacity 35 lps) and another in Bengkong (250 liter/detik). The governments of the Republic of Korea and the Republic of Indonesia have signed a US\$50 million loan agreement for the design and construction of the sewerage system in Batam Center. This program for on-site wastewater management has to work alongside these two ongoing sanitation initiatives to provide an integrated sanitation system for the city.

## Goal

The main objective of this program is to provide by 2020 a citywide central sewerage system including regular on-site services to desludge human waste (septage) from individual septic tanks and improve facilities for individual household and communal septic tanks that are viable and meet technical and environmental requirements. A number of parallel activities are required to support this main goal, including the passage of a septage management bylaw, the provision of a fleet of septage pumping trucks, construction of a new septage treatment plant (STP), some restructuring of institutional responsibilities, and capacity development. A further objective is to provide full cost recovery of staff and operational expenses.

## Results

1. Improved sanitation facilities by providing regular septage desludging services for the areas without sewerage system;
2. Improved sewerage services in Batam Centre by providing a wastewater collection system for the areas of Batam Centre including drainage, pump station, transmission line, and wastewater treatment facilities;
3. Reduced level of pollution in Duriangkang Reservoir as the main fresh water source for Batam island;
4. Dinas Kebersihan dan Pertamanan (DKP) organization strengthened and trained to implement O&M sewerage management system for Batam Centre area; and
5. Population of Batam educated to use, and pay for, the sewerage services.

## Benefits

1. Reduces the pollution impact on both groundwater and surface water (particularly Duriangkang Reservoir), protects the environment, preserves the natural resources, and benefits human health.
2. Strengthens resistance to ecological hazards.
3. Provides a public service that is efficient and reliable, economically viable, socially acceptable, and technically and institutionally appropriate.
4. Provides regulatory and management oversight for the septic tank design, construction, and use of septic tanks as well as septage transport, treatment, and disposal.
5. Equitable access to water and sanitation services is considered a human right, which constitutes the basis for a life in dignity. Water and improved sanitation must be both available, accessible, of good quality, and affordable.

## Success Indicators (targets) on Sewerage and Sanitation

Sewers Pipeline Networks	
2015	2 km
2020	81 km
Sewers House Connections	
2015	0 households
2020	11,000 households
Regular Septage Pumping Customers	
2015	1,500 families
2020	5,000 families

Source: Green Team/Mayor's Office.

## Key Risks

Although the projects are relatively well defined, the technology is straightforward, and the capacity is there to deliver them, key risks are as follows:

1. Delayed approval of the regulation and law governing on-site and off-site sanitation;
2. Cooperation between the city and the BP Batam is not guaranteed yet. There is a lack of mechanisms for interagency collaboration on planning and service delivery, bearing in mind the range of organizations that have a stake in sanitation;
3. The community has a low interest in some aspects of septic tank sanitation that is not easily improved and may slow down implementation; and
4. There is an underdeveloped (and unregulated) role for the private sector in service delivery and maintenance (e.g., in the safe removal, treatment, and disposal of septic tank sludge).

## Risk Mitigation

These risks can be mitigated to the extent possible by prioritizing the following measures and allocating sufficient resources for their implementation:

1. Implement regulatory updates as soon as possible while local political will is present (before policy/regime changes occur).
2. Establish a working group to coordinate this program and other sanitary activities.
3. Undertake a social marketing strategy to engage citizens in environmental aspects of sanitation and disseminate these information.

### **Project SAN1: Preparatory Actions for the Sanitation Program**

This first project consists of a number of actions to enable the expansion of projects in the sanitation program. These include the following:

- Review the current sanitation master plan and feasibility study.
- Establish a City Sanitation Committee.
- Create a sanitation baseline for the city.
- Undertake a public campaign and socialization program.

The review of the wastewater master plan confirms the current understanding of where the efforts in sewer network expansion and improved septage management should be focused.

A number of smaller discrete systems need to be considered on a drainage catchment basis. The natural gradients mean wastewater collection in most of the service areas are able to function via gravity, and will therefore, minimize energy use.

A Sanitation Committee is to be established to coordinate monitoring and related projects, coordinate planning, and promote the advocacy of good sanitation practices among residents. Collaboration among various stakeholders (e.g., DPRD as policymakers, regulatory agencies, Bappeda, housing agency, household users, society groups, private collection and transport companies, PT ATB as the operators of both sewerage system wastewater treatment plants, and the end-user of treated sludge), is crucial to move toward a functioning citywide sanitation management system.

It is necessary to create and establish a sanitation baseline for the Batam City to help evaluate progress under this program and develop projects to address other issues that become apparent to reduce the environmental impact on the city and help achieve the Green Vision. This project will be led by Bappeda and the City Sanitation Committee, and future annual monitoring will occur according to an agreed monitoring plan.

The baseline will include the following data and more indicators may also be established:

- % of sealed septic tanks,
- number of desludging customers,
- number and construction type of septic tanks,
- connections to piped sewerage,
- water quality (biological and chemical) monitoring at selected indicator wells, boreholes and/or streams, and
- occurrence of waterborne diseases among residents.

Engaging stakeholders from the beginning of program development helps in determining the actual sanitation needs, information and capacity gaps, as well as their perception toward the project. It is also proven to be effective in designing tools for raising awareness, ensuring public acceptability, tariff setting, and easing program implementation.

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Table continued

Action	Description and Responsibilities	Time Frame
SAN1.1	Bappeda to establish a City Sanitation Committee, including a core team to act as a Project Management Unit (PMU).  The committee comprises members from all relevant stakeholders, including Bappeda, BA Batam, the cleaning and landscaping agency, environment agency, health agency, PDAM, and the provincial government. A working group to coordinate with the Green Team on the implementation of this program and projects within it is also established.	2016
SAN1.2	Sanitation committee PMU drafts an annual monitoring plan, and coordinates the 1 <sup>st</sup> year (City Sanitation baseline).	2017
SAN1.3	Sanitation committee PMU reviews existing Sanitation Masterplan and Feasibility Study for gaps and updates city sanitation plans, particularly on septage management.	2017
SAN1.4	Once plans are developed further, a public campaign is required to establish community support for the success of the project. This should be continuous and sustained and include <ul style="list-style-type: none"> <li>• raising awareness on the benefits of improved sanitation.</li> <li>• increasing demand for sanitation infrastructure and services through marketing,</li> <li>• ensuring public acceptability of regulations and tariffs, and</li> <li>• easing project implementation.</li> </ul>	2017-2018
Responsible agency	Bappeda and City Sanitation Committee	
Estimated costs (budget needs)	<b>Preparation (design, procure):</b> ~ this activity is only software <b>Socialization:</b> Rp500 million annually <b>Realization (CAPEX):</b> ~ this activity is only software <b>Maintenance and operation:</b> ~ this activity is only software	
Implementing mechanism, funding, and financing	Not applicable	
Other partners	<b>Batam:</b> Bappeda Office <b>Provincial:</b> Dinas PU <b>National government:</b> Ministry of Public Works and Housings <b>Social/communities:</b> Sanitation Working Group and green communities	

Source: Green Team/Mayor's Office.

### Project SAN2: Establish Regular Septage Pumping (desludging) and Management System

The provision of regular septage desludging management services is one of the development challenges in achieving the 2017 Sustainable Development Goals and the 2020 Indonesia's national flagship 100%–0%–100%. In the short term, septic tanks will remain the principal form of urban sanitation in Batam as the sewer network is not extensive; sludge pumping schemes and outreach should work closely with the sewer network upgrade project funded through the loan from the Government of the Republic of Korea and phase out appropriately as household connections are made. Septic tanks require regular removal of septage. Without coordinated septage management, this will not result in improved sanitation, health, and environmental protection—as monitored under Project 1.

It is important that these services are implemented in a coordinated and holistic way including institutional and cost recovery aspects to provide a sustainable service to the residents of Batam. The transfer of the responsibility for collection and disposal of waste to DKP (Department of City Cleaning and Parks), is planned as they are best placed to manage such operational activities.

