

Towards Climate Resilience and Carbon Neutrality

Jakarta Climate Action Plan 2021–2050

Jakarta

GOVERNOR OF JAKARTA

Climate change affects Jakarta's citizens either directly or indirectly. From coastal flooding that takes away livelihoods and periods of droughts that disrupt water supply to waste being landfilled instead of reducing, reusing and recycling waste. The climate crisis will only be exacerbated as we experience more severe climate events and urban growth as one of the largest megacities in the world. Although we have taken steps to combat climate change in Jakarta through Regional Action Plan for Green House Gas Emission Reduction and Climate Adaptation (RAD GRK and RAD API), Regional Strategic Activities (KSD), short/medium/long development plans and sectoral planning, there is a need to accelerate climate action in Jakarta towards the decarbonization in 2050. This is the purpose of Jakarta's Climate Action Plan.

This plan covers ambitious targets to reduce climate risks during extreme weather events (adaptation) and reduce greenhouse gas emissions (mitigation) under the umbrella of inclusive climate action that sees the beneficial impact of climate action equitably distributed across society. With respect to mitigation and adaptation, Jakarta commits to be a Climate-Resilient City, which does not only allocate its resources to Greenhouse Gas Emission reduction efforts, but also to improve the adaptation ability of the society and urban system to face the changing climate and environment.

The targets are underpinned by 14 strategic actions to focus implementation on. This includes the expansion of the public transport network to cover areas that are not already connected and increasing the capacity on busier routes, green building policy targeting energy efficiency measures and on-site renewable energy generation, construction and natural and manmade coastal protection, urban planning to restrict development or approve it based on meeting certain mitigation and adaptation-related conditions, and maximising the diversion of organic waste to anaerobic digestion, among others. We acknowledge that some of these actions have already been implemented or are in the process of being implemented; in these cases, we seek to scale up activities, increase the ambition levels and ensure that the actions have considered those most vulnerable to climate change. We are proud to name one of the most recent recognition to be the winner of the 2021 Sustainable Transport Award for the development of Non-Motorized transport infrastructure and mass transport network.

The plan looks beyond the design and benefits of climate actions to the implementation, monitoring, evaluation and reporting of these actions moving forward under the governance structure set out in the Governor's Decree on the Climate Change Mitigation and Adaptation Working Group. The adaptation and mitigation roadmaps give a sense of when we should aim to have these actions

I hereby call to action not only for the provincial government but the national government, the private sector, non-government organisations and Jakarta's citizens to get involved in climate action.

in place to meet our targets. These actions are in the process of being transposed into sectoral plans for implementation. The monitoring, evaluation and reporting proposals are there to ensure we periodically reflect on the progress we have made against the targets in case the climate actions need revising or additional actions need implementing.

It has been an unprecedented year with the Covid-19 global pandemic that continues to affect us. However, there is light at the end of the tunnel rebuilding our economy from the pandemic is an opportunity to build back better. This means putting climate action and livelihoods at the heart of our strategy in line with our vision: to create a city that is advance, sustainable and cultured whose people are involved in realizing civilization, justice and prosperity for all.

I hereby call to action not only for the provincial government but the national government, the private sector, non-government organisations and Jakarta's citizens to get involved in climate action. It requires fundamental changes to our business models and people's behaviour and the provincial government aims to create the right enabling environment for climate action to ensure whether at community scale or across the entire province. As a provincial government, we will seek further alignment at the national level to support the province's climate vision, goals and targets. Only together, we can build back a better Jakarta.

I would like to thank C40 for the technical assistance provided by the C40 Climate Action Planning Programme in preparing Jakarta's Climate Action Plan and to all who were involved in the development of it. I would also like to thank the Ministry of Foreign Affairs of Denmark for funding the development of this plan. The publishing of this plan coincides with my first few months as one of the Vice-Chairs of the C40 Steering Committee. In this new role, I hope to host many more regional working sessions on climate action and give Southeast Asia a platform when setting the strategic direction for the global network of 97 cities committed to addressing the climate crisis.

Jakarta, May 17, 2021
Governor of Jakarta,

Anies Baswedan, Ph.D.

Developing this Climate Action Plan would not have been possible without the commitment of all stakeholders involved. DKI Jakarta acknowledges the importance of participative planning and would like to thank the following parties for their inputs. DKI Jakarta looks forward to working together in the future to deliver the CAP together for a prosperous carbon neutral and climate adaptive province.

