Brunei Darussalam-Indonesia-Malaysia-Philippines
East ASEAN Growth Area
(BIMP-EAGA)

GREEN CITY ACTION PLAN 2035

CITY OF KENDARI

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Contents

Acknowledgments

The Green City Action Plan for Kendari was developed by the Green Team (PokJa Hijau) of the City of Medan, Batam, and Kendari under the guidance of Badan Perencana Pembangunan Daerah (BAPPEDA) and the City Mayor's Office. The action planning process was supported by technical assistance from the Asian Development Bank (ADB) through RETA 8518 INO: Green Cities: A Sustainable Urban Future in Indonesia 2—Capacity Development, and facilitated by Yudi Wahyudi (city facilitator, PT Ciriajasa Rancangbangun Mandiri, Indonesia), Robert van der Hoff (team leader, Urban Solutions), and Eko Delianto (deputy team leader, PT Ciriajasa Rancangbangun Mandiri, Indonesia). The prioritization and development of programs was supported by Dr. Ramon Abracosa (environmental engineer, Urban Solutions), the financing aspects was supported by Gideon van Toledo (urban finance specialist, Urban Solutions), and the development of actions was supported by John Sutton (Urban Solutions). The support and inputs from the Government of Indonesia through the Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional (BAPPENAS), and Julian Syah (ADB consultant, Indonesia Resident Mission) are also greatly appreciated.

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.

Foreword by the Mayor

Assalamuallaikum, Wr. Wb.

The City of Kendari'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 Kendari 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 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 Kendari 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 Planning 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 Kendari into a Green City. Aamiin.

Wassalam,
Kendari, May 2016

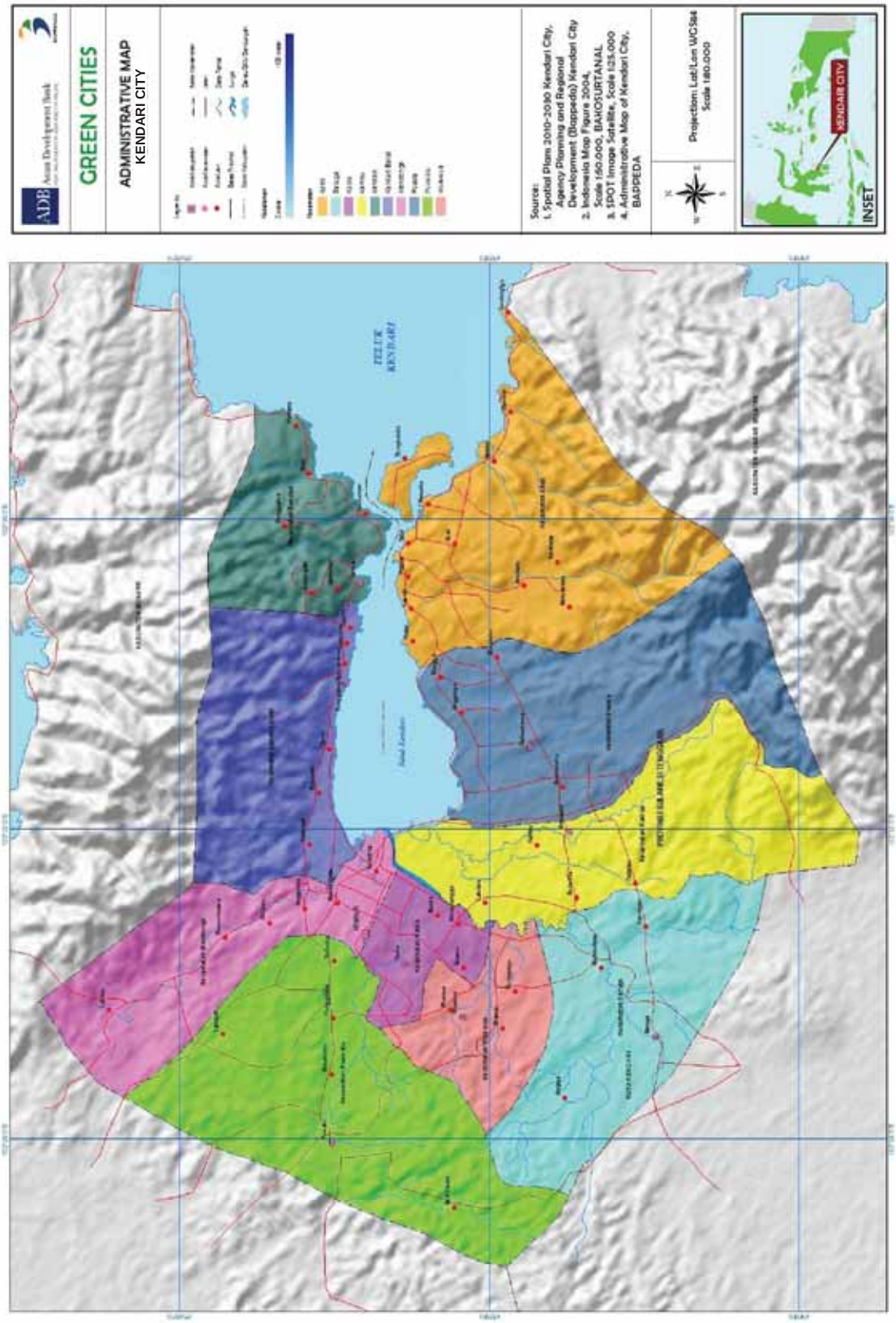
Ir. H. Asrun, M.Eng.Sc.
Walikota Kendari

Abbreviations

ADB	–	Asian Development Bank
APBN	–	Anggaran Pendapatan dan Belanja Negara (National Budget)
APBD	–	Anggaran Pendapatan dan Belanja Daerah (Regional Budget)
BAPPEDA	–	Badan Perencana Pembangunan Daerah (Regional body for planning and development)
BAPPENAs	–	Badan Perencanaan Pembangunan Nasional (Ministry of National Development Planning)
BIMP-EAGA	–	Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area
BLH	–	Badan Lingkungan Hidup (Environment Agency)
BOT	–	build–operate–transfer
BPBD	–	Badan Penanggulangan Bencana Daerah
BPPSPAM	–	Badan Pendukung Pengembangan Sistem Penyediaan Air Minum (National agency for supporting the development of water supply systems—Public Works)
BRT	–	bus rapid transport
cm	–	centimeter
CSR	–	corporate social responsibility
Dinas PU	–	Dinas Pekerjaan Umum (Kendari City Public Works Agency)
DKP	–	Dinas Kebersihan dan Pertamanan (Municipal Sanitation Agency)
GCAP	–	Green City Action Plan
GCP	–	Green Cities Program
GIS	–	geographic information system
ha	–	hectare
IMT-GT	–	Indonesia-Malaysia-Thailand Growth Triangle
IPLT	–	Instalasi Pengolahan Lumpur Tinja (Sludge Treatment Plant)
km	–	kilometer
km^2	–	square kilometer
lps	–	liters per second
LLTT	–	Layanan Lumpur Tinja Terjadwal (Regular Desludging Service)
MCA	–	Multi-Criteria Analysis
m^2	–	square meter

m^3	–	cubic meter
MW	–	megawatt
MSW	–	municipal solid waste
NRW	–	nonrevenue water
NMT	–	nonmotorized transport
NUDPS	–	National Urban Development Policy and Strategy (2x used only)
O&M	–	operation and maintenance
PAD	–	pendapatan asli daerah (local revenue)
PDAM	–	Perusahaan Daerah Air Minum (Water Supply Utility)
PFS	–	pre-feasibility study
PIP	–	project implementation plan
PLN	–	Perusahaan Listrik Negara (National Electric Company)
PPP	–	public–private partnership
PMU	–	project management unit
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)
SKPD	–	Satuan Kerja Perangkat Daerah (local Public Works Unit)
SLR	–	seawater level rise
SWM	–	solid waste management
TOR	–	terms of reference
TPS	–	intermediate waste collection points
TPA	–	Tempat Pembuangan Akhir (sanitary landfill site)
UDFC	–	Urban Drainage and Flood Control
WTE	–	waste-to-energy
WWTPS	–	wastewater treatment plants


TELUK KEND


GREEN CITIES
ADMINISTRATIVE MAP
KENDARI CITY
Source:
1. Spatial Plan 2010-2030 Kendari City, Agency Planning and Regional Development (Bappeda) Kendari City
2. Indonesia Map Figure 2004, Scale 150.000, BAKOSURTANAL
3. SPOT Image Satellite, Scale 125.000
4. Administrative Map of Kendari City, BAPPEDA
Projection: Lat/Lon WGS84
Scale 180.000
KENDARI CITY
INSET

Introduction

This Green City Action Plan (GCAP) supports the National Urban Development Policy and Strategy (NUDPS) 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 by (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 Kendari as stated below:

> *"To Actualize Kendari by 2020 as a Garden City that is Progressive, Democratic, and Affluent."*

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 NUDPS is the Green Cities Program (GCP),[1] which is implemented by 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 (MPWH) as the implementing agency. The City of Kendari 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 Kendari endeavored to scale up its GCP by promoting some of the 'heavier' green attributes, such as Green Water, Green Waste, and others, by preparing a Green City Action Plan (GCAP) with technical assistance from the Asian Development Bank (ADB).[2]

[1] Program Pengembangan Kota Hijau (P2KH).
[2] 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 Kendari's green vision over longer-term timescales. This integrated action plan complements the City of Kendari's statutory planning process, notably the Medium-Term Development Plan (RPJMD). Successful implementation of the GCAP would allow the City of Kendari 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 facilitiated by ADB consultants.

Summary of the GCAP Preparation Process

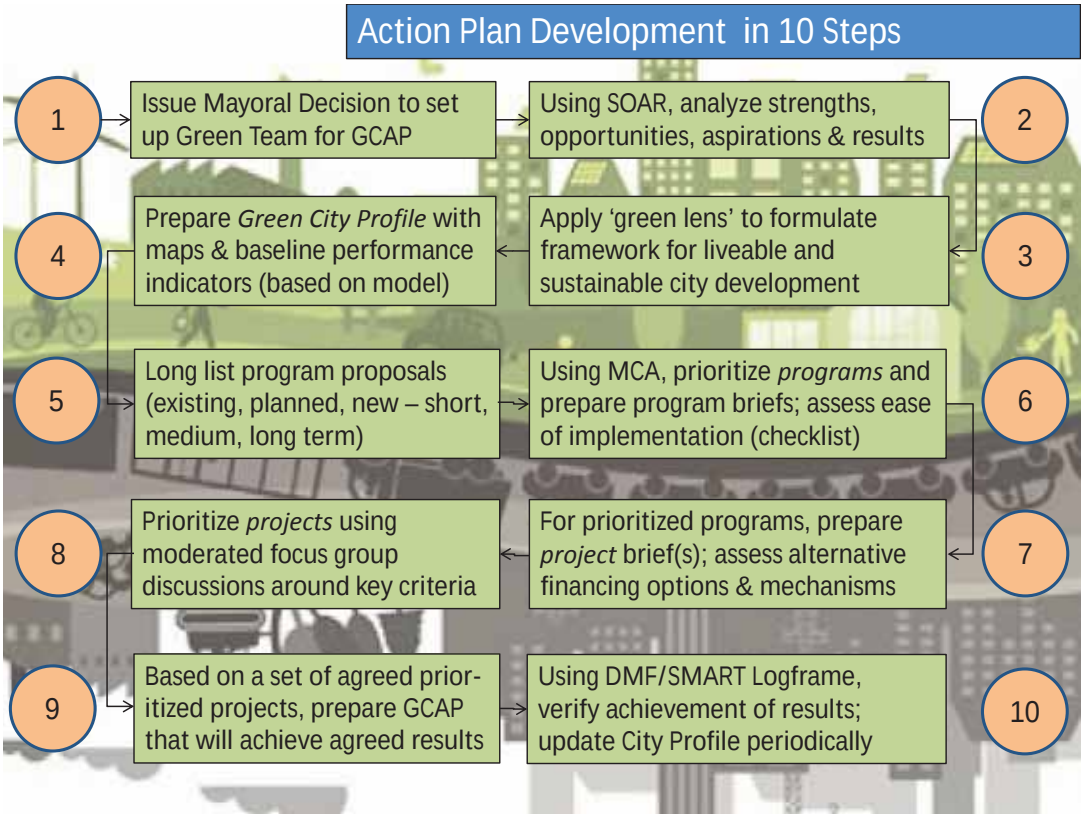
To realize this Green City Action Plan, it was essential to start with a vision for green development to guide the development of priority programs, projects, and manageable actions. The GCAP is the result of a process of identifying city development aspirations through a “green lens” to formulate a 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 to focus on five priority programs: Water Supply, Urban Drainage and Flood Control, Community-Based SWM, On-Site Sanitation, and Tidal Energy Generation (pilot). Green Education (Sekolah Adiwiyata) and Green Open Space development are included as continuous programs. Since the GCAP is a rolling plan, programs, projects and actions may be added and modified periodically.