Action	Description and Responsibilities	Time Frame
<b>SAN2.1</b>	To promote sustained operation and enable this off-site sanitation program to operate, Batam City government will draft and adopt, through its legislative body (DPRD), a local regulation (Perda) detailing Batam City's Septage Management System. The regulation will state the rationale, user fees, operation, management (roles and responsibilities), and penalties. Unless otherwise repealed or amended, the septage management ordinance remains valid, thereby ensuring sustained operation. Consideration will be given to including local design standards.	2016
<b>SAN2.2</b>	Establish a memorandum of agreement between the city and BP Batam so that future septage pumping (collection) and management will be undertaken by the city (DKP).	2017
<b>SAN2.3</b>	DKP and the sanitation working group to liaise with the Provincial Government on most appropriate mechanism for expanding septage treatment capacity.	2017
<b>SAN2.4</b>	The city government will acquire additional septage pumping trucks (two per year) from the Ministry of Public Works under a grant to the City which will then hand them over to DKP.	2017 (annual)
<b>SAN2.5</b>	DKP will establish an internal operation unit to manage and conduct septage collection (every 2 years) and disposal.	2017
<b>SAN2.6</b>	Form an operation unit to prepare and approve standard operational procedures (SOP) for septage management.	2017
<b>SAN2.7</b>	DKP will coordinate with the city government to review and set tariffs (including for adjoining municipalities) and establish a system to recover operational costs from user fees (septage pumping).	2017
<b>SAN2.8</b>	DKP to consider utilizing private sector companies to provide efficient septage collection and transport services.	2017

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Table continued

<b>Responsible agency</b>	Dinas Kebersihan and Pertamanan (DKP)
<b>Estimated costs (budget)</b>	<b>Preparation (SOP, socialization):</b> Rp1.5 billion <b>Realization (construction):</b> Desludging trucks will be provided as grant by DGHS <b>Maintenance and operation:</b> approximately Rp15,000/customer/month
<b>Implementing mechanism, funding, and financing</b>	<b>OBA</b> (government grant) for equipment Improved cost recovery for financing operational improvements. International Technical Assistance for Capacity Development and Training. Private sector contractors to provide efficient septage pumping and transport services.
<b>Other partners</b>	<b>Batam:</b> Sanitation Working Group, Bappeda, DKP (transfer of vehicles and responsibilities), environment agency (regarding advocacy) <b>Regional:</b> Other municipalities (regarding tariff setting), DKP <b>Social/communities:</b> Green communities, social groups such as the Lions Club and AKKOPSI, users, poor households <b>Private sector:</b> For septage collection and transport <b>International:</b> Technical assistance for capacity development and training

Source: Green Team/Mayor's Office.

<b>Project SAN3: Construct Communal Septic Tanks in the Area of Cagar Budaya (Kampung-Kampung Tua)</b>		
<p>The Kampung Tua serves as an old village for housing Batam natives who lived there before 1970. The cultural and historic value of these sites must be preserved. The city has a responsibility to provide sanitation services to the residents. Communal septic tanks are seen as the most cost-effective and appropriate solution as land availability is limited.</p> <p>The communal systems will be designed, built, and maintained by the city.</p>		
<b>Action</b>	<b>Description and Responsibilities</b>	<b>Time Frame</b>
SAN3.1	DKP to set up PMU to deliver this as a separate project.	
SAN3.2	Community consultation on placement, sizing, appropriate design, etc.	
SAN3.3	DKP PMU to tender for appropriate detailed engineering design (DED), enabling affordable O&M costs.	2017
SAN3.4	Approval, land compensation, and development construction program.	
SAN3.5	Construction supervision and management.	2017
SAN3.6	Inclusion of all Kampung Tua communal tanks in septage pumping and management system.	2017
Responsible agency	DKP	
Estimated costs (budget)	<b>Preparation (DED, socialization):</b> Rp500 million <b>Realization (construction):</b> Rp2.0 billion <b>Maintenance and operation:</b> Rp10,000/customer/month	
Implementing mechanism, funding, and financing	<ul style="list-style-type: none"> <li>Direct, local design, and construction contracts</li> </ul>	
Other partners	<b>Batam:</b> Sanitation Working Group, DKP, environment agency (regarding advocacy) <b>Social/communities:</b> Heads of communities, households, females	

Source: Green Team/Mayor's Office.

# Green Waste—Action Plan Batam

## *Program: Environmentally Friendly Solid Waste Management System including Waste-to-Energy Plant in Telaga Punggur*

### Why?

It is estimated that within 5 years, there will be no more space for Batam City to dump its waste. A solution, therefore, is needed so that solid waste disposal needs can continue to be met. As the amount of waste in Batam is growing rapidly, it is believed that the investment costs of such a project is feasible and can be offset through revenue.

Utilization of urban waste is one of the national priorities in the new and renewable energy area as stipulated in the National Research Agenda 2010-2014, which is also one of the reasons for converting garbage into energy. Garbage has always been a problem of big cities in Indonesia including Batam. The discrepancy between an increasing volume of waste and the limitation of landfill sites will obviously become an issue if not handled carefully. Municipal solid waste has a potential of converting biomass energy into electricity.

Given the limited land resource for landfills, the cost of investment and operations of a landfill site, the need to recover material waste as a useful resource, the City of Batam, with support from the central government, intends to partner with a competent investor in converting waste to energy using the appropriate and scientifically approved technology that converts municipal waste into energy. Waste-to-energy (WTE) is a very relevant issue for Batam City because its commercial and industrial base includes several high energy-using industries. One major issue that is being addressed is the capacity of the PLN's electricity distribution network and the need to reinforce it. It is important to note that, when considering WTE as a sustainable way of managing both waste and providing energy, no single technology dominates—there is no “one size fits all” solution. Ongoing WTE projects worldwide have shown various technological approaches based on varying criteria, needs, limitations, opportunities and public acceptability.

### Current Status

A series of legislations and policies has been enacted in Indonesia in order to effectively manage municipal solid waste (MSW), promote its utilization as a source of energy, and protect the environment. The City of Batam, supported by the central government, has identified—among others—the investment in a WTE plant as a viable alternative and a priority for an integrated municipal waste management.

In June 2015, the transaction for a WTE project for the City of Batam under a PPP (KPBU) scheme was declared failed for several reasons:

1. The investment (CAPEX) for the incinerator technology was estimated at US\$10 million with a payback period of 11 years, with the result that the investor required a bylaw (Perda) to guarantee return on its investment.
2. In 2014, the municipal government of Batam submitted a Draft Bylaw on the Tipping Fee (Ranperda Tentang Bea Gerbang) to the City Council. It stipulated the responsibility of the municipality in providing the investor with a reasonable profit margin. The tipping fee was set at the maximum legally allowed Rp300,000 per ton, with the lowest bidder winning the contract. Based on a daily volume of 1,000 tons of waste, the city had to allocate a budget of Rp110 billion per year, which was deemed too high, and rejected by the council.
3. Another problem was that the cost of energy supplied by the WTE plant did not match the purchasing capacity of the electricity company (PLN). Based on a Regulation of the Ministry of Energy and Human Resources (ESDM), the electricity company can pay only Rp850/kWh, whereas the electricity from the WTE plant would cost Rp1,350/kWh, causing a gap of Rp500/kWh.
4. Finally, the consortium (SITA-Hitachi Zosen-Itochu) that submitted the winning bid fell apart because SITA withdrew from the consortium without stating a clear reason.

## Goals

The objective of this project is to develop an environmentally friendly SWM system in the Telaga Punggur final disposal site (Tempat Pembuangan Akhir [TPA]) that includes a WTE plant using the available modern technology that would absorb all MSW, and mitigate climate change. The power generated shall be sold to the PLN's national grid at a fee that would enable the investor to get returns on its investment. The feasibility study, preliminary design, and budgetary cost estimation, which will be conducted as part of this project shall be expected to be well prepared to enable the city government of Batam to effectively pre-qualify bidders and evaluate their proposals and bids. The goals of this project are

1. Implementation of feasible and appropriate technology for an integrated municipal solid waste management focusing on WTE scheme, and
2. Reduction of MSW to be disposed of in landfill in target areas and utilization of MSW for energy generation.

## Results

The program is expected to have the following results:

1. **Infrastructure:** Improved solid waste collection and an operational WTE power plant, combined with a sanitary landfill site;
2. **Organization:** An effective and environmentally friendly management and enforcement system; and
3. **Finance:** Improved cost recovery for SWM.

## Benefits

1. Promotes energy efficiency and the use of renewable energy resources, since methane gas and other recovery materials from Telaga Punggur landfill site can be used to generate electricity.
2. Reduces impact on the environment of Batam and around the Telaga Punggur landfill site (creates a clean, safe, and healthy environment).
3. Increases the regional revenue in the total budget plan of Batam.
4. Helps strengthen the resilience to ecological hazards.
5. Reduces greenhouse gas emissions by as much as 1,540,000 tons of CO<sub>2</sub> annually.

## Success Indicators (targets)

Reduction of Greenhouse Gas Emissions (SW Reuse, Recycle, Reduction)	
2015	2,567,523 tons CO <sub>2</sub> /year
2020	1,540,000 tons CO <sub>2</sub> /year
Households Served by Municipal SWM	
2015	70%
2020	85%
Solidwaste Processing within the Landfill	
2015	840 tons of waste
2020	1,200 tons of waste
Municipal Solid Waste Cost Recovery	
2015	80% subsidies by city government
2020	50% subsidies by city government

Source: Green Team/Mayor's Office.