1. Ministry of National Development Planning, BAPPENAS
2. Ministry of Environment and Forestry, KLHK
3. Agency for the Assessment and Application of Technology, BPPT
4. Deputy Governor of DKI Jakarta for Population and Settlement Control
5. Deputy Governor of DKI Jakarta for Spatial Planning and the Environment
6. Assistant for Development and Environment for the DKI Jakarta Provincial Secretary
7. Assistant for the Economy and Finance of the DKI Jakarta Provincial Secretary
8. Regional Development Planning Agency DKI Jakarta, Bappenda
9. Regional Disaster Management Agency, BPBD
10. Regional Environmental Agency, DLH
11. Regional Water Resources Agency, DSDA
12. Regional Health Agency, DINKES
13. Regional Human Settlements, Spatial Planning and Land Agency, DCKTRP
14. Regional Highway agency, DBM
15. Regional Public Housing and Resettlement Agency, DPRKP
16. Regional Social Agency, DINSOS
17. Regional Capital Investment and One Stop Integrated Agency, DPMPTSP
18. Regional Food Security, Maritime Affairs and Agriculture Agency, DKPKP
19. Regional City Part and Forest Agency, DISPERHUT
20. Regional Transportation Agency, DISHUB
21. Regional Transmigration and Energy Board Jakarta, DTKJ
22. Regional Trade, Cooperatives, Small and Medium Enterprises Agency, DPKUKM
23. Regional Communication, Information, and Statistics Agency, DIKOMINFOTIK
24. Regional Education Agency, DISPENDIK
25. Regional Empowerment, Child Protection and Population Control Agency, DPPAPP
26. City Infrastructure and Environment Agency, BSPKLH
27. Regional Cooperation Agency, Biro Kerja Sama Daerah Setda
28. Director PT. Jakarta Propertindo
29. Director PT. LRT Jakarta
30. Director PT. MRT Jakarta
31. Director PT. Transportation Jakarta
32. Director PD. PAL Jaya
33. The Governor's Delivery Unit (TGUPP)
34. Center for Energy Bandung Institute of Technology, PKITB
35. Deutsche Gesellschaft für Internationals Zusammenarbeit (GIZ) Gmbh
36. Institute for Global Environmental Strategies (IGES)
37. United Cities and Local Governments Asia-Pacific (UCLG ASPAC)
38. ICLEI Local Governments for Sustainability
39. World Resources Institute (WRI)
40. Vital Strategies

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Abbreviations

ABBREVIATION	MEANING
APPSI	Association of Provincial Governments throughout Indonesia
BAPPEDA	Regional Body for Planning and Development
BAPPENAS	Ministry of National Development Planning
BKLNBKSD	The Foreign Cooperation Section of the Regional Cooperation Bureau
BMKG	Meteorological, Climatological, and Geophysical Agency
BNPB	National Disaster Management Agency
BP-SEKDA	Government Bureau of Regional Secretariat
BPAD	Regional Asset Management Agency
BPBD	Regional Disaster Management Agency
BPD	Regional Revenue Agency
BPHMGB	Regulatory Agency for Downstream Oil and Gas
BPKD	Regional Financial Management Agency
BPPPP	Development Planning and Construction Monitoring Section
BPPT	Agency for the Assessment and Application of Technology
BPS	Central Bureau of Statistics
BPSM	Community Participation Section
BSPKLH	City Infrastructure and Environment Section
BTLK	Environmental Governance and Hygiene Section
CCPHI	Community and Corporate Partnership for Indonesian Health
CCROM	Weather Opportunity and Risk Management Center
CSRJ	Jakarta Corporate Social Responsibility
DBM	Regional Road Agency
DCKTRP	Human Settlements, Spatial Planning and Land Agency
DIKOMINFOTIK	Communication, Information, and Statistics Agency
DINKES	Health Agency
DINSOS	Social Agency
DISHUB	Transportation Agency

ABBREVIATION	MEANING
DISPENDIK	Education Agency
DISPERHUT	City Park and Forest Agency
DKPKP	Food Security, Maritime Affairs and Agriculture Agency
DLH	Environmental Agency
DPKP	Fire and Rescue Agency
DPKUKM	Trade, Cooperatives, Small and Medium Enterprises Agency
DPMPTSP	Capital Investment and One Stop Integrated Agency
DPPAPP	Empowerment, Child Protection and Population Control Agency
DPRKP	Public Housing and Resettlement Area Agency
DRD	Regional Research Board
DSDA	Water Resource Agency
DTKJ	Jakarta Transportation Board
DTKTE	Workers, Transmigration and Energy Agency
ICLEI	ICLEI – Local Governments for Sustainability
IFC	International Finance Corporation
INDEF	Institute for Development of Economics and Finance
InGub	Instruksi Gubernur (Governor's Instruction)
ITDP	Institute for Transportation and Development Policy
JB	Resilient Jakarta
KCI	Commuterline Indonesia
KEMENHUB	Ministry of Transportation
KEMENKES	Ministry of Health
KESDM	Ministry of Energy and Mineral Resources
KLHK	Ministry of Environment and Forestry
KPBB	Committee for the Elimination of Leaded Gasoline
KRT/BRIN	Ministry of Research and Technology/ National Research and Innovation Agency
KSD	Regional Strategic Activities
LAPAN	National Institute of Aeronautics and Space
LIPI	Indonesian Institute of Sciences