The 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 Kendari’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.

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	**SOAR** (analysis of Strengths, Weaknesses, Aspirations, Results)	Powerpoint + FGD	Green City visioning as a basis for formulating SMART objectives
3	**Green City Profile** (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	**LCF + MCA** (Liveable City Framework & Multi Criteria Analysis)	Excel spreadsheets	Identify and rank priority programs
5	**Program & Project Brief** (template)	Word file	Formulate priority programs & projects
6	**Fiscal Capacity Analysis & Options for Alternative Modes of Financing**	Word file	For each brief, formulate modes of financing, CAPEX & OPEX as input for GCAP
7	**GCAP** template	Excel spreadsheet, Word file	Produce Action Plan
8	**SMART Logframe**	Powerpoint + accessoriess	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 Medium Term Development Plan (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 toward 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 Kendari’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 analyisis 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

The section below is a summary of the full Green City Profile developed by the Green Team as part of the action planning process that is appended to the GCAP. It is shortened here to provide a brief introduction.

The City of Kendari is the capital of the province of South-East Sulawesi, with an area of 295 km^2. The city is divided into 10 districts and 64 subdistricts. In 2014, the population of Kendari was 322,000, with an estimated annual population growth of 1.97%. Population density was 1,175 people per km^2 (2014).

The city government envisions Kendari 2020 as "a Garden City that is progressive, democratic and affluent." The result will be a "livable city." This vision is enshrined in Local Regulation No.10/2001 as well as in the city's spatial development plan. The term "Garden City" is understood to be a city with ample green open space to protect the environment and public facilities. The Regional Spatial Development Plan (*RTRW, 2010–2030*) defines its spatial mission as defending and strengthening environmental quality, equilibrium, and harmony.

To realize its vision, the city government prepared a program to improve conditions in slum areas and deliver adequate public services (*Renstra Dinas Tarkim, 2013–2017*). It also prepared a detailed spatial development plan (RDTR), a plan for built-up area and environment development (RTBL), and a zoning plan (*Renstra, 2013–2017*)

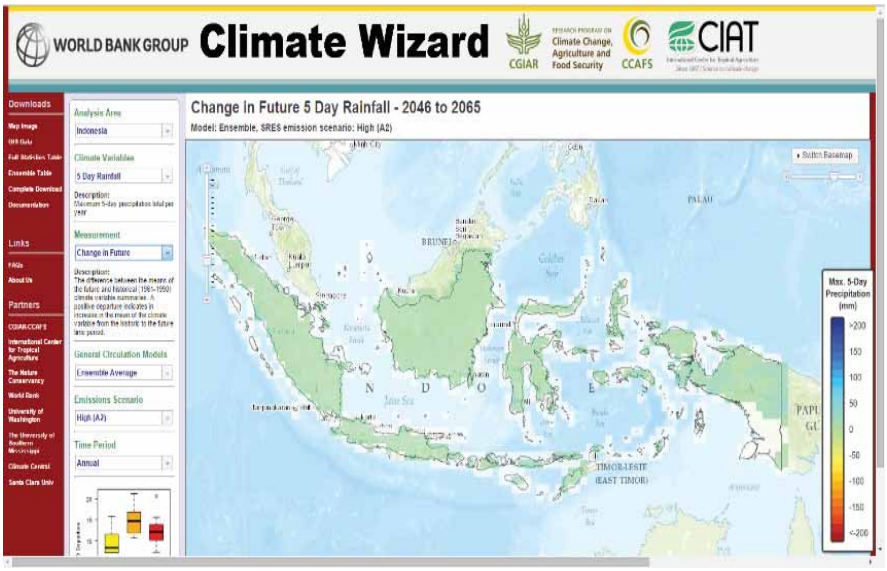
As described in the medium-term development plan 2013–2017, the city government is implementing a forest protection and land rehabilitation plan. The Department of Public Works is implementing a plan to overcome coastal erosion and landslides, primarily along rivers and steep slopes near residential areas. The environmental agency (BLH) has allocated funds to enable the city to participate in the national Clean City Award (ADIPURA) competition (award won in 2013), and the Green School Award (ADIWIYATA). All schools in the city have already reached advanced levels of green management.

Kendari does not have a formal action plan to deal with climate change, but is already implementing demonstration projects to reduce methane emissions in its final waste disposal site (TPA) (see Green Solid Waste below). The city also has allocated funds for climate change mitigation, but so far, its main output has been the creation of green parks. The national budget (APBN) has provided a special allocation fund (DAK) for this purpose. The disaster prevention agency (BPBD) has allocated funds for disaster prevention for the period 2013–2017. However, Kendari has serious natural and human resource limitations that hamper development, which can only be addressed, to some extent, by the GCAP.

Climate Change

Average temperature in Kendari is 25°C–27°C. Climate change is primarily driven by greenhouse emissions resulting from population growth and economic development. The profile of Kendari is based on the scenario used by the World Bank Climate Research

The Indonesia Climate Change Projection Portal



Source: http://climatewizard.ciat.cgiar.org/outputs1/Indonesia_annual/

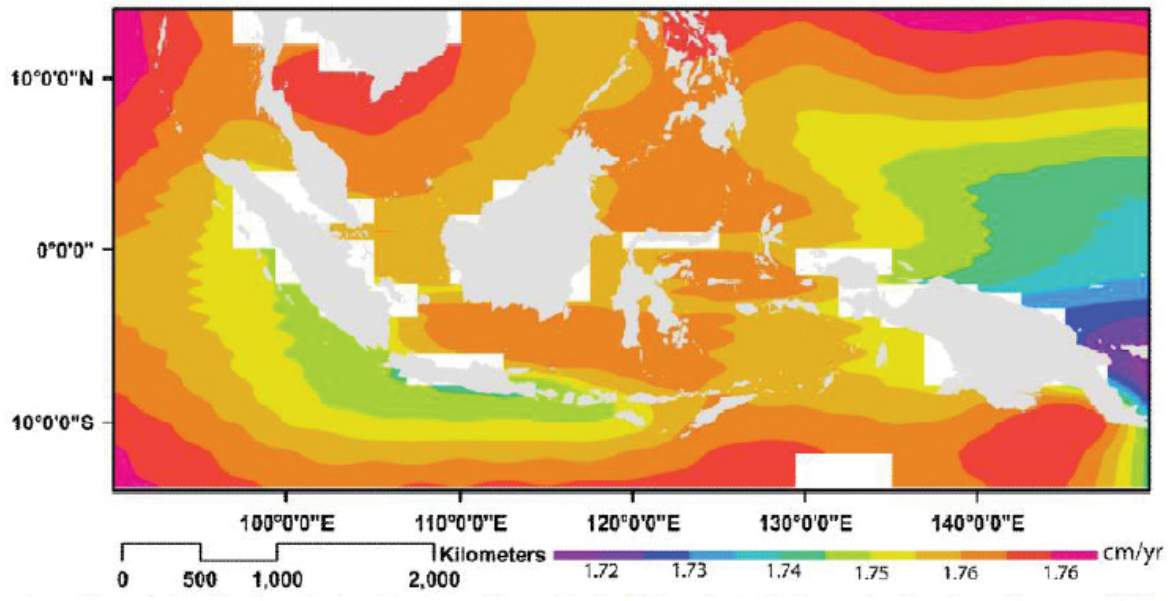
Program. The regional projection from this database is based on the results of nine global climate models that have statistically been regionalized for areas of around 50x50 km (2,500 km^2).

The climate change pattern predicted for Indonesia shows increased variability and seriousness of change, as well as increased likelihood of extreme events in the coming decades, including heat waves, dry spells, intense rainfall, etc. This projection is consistent with the South East Asia Climate Change Study (ADB 2009). The World Bank database also reinforces an assessment by the United Nations Development Programme (UNDP) in Indonesia.[3]

As explained in the National Climate Change Adaptation Action Plan (RAN-API), seawater level rises (SLR) constitute Indonesia's main threat because of its large number of coastal settlements, including Kendari. In 2050, SLR in Indonesia could reach 175 cm in 2100 (Bappenas, 2010b).

As shown on the map below, this has implications for Kendari because higher flood levels will hamper river outflow into the Kendari Bay and estuary. A heavy flood in 2013 was caused by a combination of high seawater and rainfall (see Drainage and Flood Control below). Another consequence will be increased water salinity in the rivers, which in turn will affect water supply, agriculture, and urban farming in Kendari.

[3] Karmalkar, A. et al. n.d. UNDP Climate Change Profiles: Indonesia. http://country-profiles.geog.ox.ac.uk



Source: Estimated rate of sea level rise in the Indonesian archipelago (Bappenas, 2010b)

As noted earlier, the city has initiated an action plan for Climate Change Mitigation and Adaptation, even though the scale of activities implemented by the environmental agency (BLH) is still limited. The National Agency for Regional Disaster Prevention (BNPB) has introduced a Disaster Reduction and Management Program for the city's Disaster Management Agency (BPBD) to help the city prevent and respond to emergency disasters. These activities are still being developed.

Spatial Development and Green Open Space

Built-up area and settlement patterns in Kendari are clustered around the west side of the Kendari Bay, which in fact is the estuary of the Wanggu River. The main environmental threat to the city center is flooding caused by the overflowing of the Wanggu River into the Kendari Bay area that is already heavily sedimented. This, combined with water outflow from the 22 streams from the surrounding hills during the rainy season, causes more flooding.

The mangrove areas bordering the Wanggu estuary have decreased dramatically during the last 50 years. It has gone down from around 500 hectares (ha) in the 1960s to about 28 ha at present. The city is now considering steps to preserve the remaining mangrove, as well as to replant on an area of 33 ha.