## Key Risks and Mitigation Measures (WTE only)

Although the projects are relatively well defined, the technology is straightforward, and the capacity is there to deliver them, there are key risks as shown in the table below:

Key Risks	Risk Events	Risk Mitigation Measures
Technology risk	WTE plant cannot be applied for local MSW, due to inappropriate technology and the deficiency of the project feasibility study.	<ul style="list-style-type: none"> <li>• Gain WTE experience and improve capacity on decision-making for PPP WTE project.</li> <li>• Emphasize project feasibility study.</li> <li>• Establish a clear accountability system for WTE and MSW treatment.</li> <li>• Consider and evaluate carefully the results of the decisions made by public agency.</li> <li>• Plan remedial measures well beforehand, such as insurance from insurance company.</li> </ul>

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Key Risks	Risk Events	Risk Mitigation Measures
Government credit risk	The city government of Batam (or local GCA) breaches the contract and does not pay subsidy (tipping fee) as promised.	<ul style="list-style-type: none"> <li>Establish public monitoring mechanisms, and improve government credit and performance evaluation systems.</li> <li>Avoid pursuing political gains for individuals.</li> <li>Obtain credit support from the government in written form, and look for guarantee from the government by defining the obligations and rights in the contract.</li> <li>Keep in touch with the public agency to have the latest information on relevant policies.</li> </ul>
Legal and political risk	There is no legislation (Perda on Tipping Fee) and policy to deal with contractual breaches. There is lack of policies to motivate the residents to pay and support the WTE project.	<ul style="list-style-type: none"> <li>Set up clear policy goals to avoid different public agencies making policies from their own perspectives.</li> <li>Specify influencing factors (example, replacement of the government officials, policy inconsistency between the central and local governments) of the risk in the contract to lessen the potential loss.</li> <li>Include compensation clauses of raising concession price or extending concession period in the contract.</li> </ul>
MSW supply risk	Insufficient employees and vehicles for MSW transport led to the short supply of MSW vehicles to landfill site.	<ul style="list-style-type: none"> <li>Set up a complete MSW classification system, and establish appropriate legislations and policies to restrict MSW dumping.</li> <li>Invest more in infrastructure to promote the quality of MSW sorting and classification.</li> <li>Strengthen publicity, education, and demonstration activities.</li> <li>Reach an agreement of "take or pay" with the public agency to ensure returns on the project.</li> </ul>
Environment risk	Neighborhood environment will be polluted by WTE landfills and wastewater due to insufficient treatment facilities. Toxic emissions will be discharged directly into the air if without disposal facilities.	<ul style="list-style-type: none"> <li>Oversee the whole process of emissions strictly.</li> <li>Treat the MSW classification prudently.</li> <li>Control emissions according to the legislation.</li> <li>Report the contaminants discharged.</li> <li>Make appropriate compensations to residents close to the plant.</li> </ul>
Payment risk	It is difficult to charge fees to local residents for WTE treatment facilities.	<ul style="list-style-type: none"> <li>Use a flexible concession period mechanism (i.e., on condition that a reasonable profit is set, whatever the revenue change, and the contract will expire only when the actual profit arrives at the reasonable profit).</li> <li>Include the formulas and conditions for adjusting the subsidy in the contract.</li> <li>Include the distribution clauses of extra profit between the public and private sectors in the contract.</li> </ul>

Key Risks	Risk Events	Risk Mitigation Measures
Technology risk	The imported equipment for treating waste gas cannot run properly because the local voltage is unstable	<ul style="list-style-type: none"> <li>• Adopt an effective bidding process to select qualified and experienced private participant.</li> <li>• Analyze carefully the characteristics of local MSW, and adopt suitable technologies.</li> <li>• Promote research on WTE technology.</li> <li>• Enhance personnel technical training.</li> <li>• Improve experience and capacity through cooperation with research institutes.</li> </ul>
Government credit risk	Subsidy for MSW treatment and payment for power generation are both delayed	<ul style="list-style-type: none"> <li>• Make reasonable payment for WTE treatment to private sector.</li> <li>• Faithfully implement unified price policies of PLN's grid-connected power.</li> <li>• Reach an agreement with the public agency on surcharge for overdue payment.</li> </ul>

Source: Green Team/Mayor's Office.

### Project WAST1: Improvement of Solid Collection System and Organization

Currently, the MuDKP, which is the municipal sanitation agency, collects 750 tons of household waste, 140 tons of non-toxic industrial waste, and 50 tons of yard and street waste. Anticipating the continuous growth of Batam's population, the generation of waste from households, markets, commercial, and public institutions is expected to grow in the next 25 years. Household waste is collected by a private operator under contract with the DKP. DKP collects waste from public facilities, while industrial waste is collected by a private operator paid for by the industries, but regulated by DKP by providing dumping permits for industrial waste at its landfill site (*TPA Telaga Punggur*).

Household waste is initially disposed at intermediate collection points (TPS) or at 101 household-operated and 10 school-operated waste banks, which segregate recyclable waste. According to the Ministry of Environment and Forestry, the central government aims to establish a so-called parent waste banks in Batam in 2016 to coordinate all other subordinate banks and waste management services.

In order to improve living conditions and public health around TPS sites, Batam plans to provide new covers for bin containers, and build the capacity of local staff to maintain these TPS. Since DKP is also responsible for solid waste collection in surrounding islands, the agency will establish an appropriate number of TPS on each island. Improved coordination with waste bank operators is needed to ensure that non-recyclable waste is properly disposed at a TPS. Raising community awareness is important to promote waste segregation, reduction in waste, and proper disposal.

Currently, the collection of solid waste from TPS to the TPA is insufficient, leaving waste at TPS sites longer, causing overflows, and public health hazards. Additional collection trucks are needed, covering all districts. Waste transport from the surrounding islands also needs improvement.

Action	Description and Responsibilities	Time Frame
<b>WAST1.1</b>	Set up a project management unit (PMU)	2016
<b>WAST1.2</b>	Prepare and approve a project implementation plan (PIP) including detailed activities, responsibilities, timeline, identification of qualified consultants, and budget.	2016
<b>WAST1.3</b>	Identify gaps in STP distribution and quality of existing storage facilities to determine investment needs for additional STP, new bin containers with agreed specifications (including on surrounding islands), and other improvements to properly collect waste at the neighborhood level.	2016
<b>WAST1.4</b>	Study alternative options for more environment friendly TPS solutions (study tour) and propose workable solutions for Batam.	2017
<b>WAST1.5</b>	Identify human resources requirements to properly maintain all STP sites and prepare budget requirements for proper staffing, education, community outreach, and other initiatives to improve household and commercial waste collection. This will include coordination with the Ministry of Environment and Forestry on the establishment of a parent waste bank in the city.	2016–2017
<b>WAST1.6</b>	Include appropriate budget for CAPEX and OPEX for improved STP system.	2017
<b>WAST1.7</b>	Identify investment needs, opportunities for PPP, and other arrangements needed to further expand the waste transport system to meet future needs.	2017
<b>WAST1.8</b>	Tender for additional waste transport and TPS equipment.	2018

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<b>WAST1.9</b>	Continued consultations/dialogue with private truck and waste bank operators, and community and commercial stakeholders outreach to further improve collection system and to monitor waste collection performance.	2018–2020
<b>Responsible agency (PMU)</b>	Dinas Kebersihan dan Pertamanan (DKP) in cooperation with BP Batam	
<b>Estimated costs (budget needs)</b>	<b>Preparation (design, procure):</b> \$0.1 million (~Rp1.3 billion) <b>Realization (CAPEX):</b> \$0.375 million (~Rp4.9 billion) <b>Maintenance and operation:</b> to be determined	
<b>Implementing mechanism, funding, and financing</b>	Options: <ul style="list-style-type: none"> <li>• Traditional procurement and APBD I and APBD II budgets</li> <li>• JV or management contracts with private sector for waste collection and transport</li> </ul>	
<b>Other partners</b>	<b>Batam:</b> Bappeda, environmental agency (reviews environmental documents and issues the environmental permit) <b>Regional:</b> BP Batam <b>National government:</b> Ministry of Public Works, Bappenas (PPP book), PT SMI <b>Social/communities:</b> Affected communities, waste bank and truck operators	

Source: Green Team/Mayor's Office.

### Project WAST2: Improved Managerial Capacity

While DKP is the main responsible agency for solid waste management (SWM) in Batam, the city is considering the establishment of a General Municipal Public Service Body (BLUD Persampahan), following the example of other cities. This semi-private entity, like a PDAM, would be responsible for all SWM functions, and would need to operate on a cost recovery basis. The body, in turn, could enter into PPP arrangements with private operators of waste collection trucks and the planned WTE plant at the *TPA Telaga Punggur* (see project WAST3 – Plant).

With operational costs for waste collection and disposal currently at almost twice the amount of total garbage collection fees (Rp44 billion in OPEX versus Rp22 billion in fees collected in 2014), there is an urgent need to identify ways to improve fees collection, increase fees, and/or reduce OPEX. Batam could learn from other cities that are doing a better job in reaching full SWM cost recovery, and then apply these lessons learned.