Also, low-lying areas and swamps around the Kendari Bay that in the past functioned as flood breakers have now been filled up with soil, and in some areas have become residential and commercial areas, but will remain under constant threats from flooding. In addition, about

20 ha of land in the Kendari Bay itself has been reclaimed using sediment dredged from the bottom.

The Spatial Development Plan (RTRW, 2012–2032) identified six main development areas: (1) the central commercial district bordering the Kendari Bay; (2) the central industrial area in Abeli near the container port; (3) the seaport on Bongkutoko island; (4) restoration of the Old Town on the coast; (5) zoning in the town center; and (6) development of a transport terminal, including warehouses along the corridor connecting the airport and seaport.[4]

The pattern of urban development does not correspond with official plans, primarily around the central business area and the fisherman settlement in Abeli along the southern coast of the Kendari Bay. Houses along the beach are regularly inundated, and a firm zoning control is required in those areas—especially because with uncontrolled settlement growth caused by the nearby seaport development, it will become much more expensive to take protective measures against rising seawater level rise.

Green open space is part of the city's Spatial Development Plan until 2032, although there is constant pressure on available green open space that is needed for environmental protection.

According to Law No. 26 Year 2007 on Spatial Planning, ideally, green open space (RTH) in Kendari City (10 subdistricts, total area of 29,500 ha) shall be 30% of the total area or equal to 8,850 ha, consisting of 20% public open space (1,770 ha) and 10% private open space (885 ha). At present, RTH stands at 50%, but there are plans to acquire more private land to be converted into public green open space.

According to the Ministry of Public Works Regulation No. 5/PRT/2008, the city shall provide an open space of 250 m^2 at neighborhood level (RT) (= 1 m^2/capita), 1,250 m^2 at community level (RW) (= 0.5 m^2/capita), 9,000 m^2 at village level (Kelurahan) (= 0.3 m^2/capita) and 24,000 m^2 at subdistrict level (Kecamatan) (= 0.2 m^2/capita). This, however, is not a guideline that can be easily applied in practice.

The overall target 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

The development of Kendari as a municipality and provincial capital is hampered by insufficient power supply and water supply. Regular interruptions in power supply affect the public water enterprise, Perusahaan Daerah Air Minum (PDAM), because its pumps depend on electricity supply (see Green Water Supply below). The city's diesel-fueled power plant (Cabang PLN) supplies 66 megawatts (MW), but should be able to supply at least 71 MW in order to serve the surrounding districts (Kolaka, Kolaka Utara, Unaaha, Konawe Utara, Konawe Selatan, and Bombana) with a total of 220,000 customers. In 2013, Kendari

[4] Local Government of Kendari. 2014. *Development Dynamics of Kendari City*. Kendari City.

had 86,613 connections, and 89% of those were household connections. Demand for new connections increases at 18% per year, twice the national average.

The Cabang PLN currently does not have a concrete plan to increase power supply. Although energy supply is beyond municipal authority and its statutory development planning process, this GCAP includes a proposal for tidal energy generation. As the situation is serious, it is hoped that interested parties, including the provincial government, PLN, MPWH, together with an independent power supplier, will be able to agree on a plan of action.

Baseline	Installed Capacity (MW)	Supply Ability (MW)
2015	66	66
2020	126	126

Source: PLN 2015

Green Water: Drinking Water Supply

Water supply comes from three rivers—Pokhara with 400 liters/second (lps), Wanggu with 20 lps, and Matabundo with 100 lps. In addition, there are three springs with a total capacity of 50 lps. The Pokhara River only supplies 297 lps out of the potential 400 lps because of the insufficient size of its transmission pipe, its length (16 km) and related leakages. All water is channeled to a water treatment plant (IPA) by gravitation. PDAM plans to increase pipe size and build a new downstream reservoir in the Pokhara. This, however, will increase risk of contamination. Citizens recall that in the 1970s, people were still swimming in the Wanggu River, but this has become impossible now because of chemical compounds used by the mining and other industries.

As a result of gradually disappearing vegetation in the water catchment areas, erosion is increasing, and water is becoming muddier. This, in turn, raises cost of water treatment. During the rainy season, water treatment becomes three times as expensive when compared during the dry season.

PDAM's low performance is attributed mainly to pipe leakages, illegal connections, collusion between customers and water meter readers, and broken water meters. In 2012, installed capacity was 7,489,700 m^3, but PDAM received revenue only from 3,623,900 m^3, corresponding with 53% nonrevenue water (NRW). In the following years, NRW remained stable at around 50%, whereas 25% is considered good. In 2012, water was supplied to 20,202 connected customers for 304,862 inhabitants. Supply per capita, therefore, amounted to 40 liters per day (lpd), far below the national urban standard of 130 lpd. In 2014, only 2,939,655 m^3 was supplied to 18,789 connections, while the population had increased to 322,607 inhabitants. This corresponded to a daily rate of 25 lpd, with only 5.8% of the population served. In some parts of town, water is available only for 3 days per week. This is in part caused by power outages that hamper PDAM's operations. Many customers were disconnected because of non-payment of bills.

Many citizens and companies have reverted to private sources of water supply, including wells and water trucks. Because of seawater intrusion, water from shallow wells contain high concentrations of calcium and magnesium that can only be used for nonconsumption purposes. As PDAM water costs Rp6,500 per m^3 (basic tariff), water supplied by trucks and

retailers can cost Rp50,000 per m^3, so this is clearly not a sustainable solution. At present, estimates of the volume of ground water extraction are not available.

In an effort to improve the situation, the GCAP proposed a project for reducing NRW to the standard of 25% by 2020.

Baseline	Production Capacity	% of Population Served
2012	270 liters/second	39.3%
2020	TBD	TBD

Source: PDAM 2015.

Green Water: Drainage and Flood Control

Kendari's geography, compounded by the sedimentation of the Kendari Bay area, cause drainage and flood control problems. Heavy sedimentation is not only the result of deforestation from surface mining upstream outside Kendari's administrative boundaries, but also deforestation from conversion into cacao plantations and mixed animal husbandry. The 2013 Wanggu River flooding combined high seawater levels with heavy rainfall that could not be quickly absorbed and evacuated by the shallowing Kendari Bay. It is estimated that the bay would have to be dredged at a rate of one million m^3 per year to overcome this problem. In an urbanizing environment characterized by mostly uncontrolled development, a large portion of household waste ends up in drains and waterways, clogging culverts (see Green Solid Waste below).[5]

In an effort to improve the situation, the GCAP proposed a project for improving drainage and flood control by 2020.

Green Solid Waste

It is estimated that the city produces 1,000 tons of waste per day, and that 60% (600 m^3, or 170 tons) is collected by the Sanitation Department (DKP) and delivered to the final waste disposal site (TPA) located in Puuwatu District, Kendari City, which is a controlled landfill of 13 ha, 28 km out of town, that has been in operation since 2003. There are plans to expand the site to 30 ha in 2017, and upgrade it to a sanitary landfill. It already has a composting facility and a demonstration project for the use of methane gas that is converted to electricity by the TPA itself, as well as a nearby settlement of about 100 dwelllings. The city government has plans to develop the area as a green zone for recreational purposes and an off-road biking track.

Kendari has 10 temporary waste disposal sites (TPS). Since currently only 3% of organic waste is being composted, 3 out of 10 TPS will become waste-segregation facilities (based on the 3R principle) that will reduce the amount of waste to be transported to the TPA.There are also 10 waste banks, even though these are stil small operations. The national oil company,

[5] http://www.tnol.asia/social/19399-environmental-problems-compound-kendari-flooding.html

Pertamina, provides grants under its corporate social responsibility (CSR) program to establish two more waste banks, all managed by the community.

Baseline Tons of Waste	Installed Waste Management Capacity	% of Solid Waste Treated
2015	300 m^3/day	50%
2020	455 m^3/day	55%

Source: DKP Kendari City (2015).

Green Human Waste

Kendari has no integrated sanitation system. Of the population, 84% uses individual septic tanks. The rest, mainly people living along the Kendari Bay or rivers, use pit latrines that discharge directly into the water.

The Sanitation Department (DKP) has two trucks to de-sludge septic tanks and take the waste to a treatment plant (IPLT). There are no reports about the proper functioning of the plant, and no records of the volume of treated waste.

At present, most septic tanks are estimated as not functioning correctly because of defective inlets, insufficient size, overflowing, and leakage.

The GCAP proposes a project to improve and expand on-site sanitation, provide a regular desludging service, and provide proper treatment of waste.

Baseline	Daily Volume of Human Waste	% Access to Sanitation
2015	59 ton/day	2%
2020	83 ton/day	TBD

Source: DKP Kendari City (2015).

Green Buildings

Green buildings have not yet become an important attribute for green development in Kendari, 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. In the future, certification should become a prerequisite for issuing building permits for any type of construction. The province of DKI Jakarta has issued Governor Regulation No. 38 Year 2012 on Green Buildings that can be used as an example for Kendari City. So far, Kendari City has no green building regulations.

Green Transportation

In 2014, Kendari had 641 km of roads, and 148,122 vehicles. Since 2011, the number of vehicles had increased by 60%, or 7% annually. In the same period, the number of utility vehicles increased by 17% annually, while the number of motorbikes increased by 17.5% annually. The number of minibuses increased by 21% annually during the same period. The municipality operates four passenger buses along the main corridor circling the Kendari Bay, and there is no indication if this operation is commercially viable.

The old seaport near the entrance to the Kendari Bay will be developed to accommodate more passenger traffic, while cargo shipment will be moved to a new container terminal on the island of Bungkutoko. The southern ring road will connect the city center with the container port.

Plans exist to build a bridge connecting the north and south side of the narrow estuary on the eastern end of the Kendari Bay. This would create a ring road and cut travel time significantly, but implementation is still under review.

Green Community

Kendari'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. It stimulated a number of green communities to participate in green planning and design, and to create green open spaces in their communities. Several other initiatives promoting resilient communities are ongoing, including green education (Sekolah Adiwiyata).

Resources

The City of Kendari, currently, does not have all the 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

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

Currently, Kendari's yearly budgets are not sufficient to finance the preparation of green capital projects. For illustration, Kendari's budget available for capital expenditures in 2014 was Rp784 billion (US$60 million). As part of this, GCAP Kendari has looked into ways to improve this situation by

- Increasing own local revenue;
- Attracting loans (municipal lending);

- Using available funds more efficient toward green capital projects; and
- Attracting alternative sources of finance to projects, for example by setting up joint ventures with the private sector, using build-operate-transfer (BOT) contracts, involving communities through cooperatives, and others.

Institutional Resources

Related to attracting infrastructure development projects and alternative sources of finance, Kendari has had little experience, and therefore, needs to develop its institutional capacity to generate much-needed investments.

Regulatory Resources

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

Conclusion

Based on the City Profile, and on agreed priorities based on the existing situation and capabilities, the City of Kendari 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 impact of such projects.

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

Green City Development Strategy to 2035

Kendari Green Urban Development Strategy until 2035

After completing the SOAR, and using 'green lensing' process, select the priority programs—from a long list to a short list. The matrix below summarizes Kendari's 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.)	Continuous program for urban forest development, including mangrove areas Continuous effort to acquire private 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 *kampungs* (PROKLIM)				
4	**Green Transport and Urban Mobility** (motorized and non-motorized)	To be designed in next phase of the CGAP				
5A	**Green Waste** (sanitation)	On-site sanitation system development	Program for the acceleration of house connections to the central sewerage system			
5B	**Green Waste** (solid waste)	Community-based SWM				
6A	**Green Water** (water supply)	Water supply system development				
6b	**Green Water** (urban drainage and flood control)	UDFC Masterplan, Database, Local Regulation, Sedimentation Control, etc.	Program for the 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)		Program for the green certification of buildings, including promotion of roof gardens, hanging gardens			
8	**Green Energy** (clean, efficient, and renewable)	Tidal electric power generation (pilot project)	Expansion of tidal electric power generation project			
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				

Source: Green Team/Mayor's Office.

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 12 programs as shown below, which was discussed with the Green Cities Steering Committee. Based on this discussion, the list was appraised and rearranged to identify the top four programs to be included in the listed programs. Proposals that could not be accommodated in this version of the GCAP will be further specified and incorporated into future versions. It should be noted, however, that during this process a new program for *tidal power generation* was proposed and subsequently included in a list of top five priorities.

Long List of 12 Ranked Green Programs

Ranking	Program
1	On-site sanitation with septic tanks and periodical desludging service (LLTT)
2	Development of urban drainage and flood control system
3	Efficient municipal water supply (PDAM)
4	Community-based SWM including waste banks
5	Tidal electric power generation in Kendari Bay
6	City slum eradication
7	On-site and off-site sanitation
8	Green City (Eco) tourism development in Kendari Bay area including mangrove expansion
9	Urban farming as contribution to economy, resilience, and green open space
10	Energy efficiency in public buildings, industries, street lighting, and communities
11	Expansion of green education program (Sekolah Adiwiyata)
12	Environmentally friendly public transport and urban mobility including NMT

Source: Green Team/Mayor's Office.

Priority Green Programs

From the above list, the top Five Priority Programs were selected based on their strategic importance to green development (Step 6).

Ranking	Program Selection
1	Expansion of on-site sanitation with septic tanks and periodical desludging service (LLTT)
2	Development of urban drainage and flood control system
3	Efficient municipal water supply (PDAM)
4	Community-based SWM, including waste banks
5	Tidal electric power generation in Kendari Bay

Source: Green Team/Mayor's Office.

1. **On-site sanitation with septic tanks and periodical desludging service (LLTT)**

   The aim of this program is to respond to an urgent need for better sanitation. One way to protect groundwater from contamination is to free the soil from *e. coli* bacteria. It is estimated that in Kendari only 5% of all existing septic tanks are watertight while a centralized sewerage system still has very limited coverage, with the result that groundwater is polluted. On-site septic tanks not only need to be made watertight, but their number need to be greatly increased to provide access to all low-income citizens. In addition, a regular desludging service needs to be made available to empty septic tanks.

   To achieve this, the community has to be persuaded to install new septic tanks, and repair or replace unsafe septic tanks to meet national health standards (*Standar Nasional Indonesia -SNI*) through advocacy, institutional development, and regulations concerning on-site sanitation management. In addition, on-site sanitation should be developed as a potentially profitable private enterprise. As an initial step, the municipality of Kendari will build septic tanks that meet SNI standards in public municipal buildings in Kendari as well as in low-income communities (*Masyarakat Berpenghasilan Rendah-MBR*).

2. **Urban drainage and flood control system**

   The aim of this program is to respond to an urgent need to reduce, and if possible, eliminate floods, inundations, and stagnant water that degrade roads and buildings in built-up areas. A master plan needs to be drafted, a local regulation enacted to implement it, and infrastructure needs to be developed. In addition, dredging of the Kendari Bay will be required to allow quicker discharge of rainwater.

3. **Municipal water supply**

   The aim of this program is to respond to an urgent need for reducing nonrevenue water (NRW) from over 50% to 25%, and a corporatization of the PDAM's operations. A master plan (RISPAM) exists but has not yet been implemented, in part due to lack of human and financial resources. A cooperation agreement needs to be made among the

national government, provincial government, and the municipality of Kendari to divide the responsibilities between the parties, and to strengthen the capacity of the PDAM. Considering that current local capability is insufficient, while at the same time citizens' ability and willingness to pay has sufficient elasticity, the intended turnaround is likely to require the participation of a third party.

4. **Community-based solid waste management**

   At present, solid waste is already managed quite well, but as the landfill site is becoming increasingly expensive to operate and expand as the population is growing, there is an urgent need to reduce the amount of waste that is going to the final disposal site by giving more impetus to management at the community level through waste banks.

5. **Tidal electrical energy generation in the Kendari Bay**

   Even though electricity supply is not a municipal responsibility, there is an urgent need to identify and promote additional sources of power generation that may reduce the shortages in Kendari and its surrounding areas, thus reactivating economic development and improving the delivery of public services. In addition, the city needs to promote more efficient use of available energy, including energy-efficient public buildings, factories, street lighting, and community solar panels. Construction of a waste-to-energy (WTE) plant may be considered in the future if the volume of waste produced warrants it. The initiative will start with the preparation of an Energy Masterplan, to be followed by a Pre-Feasibility Study (PFS) for a pilot tidal energy plant. This will require the engagement of several stakeholders at local, provincial, and national levels, as well as advice from independent power providers.

Final Selection of Priority Programs

After selecting the five priority programs, the Green Team reported the result to the GCAP Steering Committee, including the heads of all local government agencies (SKPD) involved, and finally had a consultation with the Regional Secretary (Sek Da Kota Kendari) as the representative of the mayor.

After final consideration of the financial, regulatory, and institutional risks for implementing each project and the interfaces and possible synergies between projects, it was concluded that four out of the five programs were implementable but required provincial, national, and/or international intervention. Only the community-based solid waste management (SWM) program could be implemented through the local budget (APBD) without external help. Programs 6 to 12 would also require external assistance and be formulated in the next stage of GCAP development.

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

Introduction

This section describes the prioritized programs, projects, and actions Kendari will undertake in the next 5 years. It also describes the institutional set-up that we will implement to ensure informed and timely decision making and careful management of the interfaces among the different projects. To avoid misunderstandings, 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, and others.

Project Management Unit (PMU)

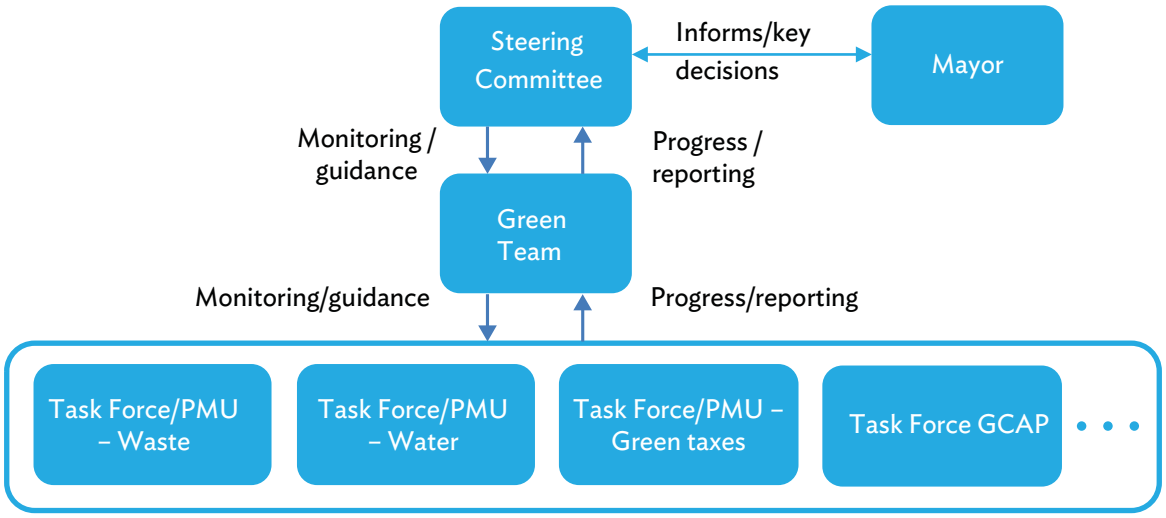
This is a temporary organizational unit created for the purpose of preparing a project implementation plan, and managing the project on a day-to-day basis. A PMU is headed by the agency responsible for the project. An operational budget for the PMU needs to be allocated. Representatives of relevant SKPDs, 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, but also 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 our efforts to transform Kendari into one of the greenest city in Indonesia. On top of the specific actions that 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.



Source: Green Team/Mayor's Office.

A Steering Committee (SC) will monitor and guide the progress of GCAP and actions on a quarterly basis. The mayor will chair the SC 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. It 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 SC 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 task forces 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 set-up and installation of SC and Green Team including description of roles, SOP, membership, and budgets	Mayor	Update in 2016
Continuation of the mayor's decree, including budget allocation	Head of Bappeda	Annually
Work plan of the Green Team, including initiating the setting up of specific task forces/PMUs for agreed projects	Green Team	As and when required
Evaluation of the performance of Green Team	Steering Committee	Bi-yearly

Source: Green Team/Mayor's Office.

The action plans that were included in the GCAP are presented in the following pages.

The Five Priority Programs—Action Plans

Ranking	Program Selection
1	Expansion of on-site sanitation with septic tanks and periodical desludging service (LLTT)
2	Development of urban drainage and flood control system
3	Efficient municipal water supply (PDAM)
4	Community-based SWM, including waste banks
5	Tidal electric power generation in Kendari Bay

Source: Green Team/Mayor's Office.

Green Water—Action Plan Program: Improvement of On-Site Sanitation System

Why?

Currently, Kendari City has a limited sewage network and uptake of on-site sanitation is limited. Open defecation and untreated waste entering the environment is common and less than 50% of households have acceptable toilet facilities. This is creating an impact on the groundwater, surface water, and bay environments and is unacceptable in terms of Kendari's Green City objectives.

Current Status

To increase coverage, the city government of Kendari has already decided to develop a new citywide sanitation strategy, and has drafted a law related to wastewater management, which is currently under discussion.

A wastewater treatment plant is planned for the densely populated area and a suitable location for this has already been identified.

Goal

The main objective of this program is to provide by 2020 regular 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 provision of a fleet of septage pumping trucks, and institutional strengthening.

Results

1. Provision of 4,000 impermeable septic tanks in 5 years.
2. Increasing the fleet of septage pumping vehicles.
3. A wastewater treatment plant to receive domestic waste and pumped septage.

Benefits

1. Reduces the sanitation impact on both groundwater and surface water and, thus, on human health.
2. Strengthens resistance to ecological hazards.
3. Provides a public service that is efficient and reliable.

Success Indicators (targets)

Indiscriminate defecation (%)	
2015	11
2020	0
Regular septage pumping (% of households)	
2015	0.7
2020	10
Household sanitation facilities (%)	
2015	46
2020	100

Source: Green Team/Mayor's Office.

Key Risks

1. Delayed approval of the law/regulation and law governing on-site and off-site sanitation.
2. Low interest of the community on some aspects of septic tank sanitation, which may slow down implementation.

Risk Mitigation

1. Pass a law as soon as possible while local political will is present.
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 to disseminate information.

Project SAN1: Establish Effective On-Site Sanitation Services

This project aims to implement sustainable on-site sanitation services including provision of 4,000 septic tanks and an operational unit in the Department of Hygiene, as well as private operators, to operate a septage pumping fleet. To enable this project, a new law is to be passed by the local council and a Sanitation Working Group will be established.