Another improvement need is to ensure that collection regulations are effectively enforced and monitored. A possible opportunity to collaborate with the police and armed forces will be identified, tried, and when proven effective, further replicated throughout the city.

Action	Description and Responsibilities	Time Frame
WAST2.1	Set up a project management unit (PMU).	2016
WAST2.2	Prepare and approve a project implementation plan (PIP) including detailed activities, responsibilities, timeline, identification of qualified consultants, budget.	2016
WAST2.3	Compare Batam's local own revenue (PAD) performance with other cities in Indonesia and identify cities that perform much better in terms of SWM cost recovery. Organize a study tour to one or more of these cities, and arrange for a partnership/knowledge exchange with a mentor city to help improve PAD performance in Batam.	2016
WAST2.4	Draft local regulations on SWM cost recovery, enact and start implementing the new regulations.	2017-2019
WAST2.5	Organize consultations with POLRI and TNI to agree on their role in enforcing SWM regulations, particularly at the community level, communicate this role to the general public through a promotion campaign, and start 'audits' by POLRI/TNI to prevent random waste dumping.	2017-2019
WAST2.6	Identify examples of successful public service bodies in Indonesia, organize a study tour to one or more of these Bodies, and arrange for a partnership/knowledge exchange with a public service body willing to help with the establishment of <i>BLUD Persampahan</i> .	2017-2018
WAST2.7	Draft local regulations on <i>BLUD Persampahan</i> . Identify investment needs and other arrangements needed to establish BLUDP.	2018
WAST2.8	Establish BLUDP and hand over responsibilities from DKP to the new organization.	2018-2019
WAST2.9	Continued consultations/dialogue with government, community, and commercial stakeholders to further improve SWM management in Batam.	2017-2018

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Responsible agency (PMU)	Dinas Kebersihan dan Pertamanan (DKP) in cooperation with BP Batam
Estimated costs (budget needs)	<b>Preparation (design, procure):</b> To be determined
Implementing mechanism, funding, and financing	Options: <ul style="list-style-type: none"> <li>• APBD I and APBD II budgets</li> </ul>
Other partners	<p><b>Batam:</b> Bappeda, environmental agency (reviews environmental documents and issues the environmental permit); POLRI, TNI</p> <p><b>Regional:</b> BP Batam</p> <p><b>National government:</b> Ministry of Public Works, Bappenas</p> <p><b>Social/communities:</b> Affected communities, commercial and other solid waste clients</p>

Source: Green Team/Mayor's Office.

**Project WAST3: Improvements at TPA Landfills, including Waste-to-Energy Plant at TPA Telaga Punggur**

All solid waste is currently disposed in a controlled landfill site (40 hectares) located at Telaga Punggur, managed by DKP. Industries deposit their nontoxic waste in a special site (KABIL) owned by the BDA and managed by a private operator. Toxic industrial waste is collected and managed by PT Prasadha Pamunah Limbah Indonesia and transported to Cileungsi in the district of Bogor (West Java) for treatment.

Other TPA sites need to be explored as well, including a site at Batu Aji and Belakang Padang. The latter is to serve a population of 20,000. Additional sites may need to be identified in the neighboring islands. Feasibility studies will need to be prepared, and sufficient budget allocated to build, operate, and maintain these new sites.

Anticipating future demand for waste disposal and green energy, a WTE plant is planned with a capacity of 700 tons/day. It is expected to generate 15 MW of power that will be sold to PLN. The WTE plant is to be managed by a private operator under a PPP contract. Given the recent failure of a PPP for a similar plant, the government is keen to further study how to make the PPP scheme more attractive to potential investors.

A Perda (local regulation) is required as a basis for PJKP about the Environmentally Friendly Technology, Based Waste Processing Service Expenses through the Mechanism of Local Government Cooperation with Business Entities. The regulation needs to mention that for the next 20-25 years, Batam will spend its APBD (2018-2038) for the "tipping fee" of the private sector that manages PLTSa (a WTE) Plant. The value of the tipping fee will be calculated in a feasibility study.

Action	Description and Responsibilities	Time Frame
WAST3.1	Set up a project management unit (PMU).	2016
WAST3.2	Prepare and approve a project implementation plan (PIP) including detailed activities, responsibilities, timeline, identification of qualified consultants, and budget.	2016
WAST3.3	Identify potential locations for TPAs in neighboring islands, and conduct an FS for alternative sites/landfill systems. Also conduct a feasibility study and development plan for the Batu Aji site.	2017
WAST3.4	Determine appropriate TPA/landfill systems for Belakang Padang. Explore challenges in coastal area, and allocate appropriate funding for implementation.	2017-2018
WAST3.5	Commission a feasibility study on WTE and landfill including preparation of TOR, identification and recruitment of qualified consultants, FS implementation.	2017
WAST3.6	Prepare detailed design (including cost estimates) including an Environmental Impact Assessment (EIA)	2018-2019
WAST3.7	Prepare a tender strategy, determine need to change existing (2013) technical and tender committees, train new committee members (if needed), tender project(s), select contractor(s), and award contract(s).	2018-2019
WAST3.8	Arrange permits, land rights, and any other regulations needed to realize infrastructure.	2018-2019
WAST3.9	Prepare and draft tipping fee Perda as a result of financial analysis in the feasibility study, through relevant working groups including Bappeda, finance, Dinas DKP, and other relevant stakeholders.	2018-2019

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Table continued

<b>WAST3.10</b>	Establish BLUDP and hand over the responsibilities from DKP to the new organization.	2018
<b>WAST3.11</b>	Oversee construction until completion of WTE.	2017-2018
<b>Responsible agency (PMU)</b>	Dinas Kebersihan dan Pertamanan (DKP) in cooperation with BP Batam	
<b>Estimated costs (budget needs)</b>	<b>Preparation (design, procure):</b> \$1 million (~Rp13 billion) <b>Realization (CAPEX):</b> \$58.5 million (~Rp760 billion) <b>Maintenance and operation:</b> \$11 million/year (~Rp143 billion/year)	
<b>Implementing mechanism, funding, and financing</b>	Options: <ul style="list-style-type: none"> <li>APBD I and APBD II budgets</li> </ul>	
<b>Other partners</b>	<b>Batam:</b> Bappeda, environmental agency (reviews environmental documents and issues the environmental permit), POLRI, TNI <b>Regional:</b> BP Batam <b>National government:</b> Ministry of Public Works, Bappenas <b>Social/communities:</b> Affected communities, commercial and other solid waste clients	

Source: Green Team/Mayor's Office.

# Green Transport—Action Plan Batam

## *Program: Development of the “Trans Batam” Bus Rapid Transit System*

### Why?

Batam City is facing the challenge of growing traffic congestion and air pollution. This is caused by a rapid increase of motorized vehicles (currently over 1 million, fivefold in comparison to 2000) and a low share of public transport (1.5% of total vehicles). The situation is urgent given the expected population growth from 1 million in 2015 to 2.5 million in 2025. By 2025, there will be 500,000 potential daily bus rapid transport (BRT) customers, hence, a sustainable and financially viable public transport system can be developed based on this potential.

Small buses (*angkots*), motorcycle, and car taxis are owned by small companies and individuals, but they create more problems than they solve because this decentralized and poorly regulated system makes it impossible to work on solutions that can improve the public transport system in a structural and sustainable way. Currently, only 10% of the independent licenses are in operation. A solution is needed that will improve traffic conditions and allow citizens to travel comfortably, safely, and reliably.

Continued reliance on, and uncontrolled growth, of private motorized transport is deemed unsustainable. Citizens want clean, safe, and healthy public transport as part of local economic and social development as well as environmental sustainability. The green benefits include reduced congestion, reduced pollution, improved road safety, and improved mobility.

### Current Status of Planning and Decision-Making on the Proposed BRT

The Batam Transport Department (BTD) already designed 11 corridors for the “Trans Batam” system, and currently operates five corridors using 48 buses as a Technical Service Unit (UPT). Corridor No. 3 has been tried since November 2015, facilitating access to the Sekupang Port.<sup>4</sup> If the current fare of Rp4,000 can be maintained, customers can save about 50% in comparison to other modes of transport.<sup>5</sup> However, the current load factor is still far below the economic load factor of 70%.