Action	Description and Responsibilities	Time Frame
SAN1.1	The local council to pass a law related to city management of wastewater, including the legal obligation of septic tank owners to desludge tanks every 2 years.	2016
SAN1.2	The Department of Hygiene, to establish a citywide sanitation working group to coordinate relevant activities. Working group to involve BLH, Public Works, PDAM, Bappeda, Department of Health, Parks Authority, and relevant community groups.	2016
SAN1.3	Public Works, in consultation with the sanitation working group to develop a plan to provide 4,000 septic tanks and increase the fleet of septage pumping vehicles, including responsibilities, time frame, and budgets.	2017
SAN1.4	The sanitation working group and the Department of Health to design and implement a socialization program, including the importance of personal hygiene, use and construction of household sanitation facilities, environmental impact, and disseminate plans to implement an on-site sanitation program.	2017–2018
SAN1.5	Public Works to design, prefabricate, and install 4,000 septic tanks over 4 years.	2017–2020
SAN1.6	Establish an on-site sanitation pumping unit within the Department of Hygiene.	2017
SAN1.7	Department of Hygiene to procure and operate two additional septage pumping vehicles.	2017
SAN1.8	The Department of Hygiene to work with the sanitation working group and private sector to write and/or outline operating procedures, and establish septage collection fees to encourage eight additional privately operated septage pumping vehicles.	2018
Responsible agency (PMU)	Department of Hygiene	
Estimated costs (budget needs)	**Preparation (design, procure):** Rp1.0 billion **Realization (CAPEX):** Rp3.0 billion/year (4 years) **Maintenance and operation:** To be determined	
Implementing mechanism, funding, and financing	APBN and APBD. Private operators of eight septage pumping vehicles	
Other partners	**Kendari:** Sanitation Working Group, Public Works, Bappeda, BLH **National government:** Ministry of Public Works and Ministry of Health **Social/communities:** WAHLI, AKKOPSI, residents, and community groups	

Source: Green Team/Mayor's Office.

Project SAN2: Establish Public Toilets in Public Parks

Pilot composting (dry) toilets have been proposed in public parks in Kendari. This will require establishing a pilot project, and if successful, upscaling this to other public areas.

Action	Description and Responsibilities	Time Frame
SAN2.1	Establish PMU in Public Works Department, with members of the Sanitation Working Group.	2017
SAN2.2	Identify suitable pilot project location.	2017
SAN2.3	Finalize design of composting toilets based on best practice international literature.	2017
SAN2.4	Construct bio-toilets.	2018
SAN2.5	Scale up project to all public parks if pilot project is successful.	2019
SAN2.6	Establish an operations unit in the City Parks Agency.	2019
Responsible agency (PMU)	Public Works Deparment	
Estimated costs (budget needs)	**Realization (CAPEX):** Rp500 million	
Implementing mechanism, funding, and financing	City Budget	
Other partners	**Kendari:** Department of Hygiene, Parks Agency	

Source: Green Team/Mayor's Office.

Project SAN3: Construct Six Communal WWTPs in the Densely Populated Coastal Regions of Kendari Bay Provide wastewater treatment plant to serve these densely populated and poor areas, which discharge effluent directly to the bay.		
Action	**Description and Responsibilities**	**Time Frame**
SAN3.1	Establish a PMU in Public Works for developing large septage storage facilities including secondary treatment of liquid effluent before discharge to the bay.	2106
SAN3.2	Public Works Department to identify suitable sites and liaise with Bappeda on land acquisition.	2017
SAN3.3	Undertake a feasibility study to establish an appropriate and replicable design for these small treatment facilities. Consider large communal septic tanks with secondary treatment for liquid effluent.	2017
SAN3.4	Commission detailed design.	2018
SAN3.5	Ovesee construction.	2018
SAN3.6	Include operation of these facilities in the technical operations unit of the Department of Hygiene.	2018
Responsible agency (PMU)	Public Works	
Estimated costs (budget needs)	**Preparation (design, procure):** Rp500 million **Realization (CAPEX):** Rp2.0 billion **Maintenance and operation:** To be determined	
Implementing mechanism, funding, and financing	Not applicable	
Other partners	**Kendari:** Department of Hygiene, Sanitation Working Group **Social/communities:** RW/RT of selected communities	

WWTPS = wastewater treatment plants.
Source: Green Team/Mayor's Office.

Green Water—Action Plan Program: Urban Drainage and Flood Control

Why?

It is forecast that because of insufficient drainage and flood control infrastructure, Kendari City will increasingly suffer from floodings as a result of continuous population growth, deforestation, sedimentation, and climate change. The recurring floods in the city cause disruptions to traffic, health hazards, and risks to the local economy. If no remedial action is taken, these disruptions will continue to grow in importance. Kendari needs improved resilience to flooding through improved infrastructure, planning, and management.

Current Status

Kendari has no master plan and local regulation on drainage and flood control yet, although these are urgently needed. At present, response to floodings is ad hoc, mainly by engaging citizens in periodical cleaning of drains, and dredging canals to remove excessive sediment. Detailed engineering designs (DED) have been prepared for five sub-catchments without an integrated approach to urban flood risk management, and construction has not yet commenced. There is insufficient enforcement of discipline in properly disposing of household, commercial, and industrial wastes (this is addressed under the Waste Banks Program).

The Kendari Bay is becoming increasingly shallow because of sedimentation. This is caused by the 22 rivers and creeks flowing into the bay, and aggravated by the gradual disappearance of the coastal mangrove forest, surface mining in the upstream area outside the Kendari City boundary (that also introduces poisonous minerals into the sediments), and increased deforestation. It is estimated that 1 million m^3 of sediments need to be dredged from the bay annually to prevent it from disappearing altogether.

Goal

The main objective of this program is to provide by 2020 an adequate drainage and flood control system that is able to prevent all but the most extreme floods, will safeguard the Kendari Bay as a Green Belt and potential area for ecotourism, can be periodically upgraded and improved to anticipate future drainage and flood control problems, and enforces compliance with environmental regulations on cleanliness.

In addition, adequate annual dredging of the Kendari Bay will have a significant impact on the feasibility and effectiveness of another proposed program, the *Green Tidal Energy Generation Pilot* that requires the tidal current from the Kendari Bay to be as large as possible in order to maximize power. Due to its importance, dredging is listed as one of the projects in the urban drainage and flood control program.

Results

1. Kendari Masterplan for Drainage and Flood Control, 2017–2035
2. A local regulation (Perda) to implement the master plan and enforce compliance
3. Budgets acquired to implement the master plan
4. Infrastructure built according to the master plan
5. Management capacity established to operate and maintain the drainage and flood control system

Benefits

1. Reduced flooding.
2. Increased cleanliness.
3. Reduced health hazards.
4. Improved business and reduced economic loss.
5. Kendari Bay safeguarded as a potential area for ecotourism and tidal energy generation.

Success Indicators (targets)

Regular Inundation Area (ha)	
2015	6,500
2020	5,500

Source: Green Team/Mayor's Office.

Key Risks

1. Delayed design, approval, and funding of the Masterplan and Local Regulation.
2. Insufficient cooperation between municipal agencies to implement and enforce the Masterplan and Local Regulation.
3. Continued low citizen commitment to proper waste management.
4. Potential displacement of staff in related agencies to manage the program.

Risk Mitigation

1. Implement regulatory updates as soon as possible while local political will is present (before policy/regime changes occur in 2017).
2. Establish a working group to coordinate this program.
3. Undertake a social marketing strategy to engage citizens in environmental aspects of drainage and flood control, and disseminate information periodically.

Project FL1: Establish Integrated Database for the Kendari Drainage and Flood Control System

To develop an integrated system to manage urban flooding in Kendari, particularly on planning infrastructure and asset management, a database should be established incorporating all existing data. This should use an integrated GIS platform, such as that used by the Spatial Planning Agency.

Action	Description and Responsibilities	Time Frame
FL1.1	Establish a drainage and flood data unit in Kendari Public Works Department	2016
FL1.2	Liaise with the Spatial Planning Agency on GIS capacity and best approach to data management	2016
FL1.3	Assemble hard, soft, and electronic data for digitizing into GIS layers, including topography and natural drainage network, hard drainage assets, embankments, inundation areas, issues reported, and others	2017
FL1.4	Maintain GIS database platform with assistance from the City Planning Agency	Ongoing
Responsible agency (PMU)	Public Works Department	
Estimated costs (budget needs)	**Preparation (design, procure):** ~Rp500 million	
Implementing mechanism, funding, and financing	APBD Kendari	
Other partners	**Kendari:** Bappeda, BLH, Spatial Planning Agency **National government:** Ministry of Public Works	

Source: Green Team/Mayor's Office.

Project FL2: Prepare the Kendari Urban Drainage and Flood Control Master Plan

Currently, drainage improvements and flood risk mitigation measures are implemented in an ad hoc manner. There is some capacity to procure detailed engineering designs for drainage, and construct and maintain such infrastructure but there is little strategic planning and coordination to ensure that infrastructure is implemented effectively and efficiently in improving urban resilience. The terms of reference for this will include (but not limited to) the following:

- Considering sustainable urban drainage principles, including Kendari's "making space for water." This will require liaising with the Spatial Planning Agency.
- Consideration of climate change.
- Develop short-term priority investments, medium-term projects, and longer-term programs to reduce flood risk in an integrated way.
- The master plan should propose institutional and budgetary requirements for implementing the short-, medium-, and long-term investments.
- Participative planning with the city's Green Team to ensure a coordinated and integrated approach.

Action	Description and Responsibilities	Time Frame
FL2.1	The Public Works Department to commission a drainage and flood risk mitigation master plan for Kendari.	2017
FL2.2	The Public Works Department to commission any additional technical assessments and surveys to enable the master planning process, including hydrological monitoring, modelling, and updated topographic surveying.	2017–2018
FL2.3	Provide counterpart staff to work with consultants to develop capacity, and update outputs in the GIS database.	2018
Responsible agency (PMU)	Public Works Department	
Estimated costs (budget needs)	**Preparation (design, procure):** ~Rp250 million	
Implementing mechanism, funding, and financing	APBD Kendari	
Other partners	**Kendari:** Bappeda, BLH, City Planning Agency, Green Team **National government:** Ministry of Public Works	

Source: Green Team/Mayor's Office.

Project FL3: Draft and Enact a Local Regulation (bylaw, Perda) on the Kendari Master Plan for Urban Drainage and Flood Control

To implement the drainage master plan, a local regulation is needed to legalize the master plan and thus enable budget allocation for implementation. The regulation should be based on the recommendations of the master plan and to cover the following:

- Budget allocation and approval.
- Responsibilities for design, procurement, construction, and maintenance of drainage assets.
- Regulation of impermeable surface construction on new developments (to reduce surface runoff).
- Responsibility of developers for maintaining drainage assets adjacent to their land.
- Public participation in drain maintenance.
- Regulation of discharges (effluents) to drains.
- Sanctions for interrupting the local drainage system.