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<sup>4</sup> Source: <http://batampos.co.id/2015/12/01/dishub-operasikan-empat-bus-trans-batam-trayek-sekupang-jodoh/>

<sup>5</sup> Source: <http://batamekbiz.com/trans-batam-layani-rute-piayu-laut-batam-centre/>

No.	Point Corridor	Length (km)	Transit in	Σ BRT (unit)	Year
1	Sekupang – Batam Center	22.5	Pelab. Sekupang –Tiban – RSAB –My Mart - Balai kota – Mega Mall	12	2014
2	Tg Uncang- Batam Center	22.0	Fanindo -Basecamp – Tembesi – Kepri Mall -Balaikota – Mega Mall	10	2015
3	Sekupang - Jodoh	20.0	Pelab. Sekupang – Tiban – UIB –Penguin - Nagoya Hills – Jodoh	10	2015
4	Tg Uncang- Sekupang	18.0	Pool Damri – Basecamp –Marina - Tg. Riau - Sei Harapan - Pelab. Sekupang	8	2017
5	TM Jodoh – Batam Center	15.0	Jodoh – Harbour Bay –Batu Ampar - Sei Panas – MyMart -Balaikota - Megamall	9	2016
6	Tanjung Piayu – Batam Center	14.0	Perum GMP, Kampung Bagan, Simpang Mangsang, Simpang Bidaayu, Simpang Bukit Kemuning, SMPN 16, SMPN 40, dan Tanjung Piayu Laut	7	2016
7	Batam Center- Nongsa	25.0	Mega mall – Tunas – KDA –UNIBA - Botania II- Botania I -SMA3 - Simpang Bandara - Batu Besar - Polda	10	2017
8	TM Jodoh- Telaga Punggur	29.0	Jodoh – DC Mall – BCS –Sudirman – Telaga Punggur	10	2018
9	Jodoh – Nongsa	30.0	Jodoh - Nagoya Hill –Raden Patah – Sudirman – Batu Besar – Nongsa	12	2018
10	Nongsa – Telaga Punggur	25.0	Simpang Bandara - Batu Besar – Polda- Telaga Punggur	10	2019
11	Tembesi – Galang	60.0	Tembesi - Jembatan I–VI	10	2019
	Total	280.5		108	

Source: Green Team/Mayor's Office.

## Goal

A citywide BRT system is an important pillar to structurally improve traffic conditions. It enables citizens to reach key destinations by means of airconditioned and eventually low-emission buses that use dedicated bus lanes and have traffic light priority (ITS system) thus allowing comfortable and reliable travel. The Batam Transport Masterplan (2013) contains a layout for the citywide BRT that can serve as a blueprint for its phased implementation. In parallel, Batam wants to set up a Batam Public Transport Company (BPTC) in the form of a General Municipal Service Agency (BLUD) that will manage and operate the BRT as well as the fleet of buses. However, the possibility of establishing a more corporatized General Municipal Service Enterprise (BUMD) should also be considered.

## Expected Results

When the program is completed, the current BRT network will have been expanded to cover the planned network, with improved infrastructure and an expanded operational fleet of buses. It is expected to expand and modernize the fleet over time, and gradually replace diesel-fueled buses with hybrid ones or buses running on electricity or gas only.

A new Batam Public Transport Company will be established and current operators of smaller vehicles (*angkot*, *becak bermotor*, and *taksi*) will be incentivized (and regulated) to join this new public company. They should benefit from this change, for example, by a financing mechanism that would make it possible for small operators to join forces and jointly operate new bigger buses on the dedicated lanes as a feeder system.

## Expected Benefits

1. Improved urban mobility for citizens. This will improve time spent on travel, and improve access to places of employment. By 2025, there will be 500,000 potential daily BRT customers.
2. Improved road safety and security for passengers and pedestrians alike with a positive impact on quality of life.
3. Reduced air pollution with a positive impact on the quality of life and citizens' health.
4. Reduced carbon emissions contributing to Indonesia's commitment to the UN-FCCC.
5. Economic opportunities for low- and middle-class citizens, for example better business for current operators of *angkot* and *taksi* as well as economic activities around stations in the form of transit-oriented development (TOD).

## Key Risks and Mitigation

An initial risk assessment informed Batam about the key risks of developing the BRT and these include the following:

1. Limited knowledge and capacity to implement a BRT can result in delays, cost overruns, and poor implementation. To mitigate this risk, the management interfaces between different technical projects and between infrastructure delivery. Setting up the BPTC in the form of a BLUD deserves special attention. The need for capacity building and consultant assistance will be further detailed in the project implementation plan (PIP).
2. The BRT has significant impact on Batam's communities, especially current operators of smaller vehicles (*angkot*, *taksi*) with the potential to cause considerable resistance and backlash. To mitigate this risk, the PIP for the BPTC needs to involve these current operators in designing appropriate mechanisms for their association and/or integration into the BRT system.

## Investment Summary (2016 estimates)

Project	Description	Timeline	Preparation (Rp billion)	CAPEX (5 year)	OPEX (annual)	Finance
I	Batam Public Transport Company (BUMD)	2016–2019	Rp500 million	Rp9.3 billion	Rp1.5 billion	PPP
II	BRT infrastructure	2016–2020	Rp1.5 billion	Rp25.2 billion	Rp2.5 billion	Public
III	BRT bus fleet	2019–	tbd	tbd	tbd	PPP

Source: Green Team/Mayor's Office.

## Success Indicators (targets)

Public Transport Share (from the current 1.5%)	
2020	10%
2025	15%

Targets are indicative and will be determined in detail based on detailed design for phase 1 and business plan for the new transport company.

Source: Green Team/Mayor's Office.

### TRANS1: Establish a New Batam Public Transport Company

It is not critical at the moment to implement institutional change but this should be considered as early as possible to improve operational efficiencies and facilitate private sector engagement and financing in Batam's public transport sector, which has a high potential for growth.

It is proposed that the current BRT UPT be upgraded to a General Public Service Agency (BLUD) through a local regulation. The new Batam Public Transport Company (BPTC) will have the ultimate responsibility to plan, develop, operate and manage, promote, and market the BRT service and bus fleet.

The business plan for the company will include details about the goals, responsibilities, management structure, and operating procedures including possible external maintenance of bus fleets, stations, and bus lanes. Choices made will have a direct relation with the tender strategy for infrastructure and procurement of buses, and will be monitored for consistency.

The ongoing BRT expansion work and expansion in the near future is expected to be managed under the existing technical unit but transfer of these responsibilities to a public company should be considered as soon as possible.

Action	Description and Responsibilities	Time Frame
TRANS1.1	Set up a project management unit (PMU) to be led by the BTD in partnership with BP Batam, coordinated by Bappeda.	2016
TRANS1.2	Prepare a project implementation plan (PIP) for creating a transport company, including detailed activities, responsibilities, need for external assistance, engaging stakeholders, approvals, and timeline.	

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Table continued

TRANS1.3	Commission the drafting of an academic paper as the basis for drafting a local regulation on BRT under a BPTC (BLUD).	
TRANS1.4	Study the possibility of a corporate BUMD as an alternative to the BLUD, and make recommendations.	
TRANS1.5	Draft and approve a local regulation on BRT and BPTC approved by the City Council.	
TRANS1.6	Develop a business plan for the operation and funding of BPTC (including set-up costs) and BRT infrastructure.	
TRANS1.7	Arrange funding for the operation of the BPTC ( <i>both upfront investments for set-up, office infrastructure; funding requirement is subject to results of the business plan; possibly BPTC will be responsible for maintaining infrastructure as well</i> ).	
TRANS1.8	Develop and manage a marketing campaign with permanent and real time Public Information System for promoting the BRT system.	
TRANS1.9	Develop and manage smart payment system.	
TRANS1.10	Restructure and regulate the current system of minibuses ( <i>angkoy</i> ) and draft a local regulation to establish a new integrated public transport network (unifying existing formal and informal operators), including Public Service Obligation.	
TRANS1.11	Undertake procurement, operation, and maintenance of BRT fleet (rolling stock) through central government assistance. APBD II (traditional procurement)	
Responsible agency	Batam Transport Department in partnership with BP Batam	
Estimated costs (budget needs)	<b>Preparation (design):</b> Rp1.0 billion <b>Realization (construction):</b> Rp3.0 billion (marketing); 1.6 billion (smart payment system) <b>Maintenance and operation:</b> To be determined	
Implementing mechanism, funding, and financing	Traditional procurement	
Other partners	<b>Batam:</b> Bappeda <b>Regional:</b> BP Batam, universities <b>National:</b> Directorate General of Land Transportation, liaise with Medan, which also plans to set up a BLUD <b>Social/communities:</b> Affected communities, informal operators, citizens (survey) <b>Private:</b> Industry with large work forces, parking operators, private BRT operators	

Source: Green Team/Mayor's Office.

**TRANS2: Expand BRT Infrastructure to 11 Corridors**

The planned BRT corridors should be realized over the next 5 years: Corridors 3 to 11 are still not in full operation. This subproject includes construction of bus lanes, ACTS, traffic lights, signs, elevated bus stops, shelters, and line painting.

The Project Management Unit (PMU) that is required to initiate action will prepare a project implementation plan (PIP). It will specify more detailed choices to be made. It will be considered to bundle the detailed design of all related infrastructure, even in cases where different government departments will become responsible for funding and tendering different infrastructure (tender strategy). A tender strategy will be prepared that will take into account the division of responsibilities for operation and maintenance among stakeholders such as the BDA (BP Batam), Batam Department of Public Works (Bina Marga), the Batam Department of Transport, the BPTC (once established), and private companies/ investors.

Action	Description and Responsibilities	Time Frame
TRANS2.1	Set up a PMU to be led by the BTD in partnership with BP Batam, coordinated by Bappeda.	2016
TRANS2.2	Prepare project PIP including detailed activities, responsibilities, time line, need for external assistance (consultants), budget, etc.	
TRANS2.3	Approve project implementation plan (PIP) and budget.	
TRANS2.4	Review and evaluate existing systems, technologies, networks, and development planning.	
TRANS2.5	Coordinate consultation with all relevant stakeholders.	
TRANS2.6	Prepare tender strategy.	
TRANS2.7	Arrange funding for infrastructure.	
TRANS2.8	Arrange permits, land rights, and any other regulations needed to realize infrastructure.	
TRANS2.9	Tender project(s), select contractor(s), award contract(s).	
TRANS2.10	Construction supervision and project completion.	
TRANS2.11	Periodical monitoring and evaluation of results.	
Responsible agency	Batam Transport Department (or BPTC) in partnership with BP Batam	
Estimated costs (budget needs)	<b>Preparation (design):</b> Rp2.5 billion <b>Realization (construction):</b> Bus stops and shelters, Rp3.6 billion; Ground marking, Rp7.4 billion; Other infrastructure, Rp10 billion <b>Maintenance and operation:</b> Rp1.25 billion (annually)	
Implementing mechanism, funding, and financing	Traditional procurement <ul style="list-style-type: none"> <li>Funding by APBD II</li> </ul>	

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Other partners	<p><b>Batam:</b> Batam Bappeda, Office of Bina Marga, Office of Perkim, environmental agency, Department of Housing and Settlement (builds park and ride facilities), Department of Parks (prunes the trees along the BRT corridor), environmental agency (reviews environmental documents and environmental permits)</p> <p><b>Central government:</b> BP Batam, National Transport Authority, Department of Land Transportation (Ministry of Transportation), Organda (Land Transport Organization)</p> <p><b>Private sector/government enterprises:</b> Newly formed Batam public transport organization (BLUD), private operators (BRT bus manager, parking management)</p> <p><b>Social/communities:</b> Citizens of Batam</p>
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Source: Green Team/Mayor's Office.

# Green Transport—Action Plan Batam

## *Program: Development of Network of Bicycle Lanes and Footpaths in Batam City*

### Why?

Batam is faced with the challenge of growing traffic congestion and air pollution. This is caused by a rapid increase of motorized vehicles (currently over 1 million, fivefold in comparison to 2000) and a low share of public transport (1.5% of total vehicles). The situation is urgent given the expected population growth from 1.03 million in 2015 to 1.52 million in 2020. Continued reliance on, and uncontrolled growth, of private motorized transport is deemed unsustainable.

While our citizens want clean, safe, and healthy public transport options (see *Program D – Development of the “Trans Batam” Bus Rapid Transit System*), we are also keen to promote the use of nonmotorized modes of traffic (walking, bicycling) by providing exclusive pedestrian and bicycle lanes. While in the short-term a reduction of motorized private transport is sought, ultimately we aim to transition from a motor vehicle-oriented society to a multimodal society.

Currently, only the town center has dedicated pedestrian pathways, but still insufficient. Since Batam’s built-up area is not very dense, it has good potential for nonmotorized transport (NMT). Shaded/canopied pedestrian walkways and bicycle paths (essential in tropical climates) can be segregated from automotive roads. We would like to design our major streets for *walkable communities*, with ample safe crossings, pedestrian signals, cycle lanes, and shaded public areas and walkways.

To further encourage nonmotorized transport, we will pay specific attention to integrating NMT modalities with the new public transport options. We consider NMT facilities provision as an integral part of our BRT system development. Another priority is the need to provide a safe environment for pedestrians, transit users, and cyclists as they are the most vulnerable users on urban streets.

### Planning and Decision-Making on Nonmotorized Transport

In 2008, the mayor of Batam, together with 10 other Asian mayors, signed the Kyoto Declaration. Under the declaration, the mayor pledged to provide exclusive pedestrian and bicycle lanes and ensure safe and comfortable movement of women, children, the elderly, and people with disabilities.

BP Batam developed a transport master plan in 2014. This plan includes 20 km of bicycle lanes, in addition to development of a BRT system. The city of Batam has yet to include nonmotorized transport in its Spatial Development Plan (RTRW). The responsibilities for planning, construction, and operation of NMT need to be coordinated between BP Batam and the municipality, with the latter taking responsibility. An NMT Master Plan should be developed for the period 2016-2035.

## Goal

The NMT Masterplan 2016-2035 should connect NMT and motorized modes of transport (such as the Trans Batam Ferry and the Trans Batam BRT) in Batam's RTRW that is currently being prepared; integrate with the new Medium-Term Development Plan (RPJMD); and create opportunities for transit-oriented development (TOD).

A total of 78 km of bicycle lanes and 36 km of footpath network will be constructed in strategic areas in the city. NMT facilities will connect other modes of transport. We will add shading, pedestrian crossings, and other features to make walking more enjoyable and safe in areas with significant pedestrian use. We will add sufficient parking at strategic areas, such as larger BRT stations, major facilities, to encourage multimodal transport.

## Expected Results

Improved urban mobility by integrating motorized and nonmotorized modes of transport is expected thereby creating a clean, safe, and healthy NMT system as part of local economic and social development as well as environmental sustainability.

## Expected Benefits

1. Improved urban mobility both for long distances (buses) and short distances (bicycle lanes and pedestrian walkways) for citizens.
2. Improved road safety and security for passengers and pedestrians alike with a positive impact on quality of life.
3. Reduced pedestrian-related road accidents.
4. Reduced air pollution with a positive impact on the quality of life and citizens' health.
5. Reduced carbon emissions contributing to Indonesia's commitment to the United Nations Framework Convention on Climate Change (UNFCCC).

## Key Risks and Mitigation

An initial assessment of the key risks of developing the NMT network showed the following:

1. The current lack of coordination combined with overlapping authorities among the various stakeholders including the municipality of Batam and the Batam Development Authority (BP Batam) can hamper development; this will necessitate the creation of an integrated committee or organization (PMU).

2. The need for significant public funding for expropriation and securing the rights-of-way and other practical bottlenecks can hamper construction; private funding under CSR to pay for beautification and maintenance is not assured, so this will also necessitate the creation of an integrated committee or organization (PMU).

## Investment Summary (2016)

Project	Description	Timeline	Preparation (Rp billion)	CAPEX (Rp billion)	OPEX (Rp billion)	Finance
I	Infrastructure	2016–2020	Rp700 million	Rp10 billion	Rp200 million	Public
II	Management	2016–2019	Rp200 million	0	0	PPP
II	CSR	2019	0	Rp500 million	0	CSR

Source: Green Team/Mayor's Office.

## Success Indicators (targets)

Year	Pedestrian Walks	Bicycle Path
December 2018	28.8 km	52 km
December 2020	36.0 km	78 km
Share of NMT as % of total public transport for short distances		
December 2018	3%	1%
December 2020	5%	2%

Note: Targets are indicative and will be determined in detail based on detailed design for phase 1 and business plan for the new transport company.

Source: Green Team/Mayor's Office.

### Project NMT1: Develop Master Plan and Detailed Engineering Designs for Nonmotorized Traffic

Based on the Program Brief (attached), this project includes the following subprojects: (A) Prepare a Nonmotorized Traffic Master Plan for 2016–2035, and (B) Detailed Engineering Designs (DED).

This program is led by the Batam Department of Transportation (BDT), and should be developed in close collaboration with the Batam Public Transport Company established under Program D – Development of the “Trans Batam” Bus Rapid Transit System. BDT will also seek input from BP Batam and Bappeda.

The NMT Master Plan will follow, and seek to support, the spatial plans set out in the latest RTRW, and specifically will focus on creating walkable communities, and feeder connections with BRT and other modes of public transport. The plan will focus on short-term interventions (2016–2020), and medium- to long-term interventions (2020–2035). The initial focus will be on creating additional NMT facilities (paths, lanes, crossings, etc), while the medium- to long-term focus will be on further integrating NMT into a multimodal transport system, with specific emphasis on BRT.

The initial designs should focus on cost-efficient and safe solutions for integrating NMT with motorized modes of transport for the period 2016–2020. Designs are needed for 36 km of footpaths (including shading, pedestrian crossings, markings, and other features), and 78 km of dedicated bicycle paths (including markings, crossings, etc).