Action	Description and Responsibilities	Time Frame
FL3.1	Draft academic paper with Perda recommendations and outline.	2018
FL3.2	The Public Works Department to draft Perda and submit Perda to the Local Council for approval.	2018
FL3.3	Enact the local regulation by implementing priority drainage infrastructure detailed in the master plan.	
FL3.4	The Public Works Department to coordinate with Bappeda to resolve land acquisition issues, obtain permits, arrange funding, etc.	2018
FL3.5	Detailed design and construction supervision.	2019
FL3.6	Allocate human resources and budget for a sustainable urban drainage maintenance and regulation team within public works. Work with GIS operators, spatial planners, other infrastructure development agencies, private sector, and communities in an integrated asset management approach.	2019
Responsible agency (PMU)	Public Works Department	
Estimated costs (budget needs)	**Realization (CAPEX):** Estimated at Rp15 billion/year (5 years) **Maintenance and operation:** Estimated at Rp1.0 billion/year	
Implementing mechanism, funding, and financing	APBD, APBN, provincial and national funding	
Other partners	**Kendari:** Bappeda, BLH, City Planning Agency, Sanitation Agency **National government:** Ministry of Public Works	

Source: Green Team/Mayor's Office.

Project FL4: Control Sedimentation in the Kendari Bay Area to Safeguard Its Potential Role as an Ecotourism Area and its Potential for Future Tidal Energy Production

The Kendari Bay represents an important economic asset to our city, including tourism and commercial potential, as well as the possibility for future tidal energy generation. Managing sedimentation requires a coordinated approach to manage development and land use within the drainage catchments, as well as local issues related to sediment mobilization and other local solutions (sediment capture, dredging).

Action	Description and Responsibilities	Time Frame
FL4.1	The Public Works Department to establish a Kendari Bay Catchment Management Committee for controlling bay sedimentation, including regional governments, landowners, and the private sector.	2016
FL4.2	Dredging of rivers and shallow/strategic bay areas	2016-ongoing
FL4.3	Commission bathymetric survey to determine the depth and contours of the Kendari Bay.	2017
FL4.4	Check dams constructed in tributaries of the main river channels (Wanggu, Tipulu, Mandonga, and Sodohoa rivers).	2017
FL4.5	Participation with provincial authorities, the private sector (mining companies), and farmers within the catchment areas to reduce sediment production.	2017
FL4.6	Rehabilitation of mangrove forest as an 'ecological capital' solution to retain sediment in the bay fringes and provide other benefits related to climate change, habitat creation, and tourism.	2017
Responsible agency (PMU)	Public Works, Kendari Bay Catchment Management Committee	
Estimated costs (budget needs)	**Realization (CAPEX):** Rp1.5 billion **Maintenance and operation:** To be determined	
Implementing mechanism, funding, and financing	APBD	
Other partners	**Kendari:** Bappeda, BLH **Provincial:** Provincial and regional governments **National government:** Ministry of Public Works and Ministry of Health **Social/communities:** Farmers, landowners, and communities in the catchment areas **Private sector:** Mineral operators	

Source: Green Team/Mayor's Office.

Green Water—Action Plan Program: Increasing the Efficiency and Supply of Drinking Water

Why?

Due to population growth in Kendari, and lack of follow up to the recent investment (since 2000 under the World Bank's loan-financed project, called Sulawesi Urban Development Project) in water supply infrastructure, particularly in the distribution system, there are large unserviced areas within the city, while many urban residents lack access to adequate and safe water supply and sanitation services. The current service coverage provides drinking water to 35% (20,202 house connections, 2015) of the total population. PDAM Tirta Anoa, our city's water utility enterprise, operates unsustainably and delivers substandard services. Currently, the maintenance of systems is restricted by a lack of funding and limited revenues from treated water, 56% of which are nonrevenue water (NRW).

To meet national government targets (100% access to clean drinking water), improve liveability in our city, human health, and facilitate economic growth, the city needs to work with PDAM to improve efficiency and management in water supply, reduce losses, and increase the coverage and reliability of treated water supply.

Current Status

The total value of lost water produced by PDAM Tirta Anoa is estimated at Rp38 billion/year and total revenue is Rp34 billion/year. An NRW study was undertaken in 2015, which suggested that physical leakage reaches 2.3 million m^3/year due to poor maintenance and over-pressurization of the distribution network; over 0.5 million m^3/year is caused by errors in water meter data management; and 0.78m^3/year is lost through illegal connections.

The NRW issue creates a negative feedback cycle as lost revenues result in poor operating and management practices and inability to undertake maintenance works. Energy supply issues create unreliability, which in turn creates reluctance in bill paying, and many complaints to the PDAM office.

There is currently sufficient raw water supply, hence, the pressing issue is improving management and operation and maintaining distribution networks to create a sustainable water supply organization. For this, PDAM requires support from a number of city stakeholders, hence, its inclusion in this GCAP to allow for better management of institutional partnerships for implementation, particularly coordination among the Bappeda, Department of Housing, and PDAM. It is also necessary for PDAM to coordinate with the central government stakeholders.

A water supply master plan has been produced.

Goal

The project aims to address the most urgent needs of the urban water sector by improving and expanding services; and to contribute to the government's target of achieving 100% piped water supply coverage in urban areas by 2020 by (i) rehabilitating and improving existing water treatment plants, (ii) augmenting or replacing existing distribution pipelines to increase system pressure and improve service delivery, (iii) providing new transmission and distribution pipelines, (iii) providing improved 24-hour service coverage and better water quality, (iv) making the PDAM more autonomous and therefore more financially sustainable, and (v) providing capacity development support to PDAM.

Water security actions and an additional water treatment plant are included in the water supply master plan, and are thus included in this action plan. While our priority is to increase customers, reliability, and better operation and management, we should not forget about securing the future water needs of our city.

Results

1. New distribution pipelines rehabilitated and installed.
2. An increase or an additional of 20,000 household connections, and marketing to increase PDAM customers to 40,000 by 2020.
3. Improved energy efficiency of the water supply system and reduced NRW, thus, specifically reducing unaccounted-for-water (NRW) from 46% in 2015 to 30% in 2020.
4. Improved PDAM management system.

Benefits

5. An improvement of public service infrastructure in water supply.
6. Improvement of health and hygiene of residents, and productivity and liveability in the city.
7. Access to drinking water for the urban poor.
8. Promotion of energy efficiency, reducing carbon footprint.
9. Better revenue generation to improve the financial performance of PDAM.

Success Indicators (targets)

Year	Coverage Piped Water Supply Services to Residents
2015	35%
2020	50%
Reduction in Nonrevenue Water	
2015	56%
2020	30%
House Connections	
2015	20,200
2020	40,000

Source: Green Team/Mayor's Office.

Key Risks

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

1. Raw water sources are depleted. The government does not implement regulatory changes to protect the catchment areas.
2. Funding availability.
3. Lack of human resources for project management and implementation may cause delays in project implementation.
4. Private sector agreements may be difficult to finalize.

Risk Mitigation

1. Decision making by the city mayor and implementing agencies (i.e., PDAM, Bappeda, Dinas PU) is timely.
2. Institutional coordination between the city government and PDAM (through the Green Team) in implementing network expansions in line with increases in treated water supply.
3. Kendari should seek technical assistance from Jakarta to assist in arrangements with the private sector.
4. O&M is prioritized and sufficient funds are allocated by PDAM in its annual budget.
5. Appropriate tariffs imposed for PDAM's cost recovery.
6. Provide specific support and on-the-job training to mitigate these risks and the PDAM will ensure that additional qualified staff are recruited.

Project WAT1: Prepare to Implement an Integrated Nonrevenue Water Reduction Program

Nonrevenue water (NRW) reduction requires many integrated components from technical design and installation of appropriate infrastructure (including pumping, networks, and meters), through operational asset management, financial management, information management, marketing to new customers, and enforcement.

Feasibility study should consider the following:

- Detection and reduction of leakage and a leakage repair/maintenance program.
- Gradually introducing improved district metering areas and data-basing to evaluate losses.
- Installation of pressure reduction valves.
- Replacement of customer water meters, phasing in digital water meters.
- The possibility of involving the private sector to undertake an energy-efficiency audit and implementing energy efficiency. improvements (re-specification of pumps, etc.) through an ESCO-type arrangement.
- Tariffs and financial management improvements.
- Regulatory issues and enforcement.

Currently, the PDAM is receiving technical assistance from Public Works in Jakarta. PDAM Tirta Anoa will use this wisely and develop a plan for an integrated feasibility study for NRW reduction. PDAM can start by undertaking necessary tasks.

A realistic business plan then needs to be established.

Preparation for this program includes developing a marketing strategy, and in-house capacity development. PDAM will require support from the city in preparing an NRW program.

Action and Planning (action completed)	Description and Responsibilities	Time Frame
WAT1.1	PDAM consults with the BPPSPAM department of the Ministry of Public Works to develop the NRW study into a feasibility study for improvements.	2016
WAT1.2	Bappeda allocates budget for a feasibility study into NRW improvements.	2016
WAT1.3	PDAM conducts initial studies that will • Identify physical and non-physical water losses • Measure water pressure in house connections • Conduct metering analysis to update NRW baseline.	
WAT1.4	PDAM drafts comprehensive terms of references (TOR) and allocate the funds within its business plan 2017.	2016
WAT1.5	PDAM, in collaboration with Bappeda, processes the procurement of support consultants in the implementation of the FS for NRW reduction program activities. PDAM provides transparent financial data.	2017
WAT1.6	PDAM (with the assistance of Bappeda and BPPSPAM) approves the FS and holds public consultation together with PDAM and the consultant to ensure public acceptance and implementation.	2017
WAT1.7	PDAM develops a business plan for 2018 in line with the findings of the approved feasibility study, allocating budgets for Projects 2, 3, and 4 (PROJECTS WAT2 WAT3 & WAT4).	2017
WAT1.8	Investment in staff is critical and budgets need to be allocated for hiring, retaining, and training quality staff. Human resources is a key issue for PDAM and needs to be addressed as soon as possible, through an in-house Human Resources Development Program, which maps skills gaps throughout the organization and identifies external and internal training courses to develop skills. Training with PDAM Malang has already commenced.	2017
WAT1.9	Marketing to new and existing customers to socialize water tariffs, increase customer base, and reduce illegal connections.	2017

continued on next page

Table continued

Responsible agency (PMU)	PDAM Tirta Anoa
Estimated costs (budget needs)	**Preparation (design, procure):** Rp750 million **Realization (CAPEX):** ~ To be determined based on the feasibility study **Maintenance and operation:** To be determined based on the feasibility study
Implementing mechanism, funding, and financing	Not applicable
Other partners	**Kendari:** Bappeda Office, Green Team **National government:** Ministry of Public Works and Housing, BPPSPAM **Social/communities:** Customer consultation

Source: Green Team/Mayor's Office.

Project WAT2: Implement Nonrevenue Water Reduction (from 45% to 30% by 2020)

This project is a result of Project 1 and needs to be integrated with Project 3 because rehabilitating and expanding networks should consider leakage reduction and metering/zoning; and Project 4 because new household connections should be metered and affordable tariffs set and collected.

Actions and Planning (action completed)	Description and Responsibilities	Time Frame
WAT2.1	PDAM to assign a PMU to develop a detailed project implementation plan (based on NRW aspects of the business plan), including coordination strategy. Green teams and Bappeda can act in a coordinating role. Initial consultation with specialist energy efficiency companies.	2017
WAT2.2	PDAM undertakes procurement of all necessary supplies (leak detection equipment, piping and accessories, meters, pressure meters, etc.) to rehabilitate existing networks and reduce water losses in coordination with Project 3.	2018
WAT2.3	PDAM commissions a specialist firm to undertake an energy-efficiency audit, with the view to engage the private sector (through an ESCO arrangement) in financing energy-efficiency measures to produce savings.	2018
WAT2.4	Gradual phasing of district metered areas in coordination with Project 3.	2018–2020
WAT2.5	Evaluation of excessive pressure and procurement and installation of pressure reduction valves. Replacement of inefficient pumps.	2018–2020
WAT2.6	Social marketing of payment for water to reduce illegal connections and prosecutions.	2018–2020
Responsible agency (PMU)	**PDAM:** Responsible for delivering NRW reductions and energy efficiency improvements	
Estimated costs (budget needs)	**Preparation (design):** Rp750 million **Realization (construction):** Estimated in Project 1	
Implementing mechanism, funding, and financing	Traditional procurement, ESCO	
Other partners	**Social/communities:** PDAM customers	

Source: Green Team/Mayor's Office.