Action	Description and Responsibilities	Time Frame
TRAN3.1	Set up a project management unit (PMU) to plan and design nonmotorized traffic investments	2016
TRAN3.2	Prepare and approve project implementation plan (PIP) and budget for 2016–2020	2017
TRAN3.3	Identify and hire consultants to assist in the development of an NMT Master Plan. The focus here is on driving the development of the master plan through own resources	2017
TRAN3.4	Develop the NMT Master Plan and ensure approval and enactment of associated local regulations	2017–2018
TRAN3.5	Prepare TOR and select qualified consultants for DED preparation	2017
TRAN3.6	Finalize the DED for pedestrian pathways and bicycle lanes, including Bill of Quantities (BOQ)	2017
TRAN3.7	Develop Project Preparation Plan and Budget and get DED and have these approved by the City Council	2018
Responsible agency	Batam Department of Transportation: Prepares this program as an integral part of the business plan for the Batam Public Transport Company	
Estimated costs (budget)	Rp700 million	
Implementation mechanisms, funding, and finance	<ul style="list-style-type: none"> <li>Funding by APBN, and APBD II.</li> </ul>	
Other partners	<b>Batam:</b> Batam Public Transport Company, Bappeda, Department of Public Works <b>Regional:</b> BP Batam <b>Central government:</b> Directorate General of Land Transportation <b>Social/ communities:</b> Affected communities	

**Project NMT2: Construct Nonmotorized Traffic Interventions**

Based on the Program Brief, this project includes the following subprojects: (A) Build the network of bicycle lanes and foothpaths, (B) Install road safety features, and (C) Undertake landscaping of new paths/lanes during 2017-2020.

This program is led by the Batam Department of Transportation (BDT), and should be developed in close collaboration with the Batam Public Transport Company established under Program D – Development of the “Trans Batam” Bus Rapid Transit System. BDT will also seek input from BP Batam and Bappeda.

Foothpaths and bicycle lanes will predominantly be constructed along existing traffic corridors. An important focus for construction will be to minimize the construction impact on traffic flows (minimal traffic congestion) and living environment (especially in downtown areas). When planning for, and during construction, BDT will seek continuous coordination with relevant government entities, such as POLRI, and neighborhood representatives.

Where possible, BDT will select local contractors for the implementation works, and will encourage the use of locally available construction materials.

Action	Description and Responsibilities	Time Frame
TRAN3.1	Set up a project management unit (PMU) to implement the nonmotorized traffic investments. This PMU may be the same as the one set up for the Master Planning, but will also include POLRI and possibly neighborhood representatives for affected areas.	2016
TRAN3.2	Allocate sufficient budgets for project preparation and implementation for 2017–2020.	2017
TRAN3.3	Bappeda to coordinate consultation and collaboration among all stakeholders.	2017–2020
TRAN3.4	Prepare Tender Documents, and award projects to (local) contractors for all works. Bids will be packaged by area. All bids will include hardscape (paths/lanes, markings, etc), landscaping (trees, canopies and other shading structures, plantings and other ‘natural dividers’), and safety measures (crossings, safety railings, streetlighting, etc). BTD will issue bids in tranches from late 2017–2019.	2017–2018
TRAN3.5	Supervise the construction works (if needed a consultant may be hired to assist), test-run and approve completed works.	2018–2020
TRAN3.6	Monitor and evaluate progress and results. This may include conducting surveys in affected areas. As this is the first stage of construction, the focus will be on learning from feedback. One aim is to determine the most effective shading and safety solutions based on actual usage.	2019–2020
TRAN3.7	Develop project plan and budget and get DED and have these approved by the City Council.	2018

*Table continued*

<b>Responsible agency</b>	Batam Department of Transportation
<b>Estimated costs (budget)</b>	Rp10 billion
<b>Implementation mechanisms, funding, and finance</b>	<ul style="list-style-type: none"> <li>Funding by APBN, and APBD II.</li> </ul>
<b>Other partners</b>	<p><b>Batam:</b> Batam Public Transport Company, Bappeda, Department of Public Works</p> <p><b>Regional:</b> BP Batam</p> <p><b>Central government:</b> Directorate General of Land Transportation</p> <p><b>Social/communities:</b> Affected communities</p>

Source: Green Team/Mayor's Office.

# Green Water—Action Plan Batam

## *Program: Improvement of Urban Drainage and Flood Control System*

### Why?

Batam City, currently, has flood inundation problems in nine subdistricts (*Kecamatan*) over 45 sites during the rainy seasons. This is due to the advancing urbanization of Batam City where flood plains have been improperly occupied and developed, and where local drainage problems have not been adequately considered and handled. Flooding has an adverse impact on the economy, and also on the safety of residents.

Impermeable areas are rapidly developing and drainage systems are not adequate to cope with the additional stormwater runoff. There is a need for improved drainage and flood management and also regulations to reduce surface runoff from new developments, including water retention on site, reduced permeable surface areas, as well as design of suitably sized drains.

The most affected areas are located in the urbanized areas of Batam Centre, Sungai Harapan, Marina, Sungai Pelungut, Buliang dan Duriangkang, and some private housing complexes. Flood flows can damage built assets, create loss of earnings and gross domestic product (GDP), and impact on human safety.

The lack of a standard set of performance indicators for urban drainage is seen by many, including Bappenas, as a serious disincentive for funding in the sector. Without measureable and verifiable outputs of project success, justification for budget expenditure becomes difficult; however, defining the performance of a storm drainage system is not straightforward.

### Current Status

There is no updated Urban Drainage and Flood Control (UDFC) Master Plan for Batam City. The first UDFC Master Plan was established in early 1980 by BP Batam and since then there has been no other planning document even after the establishment of an autonomous Batam City local government in 1999. To improve the situation, the city government of Batam has already decided to develop a new integrated urban Drainage and Flood Control Master Plan.

## Goals

The contemporary engineering approach to drainage is to recognize that stormwater is part of the total water cycle. Consideration needs to be given to the impact on the receiving environment, its integration into the built environment, and to recognize that Batam's water supply is a limited resource and the urban drainage system provides opportunities to provide important water resources.

The successful integration of elements of Batam's urban drainage systems into the urban landscape can provide benefits to all stakeholders. These resources can enhance visual amenity, provide recreational opportunities, and can help engender a sense of ownership and focus for the local community. Preserving, and in some cases restoring, natural features of drainage lines and waterways, such as natural channels, wetlands, and riparian vegetation can often be advantageous to both the environment as well as enhancing visual amenity.

## Results

1. An urban drainage and flood control master plan for Batam City.
2. Better integrated and maintained sustainable drainage infrastructure.
3. Flood hazard management and/or warning plan.

## Benefits

1. Minimize economic impacts of flooding, in GDP, and earnings losses.
2. Increase urban resilience.
3. Reduce impacts of floods on health, safety, and built assets.
4. Ensure that future development do not have impacts on downstream properties.
5. Safeguard Batam's water resources.

## Success Indicators (targets)

Flooded Areas	
2015	45 sites
2020	20 sites

Source: Green Team/Mayor's Office.

## Key Risks

1. Uncontrolled development

## Risk Mitigation

1. Approve a drainage and flood risk master plan that is integrated into the city's spatial development plans and enforce development control.

### Project UDFC-1: Prepare a new Master Plan for Urban Drainage and Flood Control System

It is necessary to create and establish a new Urban Drainage and Flood Control (UDFC) system for the City of Batam. This new master plan is an important tool to identify remedial drainage projects for construction, and also to guide new land development projects (in collaboration with BP Batam) to be consistent with Batam island drainage needs. The master plan also provides valuable input to the city's RPJMD (2016–2020) Five-Year Capital Investment Program, and help to identify and acquire land or access for future capital improvements and areas for preservation of raw water sources (in line with Green Water and Sanitation Programs) to reduce the environmental impact and help achieve our Green Vision. This project will be led by Dinas PU in collaboration with Bappeda of Batam City and BP Batam.

The master planning will

- Define flood hazard areas under existing and various future development conditions;
- Take into account climate change;
- Identify flooding problem areas, and infrastructure that will require improvements where future development is planned;
- Prepare conceptual plans for drainage and flood control infrastructure, with short-, medium-, and long-term priorities;
- Follow the Ministry of Public Works Guidelines No. 12 /PRT/M/2014 regarding the Urban Drainage Management;
- Provide recommendations for improved floodplain management and river enhancement, to keep new land development out of floodplains, while emphasizing their natural and beneficial functions;
- Provide recommendations on catchment management and land use planning;
- Provide recommendations on generic design (design flood, design storm etc), construction and maintenance;
- Develop recommendations on monitoring, information services, and flood warning; and
- Develop procedures for the reporting of information on flooding incidences and advice to residents.

Engaging stakeholders, including both upstream and downstream developers and landowners, from the beginning of project development helps in determining the actual drainage needs.