Project WAT3: Extension of Distribution Network of SPAM PDAM

Kendari City Public Works Agency (Dinas PU), in partnership with PDAM, will add to existing networks where capacity is insufficient due to increased population in those areas, and provide new distribution networks in unserved areas.

The Bappeda of Kendari City should coordinate the planning of this action as it requires a number of inputs, surveys, and social data. The Dinas PU and PDAM will evaluate existing networks and a plan in stages to implement these improvements will be developed. PDAM will evaluate the existing conveyance of water transmission pipelines and propose upgrades necessary to meet future requirements in all water supply zones—and specify the necessary improvements. The Dinas PU is responsible for the design and construction. Operation and maintenance responsibilities are transferred to PDAM on completion.

Actions and Planning (action completed)	Description and Responsibilities	Time Frame
WAT3.1	Green Team to set up a project management unit (PMU) to be led by Bappeda, including the Dinas PU and PDAM.	2017
WAT3.2	Dinas PU, Bappeda, and the City Spatial Planning Agency to undertake initial survey of potential, suitably populated areas for the water distribution network expansion plan.	2017
WAT3.3	PDAM to evaluate conveyance of existing networks, identifying required upgrades in pipe diameter.	2017
WAT3.4	The Department of Public Works drafts a workplan for implementing the required expansion/upgrades to the distribution network, including detailed activities, responsibilities, timeline, need for external assistance (consultants), budget, etc.	2018
WAT3.5	Approve project implementation plan and budget.	2018
WAT3.6	The Department of Public Works undertakes procurement of detailed design, cost estimates.	2018
WAT3.7	Detailed consultation phase with all relevant stakeholders, city agencies—housing, environment, highways—and communities and landowners affected by easements and construction.	2019
WAT3.8	Excavation permits issued by the highways agency and EIA approved by BLH.	2019
WAT3.9	The Public Works Department tenders construction, and supervises project implementation.	2019
WAT3.10	Project completion and transfer of infrastructure to PDAM.	2020
Responsible agency (PMU)	**Dinas PU:** Responsible for the construction of water distribution networks	
Estimated costs (budget needs)	**Preparation (design):** Rp1.2 billion **Realization (construction):** Rp60 billion	
Implementing mechanism, funding, and financing	• Traditional procurement • Funding by APBD I and APBD II	
Other partners	**Kendari:** Bappeda, Spatial Planning Agency, BLH, Highways, Police Department, and transportation agency (for mitigating construction impacts on traffic), partnership with other utilities to improve efficiency in utility network expansions **Regional:** PDAM **Social/communities:** Affected communities, businesses, social services (schools, hospitals, etc.)	

Source: Green Team/Mayor's Office.

Project WAT4: Installation of Metered House Connections with a Target of 40,000 Households (2020)

To increase the customer base and thus revenue, in line with network expansions and provide water supply to residents, PDAM will increase the number of household connections from 20,000 to 40,000 by 2020.

Action and Planning (action completed)	Description and Responsibilities	Time Frame
WAT4.1	In coordination with Project 3, PDAM maps potential for new customers.	2018
WAT4.2	PDAM prepares payment scheme for new connections.	2018
WAT4.3	PDAM undertakes socialization and promotion to potential new water supply customers.	2018
WAT4.4	PDAM undertakes procurement and installation of new water connection. PDAM replaces faulty water meters of existing customers.	2018–2020
WAT4.5	Establish new customers in existing billing register/database, and integrate with the GIS system.	2020
Responsible agency (PMU)	PDAM Tirti Anoa	
Estimated costs (budget needs)	**Preparation (design, procure):** ~ Rp500 million **Realization (CAPEX):** ~ Rp3 million/connection **Maintenance and operation:** To be determined	
Implementing mechanism, funding, and financing	Not applicable	
Other partners	**Kendari:** Bappeda Office **National Government:** Ministry of Public Works (it would be better if PDAM can get a Water Hibah fund from APBN source) **Social/communities:** customers	

Source: Green Team/Mayor's Office.

Project WAT5: Prepare a Water Supply Safety Plan (RPAM) To improve resilience, and to safeguard the future water supply, PDAM will develop a water safety plan for existing and potential new sources.		
Actions and Planning (action completed)	**Description and Responsibilities**	**Time Frame**
WAT5.1	PDAM prepares inventory of water sources and their catchment areas.	2106
WAT5.2	PDAM commissions hydrological water resources (low flow) assessments for sources, with consideration of climate change.	2017
WAT5.3	PDAM evaluates the inventory and compares it with water supply targets in the master plan.	2017
WAT5.4	If necessary, PDAM investigates and safeguards possible new water sources.	2017
WAT5.5	PDAM and the city government liaise with provincial government and catchment-based stakeholders to develop a catchment management plan for each water source, including pinpointing sources and diffusing pollution reduction measures, as well as water retention and promotion of recharge.	2017–2018
WAT5.6	These catchment management plans should be implemented and enforced through collaboration with the provincial government and integrated with the flood control and drainage program in this action plan.	2018–2020
Responsible agency (PMU)	PDAM Tirti Anoa	
Estimated costs (budget needs)	**Preparation (design, procure):** To be determined	
Implementing mechanism, funding, and financing	Not applicable	
Other partners	**Kendari:** Bappeda **Provincial:** Provincial governments, landowners, agriculture and industry sectors, and communities. **National government:** Ministry of Public Works and Ministry of Health **Social/communities:**	

Source: Green Team/Mayor's Office.

Green Waste—Action Plan Program: Community Solid Waste Management

Why?

To improve the environment in Kendari and reduce the pressure on final waste sites, waste reduction, reuse and recycling activities are to be introduced in our city, so that all levels of society, including the government and the business sector, will limit their production of waste by recycling and reusing waste, which is better known as the Reduce, Reuse and Recycle (3R).

These 3R activities still face a major obstacle, which is the lack of public awareness for waste sorting. One solution to overcome that problem is through the development of "Waste Bank," which is a "social engineering" type of activity that teaches people to sort waste and raises public awareness in waste management. This activity will reduce the waste that is sent to landfills.

The mayor of Kendari has encouraged the formation of waste banks to promote 3Rs in 64 villages in Kendari through the issuance of a Mayoral Decree on the establishment of waste banks in each village.

Currently, only two waste banks are operational so there is a need to raise awareness on waste banks and scale up the program in a phased manner, through initial pilot projects.

Waste banks accept presorted waste from communities and convert these into savings for each waste contributor. The type of savings can be through the following:

- Regular savings, can be taken at any time, within a minimum of one month;
- Lebaran savings, can be taken at a time before Eid to fulfill the needs of the celebration;
- School savings, can be taken for the new school year students' needs;
- Grocery savings, can be taken in the form of basic food in accordance with the value of savings;
- Environmental savings, can be taken in the form of waste management tools such as trash cans, plants, composter, carts, etc.; and
- Social savings, where the value of savings will be distributed to orphanages, boarding schools, and other social institutions by customer demand.

Current Status

The coverage of waste management services in Kendari in 2015 reaches 53 villages in 10 districts. Kendari City's waste production based on the assumption of 0.63 kg/person/day waste production, reaches 215.45 tons per day. Meanwhile, based on the data from the weight bridge, the total transported waste to the landfill in Puuwatu district reaches 150.7 tons/day or 69.8% of the total waste generation of Kendari.

As an illustration of the economic value of the 3R management, in December 2015, Haji Seno village managed to sell 36.8 tons of sorted waste with an estimated value of Rp140.8 million.

To encourage the application of the 3R, Kendari's government originally built 24 Integrated Waste Management Site (TPST); 21 are still functioning, and only two are equipped with waste banks applying 3R principles.

In general, the mayor of Kendari has encouraged the formation of a waste bank in 64 villages in Kendari through the issuance of Mayoral Decree on the Establishment of Waste Bank in each village. Despite that effort, only two waste banks are still in operation, which are the two TPSTs mentioned above. Also, through the Adiwiyata awards event held by the Ministry of Environment and Forestry, Kendari City also has waste banks in 88 Adiwiyata schools with varying operational level. The existence of the waste banks should make it easier for the city of Kendari to implement the 3R principles on an urban scale.

Goal

Economically sustainable waste banks in all Kendari villages and schools.

Results

1. A cleaner city.
2. A more educated and proactive community in managing waste and benefiting from waste banks.

Benefits

1. Promotes a clean city and reduces environmental impact and flood risk.
2. Increases community assets and economic resilience.
3. Bahavioral change in 3Rs.
4. Enhances environmental education and promotes a caring society.
5. Community empowerment.
6. Job creation.

Success Indicators (targets)

Waste Project Coverage Projection	2015	2016	2017	2018	2019	2020
Σ population in Kendari	347,496	356,552	367,356	378,487	389,955	401,770
Σ waste service coverage	69.8%	75%	87%	92%	97%	100%
Σ 3R management	3%	4%	6%	10%	15%	18%
Σ public waste bank (active)	2	4	6	8	10	12
Σ school waste bank	88	100	120	150	180	225

Source: Green Team/Mayor's Office.

Key Risks

1. Lack of skills and practice in operating waste banks effectively.
2. Land availability.
3. Waste delivery quantities /low community participation in the waste bank scheme.

Risk Mitigation

1. Capacity development through city-to-city learning (with Malang).
2. Larger waste banks can be used for multiple districts, upgrade existing TPSTs to include waste banks.
3. Marketing to communities.

Project SOL1: Prepare a Pilot Study for Scaling Up Waste Banks

Before providing more waste banks, DKP and Bappeda should conduct some initial assessment to scale up the current program.

First, it will be necessary to establish the demand for the end products of the waste, the commercial price for waste products, and in what processed form (shredded and washed plastic for example), before investing in waste bank facilities and equipment.

Some capacity building of DKP could be included in the pilot project through a technical partnership with Malang, another Indonesian "Green City" where waste banks are widely and successfuly used. This will illustrate how to staff and operate the pilot waste banks.

It will also be necessary to establish the best districts for the pilot study (the most dense). Before implementing a pilot project, good and bad practices should be evaluated from existing waste banks and lessons learned to be incorporated into the set-up of the pilots.

Action	Description and Responsibilities	Time Frame
SOL1.1	A PMU is set up to pilot test 2 more improved (second generation) waste banks for Kendari at two existing TPST.	2016
SOL1.2	Evaluate successes and failures of existing waste banks.	2016
SOL1.3	Evaluate the demand and market price locally/regionally for waste products, and in what processed form (washed, crunched, shredded, etc).	2016
SOL1.4	Training with Malang DKP on waste bank set-up.	2016
SOL1.5	Evaluate high-density urban districts for good potential for 2 pilot waste banks at existing TPSTs.	2016
SOL1.6	PMU to develop a pilot project implementation plan to build and operate 2 pilot waste banks.	2017
SOL1.7	Manage construction, procure equipment.	2017
Responsible agency (PMU)	DKP (Sanitation Department)	
Estimated costs (budget needs)	**Preparation (design, procure):** ~ Rp100 million **Realization (CAPEX):** ~ Rp200 million **Maintenance and operation:** To be determined	
Implementing mechanism, funding, and financing	Traditional procurement, APBD	
Other partners	**Kendari:** Bappeda, Environment Agency **Private sector:** Banking association **Social/communities:** Households, RW/RT, scavengers' association, Teras community, Focil Indonesia, Hygiene Working Group of Kendari	

Source: Green Team/Mayor's Office.

Project SOL2: Scale Up Waste Banks Program and Improve 3R in Communities

The city wants to implement waste banks in all Kendari communities. The target for 2020 is the application of the 3Rs and waste banks in all districts and schools. This will require scaling up the pilot study and a socialization strategy for 3Rs and marketing of the waste banks to all residents in Kendari.

Action	Description and Responsibilities	Time Frame
SOL2.1	PMU (same as project 1) to undertake detailed evaluation of waste bank pilot study successes, including • Monthly waste accepted: plastic, glass, metal, paper, organic wastes; • Total cost of savings accrued by customers; • Processing efficiency; • Onward sales of processed waste; and • Economic viability.	2018
SOL2.2	Develop generic outline design (processes) for the replication of waste bank site at TPSTs and greenfield sites.	2018
SOL2.3	DKP and BLHD to implement a socialization program to raise awareness of 3R principles at home, environmental impacts of poor waste management, and raise awareness of waste banks and how residents can benefit through savings. An environmental education program is carried out in schools.	2018
SOL2.4	PMU to develop project implementation plan, budget, time frames responsibilities, and locations for all district and school waste banks.	2018
SOL2.5	Approve budgets.	2018
SOL2.6	Aquire land, manage construction, procure equipment.	2019
SOL2.7	Hire and train staff from local communities for the operation of waste banks.	2019
SOL2.8	Consider development and operation of waste banks by private individuals and community cooperatives.	2019
Responsible agency	DKP	
Estimated costs (budget needs)	**Realization (construction):** Rp300 million **Maintenance and operation:** Rp150 million per year	
Implementing mechanism, funding, and financing	• Traditional procurement, ABPD	
Other partners	**Kendari:** Bappeda, environment agency **Private sector:** Banking association **Social/communities:** Households, RW/RT, scavengers' association, Teras community, Focil Indonesia, Hygiene Working Group of Kendari	

Source: Green Team/Mayor's Office.

Green Energy—Action Plan Program: Tidal Electric Power Generation in Kendari Bay (pilot)

Why?

It is estimated that the power company (PLN Kendari Branch) currently supplies 65 megawatts (MW) of daily electricity to Kendari with diesel-fueled generators, which are unreliable. Actual demand is approximately 75 MW, and expected to increase to 30% by 2020.

Due to the high operation costs of high-speed diesel (HSD) and marine fuel oil (MFO) diesel-fueled engines, low billing collection rate (account receivable amounted only to Rp400 billion per annum), low tariffs, as well as lack of capital investment, the company is operating at an unsustainable loss, and is unable to invest in improved services.

Kendari Bay is seen as particularly an advantageous site for tidal power generation due to the narrow neck of the bay, creating high-velocity tidal flows.

Current Status

Electricity prices paid by end-users are regulated by the Government of Indonesia under Presidential Decree No. 8/2011. The average selling price in 2013 was US$7.1 per kilowatt-hour (kWh) while the cost of production was US$10.5. The shortfall is funded through a government subsidy currently running at Rp1.0 trillion per annum. This results in numerous problems. Not only do citizens suffer from power cuts

each day, public services, such as the water enterprise PDAM, cannot operate its plants at full capacity, with the result that water supply is erratic. Further, many businesses are forced to invest in private backup power generators. The economy of Kendari will remain stunted if the energy shortage cannot be overcome within reasonable time.

The supply of electricity at an affordable cost to the government is, therefore, emerging as a potential constraint to Kendari's long-term growth and development goals. Consequently, the government has banned the use of expensive diesel fuel for new power plant and is actively promoting private sector investment in alternative feed stocks to reach its power-generated targets. The government also has plans to progressively increase electricity prices in the coming years.

Even though the proposed pilot project for tidal energy is not under the authority of the municipality of Kendari but rather under the provincial and central government, and therefore not part of the mandate of the Green Cities Program, it is still proposed as part of this GCAP because of its enormous potential impact on all aspects of life in the City of Kendari, including green development.

The experience of constructing, deploying, and operating the devices will facilitate the development of turbines that can be considered for commercial deployment in the Kendari Bay and elsewhere in Indonesia.

Tidal Power Generation in Indonesia

Atlantis, a global leader in the tidal power sector, is pleased to announce that it has entered into a Memorandum of Understanding (the "Agreement") with SBS, a privately owned international marine, subsea and renewable energy developer, which has been studying the potential of ocean energy resources for tidal-stream devices around the Indonesian archipelago since 2013.

Under this agreement, Atlantis and SBS will work together to establish a joint venture to develop a 150 MW tidal stream site in Indonesia. The total cost of this commercial array has been estimated at US$750 million and will be constructed over a number of stages. SBS has completed a feasibility study and the project will be supported by a 25-year power purchase agreement with the state-owned electricity company, Perusahaan Listrik Negara ("PLN").

Atlantis has the largest portfolio of tidal power projects in the United Kingdom, which represent a combined potential capacity of almost 700 MW, in addition to its other development projects throughout China, Canada, India, and a number of places in other parts of the world.

Source: Green Team/Mayor's Office.

Goal

The main objective of this program is to implement by 2020 a pilot project that will provide tidal energy from the Kendari Bay. This is closely related to the proposed program on *Green Urban Drainage and Flood Control* because significant sedimentation in the bay may affect the feasibility of tidal power generation.

The experience of constructing, deploying, and operating the tidal turbines will facilitate the development of turbines that can be considered for commercial deployment in the Kendari Bay and elsewhere in Indonesia. The pilot project will enable monitoring and research

associated with the deployment, installation, and operation of tidal turbines for the purposes of (a) supporting improvement of this technology, and (b) providing an understanding of its potential environmental impacts.

Results

1. Pre-feasibility study on tidal power generation in Kendari Bay.
2. If feasible, permit, construct, and operate a pilot tidal energy facility in the Kendari Bay.

Benefits

1. Meeting Indonesia's Greenhouse Gas Reduction Commitments and Renewable Electricity Production Commitment by 2020 by accelerating the use and production of renewable energy instead of fossil fuel-derived energy.
2. Providing the opportunity to acquire the know-how to deploy, service, and grid-integrate tidal turbines just as a world market opens up.
3. Improving the sustainable supply of energy to Kendari and enabling economic development.

Success Indicators (targets)

PFS completed, Tidal Energy pilot project deemed viable.
Tidal energy pilot project ready for implementation.

Key Risks

1. Kendari Bay does not have sufficient tidal current for the installation of a viable power plant; the pilot is deemed unfeasible.
2. If deemed feasible, insufficient investor appetite, due to local capacity and other risks in development and construction.
3. Delayed approval of permits and contracts, among others. etc.
4. Low interest shown by the new provincial and municipal leadership from 2017 onward.

Risk Mitigation

1. Implement regulatory updates as soon as possible while local political will is present (before policy regime changes occur in 2017).
2. Establish a working group to coordinate this program with other activities.
3. Train staff to manage the program.

Project POW1: Prepare Pre-Feasibility Study for the Generation of Tidal Energy (electricity) in the Kendari Bay

The pre-feasibility study (PFS) will cover the following:

(i) Legal, institutional, and technical aspects; (ii) Cost estimation; (iii) Evaluation of the existing national feed-in tariff (FIT) for renewable energy; (iv) Financial feasibility, including development of an outline business case; (v) Economic feasibility; (vi) Initial environmental impact scoping, modes of PPP, risk allocation; and (vii) Market sounding, government support, and public consultation.

Action	Description and Responsibilities	Time Frame
POW1.1	The Kendari Green Team, Bappeda, and PLN to establish a Tidal Energy Pilot Task Force to liaise with the national government, coordinate local assistance in PFS development, coordinate local consultations and surveys, and assist with market/investor sounding.	2017
POW1.2	The responsible national government agency (MEMR) allocates funds for a PFS on the generation of electricity in the Kendari Bay. There is the possibility to involve private renewables investors in the PFS, and existing operators should be approached.	2017
POW1.3	MEMR selects and appoints a consultant for the PFS.	2018
POW1.4	Tidal Energy Task Force to coordinate with the Drainage and Flood Control Project PMU on a bathymetric survey of the Kendari Bay and development site.	2018
POW1.5	City government allocates counterpart funds for preparing the PFS.	2018
POW1.6	City government supervises and assists the work of the Consultant implementing the PFS.	2019
POW1.7	The responsible national government agency approves the PFS.	2019
POW1.8	MEMR and local Tidal Energy Pilot Task Force make yes/no decision based on pre-feasibility study, particularly with respect to market sounding and potential downstream investment.	2019
POW1.9	If Yes, pilot project preparation will include further detailed feasibility study (costing, financial feasibility, environmental impact). To utilize technical skills, the pilot project could be implemented on a build–operate–transfer mechanism with an experienced developer. Without private sector interest and international technical capacity, the pilot project should not go ahead.	2020
Responsible agency (PMU)	Tidal Energy Task Force and MEMR (National)	
Estimated costs (budget needs)	**Preparation (design, procure):** ~ Rp12 billion **Realization (CAPEX):** To be determined based on the PFS **Maintenance and operation:** To be determined based on the PFS	
Implementing mechanism, funding, and financing	• Traditional procurement, Potential BOT	
Other partners	**Kendari:** Dinas Energi dan Pertambangan Office **Provincial:** BLH, provincial government, PLN **National government:** Ministry of Energy and Mineral Resources	

The Five Priority Programs—Finance Actions

Fiscal Capacity

The Green Team concluded that there are possibilities to further increase its own local income the PendapatanAsliDaerah (PAD). Possible specific actions to increase PAD, which were brought up by the Green Team, are the following:

- 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 revenues improvement action plan (RIAP) to further explore these and other options and to formulate specific actions to achieve them.

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 as follows:

- Advanced procurement: Kendari can start procurement procedures before the local budget (APBD) is officially formalized. By this, Kendari can avoid delays.

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 Kendari'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.

Alternative Mechanisms to Attract Financing

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 BOT contract for new bulk water treatment facility, WTE, 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 Kendari Action Plans

Project and Owner (rows)/Financing Options (columns)	(A) Financing	(B) Funding	(C) Implementing Mechanism	(D) Financing Sources (options)	(E) Funding Sources (options)
Human Waste Management – PLT2		✔		No	**Kendari city:** septic tanks **PDAM:** trucks
Green Water – SPAM (Drinking Water Supply Distribution Network expansion	✔	✔	PDAM	Significant availability payments could attract private sector investments. Lessons learned from ATB (Batam) and BOT contract with PT Tirta Lyonnaise Medan, a joint venture between the Suez Group of France (85%) and PDAM Tirtanadi (15%).	PDAM, city budgets
Tidal Energy	✔	✔	To be explored	To be explored	To be explored
Urban Drainage and Flood Control		✔	To be determined	No	APBN, APBD

Source: Green Team/Mayor's Office.