Action	Description and Responsibilities	Time Frame
UDFC-1.1	A project Management Unit (PMU) shall be established that will design, coordinate, and monitor related projects, and promote the advocacy of good urban drainage practices among residents and housing developers. The PMU comprises members from all relevant stakeholders, including Bappeda, Dinas PU (Public Works Agency), Highways Agency, Dinas Tata Bangunan (Building Codes Agency), DKP (the Cleaning and Landscaping Agency), BLH (Environment Agency), Health Agency, BP Batam, the provincial government, and the Ministry of Public Works and Housing (Directorate General of Human Settlements and Directorate General of Water Resources). PMU to coordinate with Green Team on the implementation of this program.	2017

*continued on next page*

Table continued

UDFC-1.2	PMU will prepare a robust term of references (TOR) for the preparation of a master plan. A competitive tender consultancy procurement will be done in order to get maximum results.	2017
UDFC-1.3	The consultant will work with relevant city stakeholders in developing a new master plan as guided by the Ministry of Public Works Regulation No. 12 /PRT/M/2014 regarding the Urban Drainage Management, including the environment agency, highways agency, social groups, etc.	2017
Responsible agency (PMU)	Dinas PU	
Estimated costs (budget needs)	Preparation (design, procure): Rp2.4 billion	
Implementing mechanism, funding, and financing	Traditional procurement	
Other partners	<b>Batam City:</b> Bappeda, city spatial planning agency <b>Provincial:</b> River Basin Authority (Balai Wilayah Sungai) <b>National government:</b> Ministry of Public Works <b>Private:</b> REI (housing estate developers) <b>Social/communities:</b> universities, NGOs, sanitation working group and green communities	

Source: Green Team/Mayor's Office.

<b>Project UDFC-2: Implement Construction of Priority Drainage Infrastructure</b>		
<p>This will include aspects related to design, construction, and maintenance of priority drains and related infrastructure. The construction works will follow the Ministry of Public Works Regulation No. 12 / PRT/M/2014 regarding the Urban Drainage Management as well as to refer for the Environmental Management and Monitoring plans (RKL and RPL).</p>		
<b>Action</b>	<b>Description and Responsibilities</b>	<b>Time Frame</b>
UDFC - 2.1	Commission consultants to develop detailed engineering design (DED) for prioritized infrastructure, including production of hydraulic calculations, design notes, construction drawings, technical specifications, bills of quantities, and cost estimates.	2017–2018
UDFC - 2.2	PMU will conduct an environmental study (AMDAL) according to the environmental law No. 5/2012, such that construction of drainage canal > 5 km and sedimentation excavation > 500,000 m <sup>3</sup> has to provide the full environmental impact assessment (EIA) study.	2018
UDFC - 2.3	PMU to arrange all the necessary permits and coordinate with all utility providers (i.e., water supply pipelines with PT ATB, telecommunication lines with PT Telkom and other private services, gas pipeline with PT PGN, electricity with Bright PLN Batam, etc.).	2019
UDFC - 2.4	Construction to commence from downstream first, and will comply with the environmental management and monitoring plans (RKL and RPL).	2019–2020
UDFC - 2.5	Drainage maintenance unit (public works) to develop a maintenance (asset management) operational procedure, including a rational basis for ranking maintenance projects for implementation (given the limited budget available through APBD), inspection of assets, and responding to reported failures/damages.	
Responsible agency	Batam Public Works Agency (Dinas PU)	
Estimated costs (budget needs)	<b>Preparation (design):</b> Rp1.5 billion <b>Realization (construction):</b> To be determined based on the DED works.	
Implementing mechanism, funding and financing	<ul style="list-style-type: none"> <li>• Traditional procurement</li> <li>• Funding by APBN, APBD I and APBD II</li> </ul>	
Other partners	<b>Batam:</b> Bappeda, PMU, BLH, transport, <b>Private sector:</b> Housing Estate Developers <b>Provincial:</b> Balai Wilayah Sungai <b>Social/communities:</b> Poor communities and households regarding appropriate design	

Source: Green Team/Mayor's Office.

<b>Project UDFC-3: Nonstructural Measures</b>		
<p>The nonstructural measures aim to protect the urban drainage system from the software perspective (non-physical works) and will include the following activities:</p> <ul style="list-style-type: none"> <li>• Establish Perda (local regulations) on urban drainage and flood control.</li> <li>• Prepare community flood preparedness.</li> <li>• Prepare an emergency response.</li> </ul>		
<b>Action</b>	<b>Description and Responsibilities</b>	<b>Time Frame</b>
UDFC-3.1	<p>Public works to draft academic paper and local regulation including the following:</p> <ul style="list-style-type: none"> <li>• Developers will be required to fund and construct on-site water quality treatment to meet best practice objectives for the removal of litter, total suspended solids, total nitrogen, and total phosphorus.</li> <li>• Developers will be required to fund the infrastructure necessary to cater for upstream rural flows.</li> <li>• The housing developers will be required to maintain existing (pre-development) runoff rates and volumes by including infiltration and retention features into landscaping and design.</li> </ul> <p>Legislation for flood-reduction measures should be incorporated within the technical legislation covering urban development, regional development, environmental management, resource management, communication, housing, etc.</p>	2017-2018
UDFC-3.2	Councilors' approval of local regulation will be required.	2018
UDFC-3.3	Commission an academic study to develop a hydrological design manual to assist developers in sizing and designing sustainable drainage systems. Including standard, soil group, appropriate rainfall-runoff methods, design storms (5, 10, 25 years) and durations for the design of retention, infiltration, and conveyance features.	2019
UDFC-3.4	Public works to develop a flood emergency warning and response plan.	2019
UDFC-3.5	Public works to report annually to Bappeda, spatial planning agency, and BP Batam to assist with development control around floodplains.	annual
<b>Responsible agency</b>	Batam Public Works Agency (Dinas PU)	
<b>Estimated costs (budget needs)</b>	<b>Preparation (design):</b> Rp500 million	
<b>Implementing mechanism, funding, and financing</b>	<ul style="list-style-type: none"> <li>• Traditional procurement</li> <li>• Funding by APBN, APBD I, and APBD II</li> </ul>	
<b>Other partners</b>	<b>Batam:</b> Bappeda	

Source: Green Team/Mayor's Office.

# The Six Priority Programs— Finance Actions

## Fiscal Capacity

The Green Team concluded that there are possibilities to further increase own local income (Pendapatan Asli Daerah [PAD]). Possible specific actions to increase PAD that were brought up by the Green Team are as follows:

- Introduce electronic tax collection system. This will increase collection rates, for example for restaurant tax and entertainment tax.
- Improve database for IMB (building permits) and PBB (property tax).

The Green Team intends to develop a RIAP (revenues improvement action plan) to further explore these and other options and to formulate specific actions to achieve this.

To improve budgets available for capital expenditures, the Green Team sees opportunities to decrease annual unused cash balances by improving procurement and planning. This could partly free up funds for capital projects. Possible specific actions identified are

- Advanced procurement: Batam can start procurement procedures before the local budget (APBD) is officially formalized. By this, Batam can avoid delays.
- Batam is already making use of an e-procurement system (electronic).

An initial analysis of the potential borrowing capacity showed that Batam could potentially borrow over Rp3.0 billion (US\$230 million) in 2016 and over Rp5.0 trillion (US\$424 million) between 2016 and 2020. The Green Team indicates that this looks promising. The Green Team will discuss with high-level decision makers the possibility of attracting loans for green actions and projects that do add value to Batam's economy and liveability but for which no budgets are currently available and actions to further explore this opportunity. The city will put special attention to its low classification (score 0.25) according to MoF Regulation No.33/PMK.07/2015 on Map of Local Government Fiscal Capacity.

The following pages show the result of the Fiscal Analysis and Financial Assessment Report.

## Alternative Mechanisms to Attract Finance

Table 1 below summarizes the result of exploring the potential for applying alternative mechanisms to priority programs. The Green Team learned that alternative mechanisms can be applied to a build–operate–transfer (BOT) contract for new bulk water treatment facility, waste-to-energy, and BRT. Actions aimed at further exploring and applying these models have been incorporated in the action plans for these priority programs.

Table 1 – Summary of Batam Action Plans

Project and owner (rows)/ financing options (columns)	(A) Financing	(B) Funding	(C) Implementing mechanism	(D) Financing sources (options)	(E) Funding sources (options)
Waste-to-Energy	✓	✓	BOT (contract); BU Joint Venture (company public and private)	Investor has withdrawn	Tipping fee: New regulation required
Bus Rapid Transit	✓	✓	BUMD/ BLUD (own company)	Private sector: Buses and possibly stations International	National and city budgets: dedicated bus lines National budgets: buses development institutes: business plan BUMD (GiZ), detailed design buslanes (ITDP)
Human Waste Management – PLT2		✓	Batam City: Septic tanks, trucks		APBN; Batam City: Septic tanks, trucks

Source: Green Team/Mayor's Office.