ABBREVIATION	MEANING
LPMJ	Jakarta Community Empowerment Body
LRT	Light Rail Transit
MPBI	Indonesian Disaster Management Society
MRT	Mass Rapid Transit
MTI	Indonesian Transport Society
MUI	Indonesian Ulema Council
PBKLHK	Center for Data and Information / Research and Development Agency of the Ministry of Environment and Forestry
PD PAL	Regional Wastewater Management Company
PD PAM	Regional Drinking Water Management Company
PDPJ	Pasar Jaya Regional Company
PDSJ	Sarana Jaya Regional Company
PerDa	Peraturan Daerah (Provincial Decree)
PerGub	Peraturan Gubernur (Governor's Decree)
PerPres	Peraturan Presiden (Presidential Decree)

ABBREVIATION	MEANING
PGN	National Gas Company
PKITB	Center for Energy Bandung Institute of Technology
PMI	Indonesian Red Cross Society
PUPR	Ministry of Public Works and Housing
PUSDATIN	Center for Data and Information of the National Development Planning Agency
RCCC-UI	Center for Climate Change Research – University of Indonesia
RDTR	Detail Spatial Plan
RPJMD	Regional Medium-Term Plan
RTRW	Regional Spatial Plan
SEKDA	Regional Secretary Governor
TAPEM	Governmental Management
TGUPP	Governor Delivery Unit
UCLG ASPAC	Asia Pacific Association of Regional & Cities Governments
WRI	World Resources Institute
WWFNI	World Wide Fund for Nature Indonesia

Executive Summary

Climate Action Plan

On 31 October 2016, Indonesia ratified the Paris Agreement for the international commitment to limit global average temperature rise to below 1.5°C from pre-industrial levels. The Agreement also sets goals to enhance adaptive capacity and resilience, as well as to reduce vulnerability to climate hazards, while contributing to sustainable development. The Paris Agreement is a decisive achievement in the efforts to limit climate change and prevent potentially disastrous impacts.

In line with this national commitment, Daerah Khusus Ibukota Jakarta (DKI Jakarta) has developed this Climate Action Plan (CAP) as a strategic document that sets out the evidence base used to develop Jakarta specific climate targets in line with the Paris Agreement, the strategic actions to achieve this, and the implementation of these actions between now and 2050. Building on existing national and provincial policy frameworks, including the impending RAD-GRK 2021 and RAD-API 2021, it aims to strengthen existing climate actions, and propose new ones that will also produce economic and social benefits.

Time to Act

DKI Jakarta is the economic heart of Indonesia and together with the surrounding Greater Jakarta Region (Jabodetabekpunjur), is the fourth largest megacity in the world. It is expected that the population of DKI Jakarta will have grown to 12 million by 2050. Given this growth, the province has a wide range of challenges to overcome. These include housing shortages, availability of reliable and clean water, flooding, traffic congestion and low air quality. DKI Jakarta expects under the business-as-usual scenario, the effects of climate change on Jakarta's environment and its inhabitants would be disastrous.

DKI Jakarta has identified that sea level rise and increasing intensity of rainfall will worsen the flooding situation in Jakarta. In addition, periods of droughts and heatwaves will put additional strain on the province, especially in terms of the water supply system and low air quality. A vulnerability study under the RAD-API 2021 has shown that 17 subdistricts have been identified as being highly susceptible to climate hazards, where children and the elderly are especially at risk.

It is imperative for the province to take action to reduce its emissions, as its contribution to limiting the temperature rise to below 1.5°C. In 2016, DKI Jakarta recorded GHG emissions of 53.6 $MtCO_2e$ of which 57% are related to grid electricity consumption and 22% to fuel consumption for non-grid electricity. Analysis has shown that under a business-as-usual scenario, emissions will grow by 400% from 2010 to 2050. There are many opportunities to implement actions to reduce emissions across the stationary energy, transport and waste sectors, which could also create jobs, increase equity and improve air quality.

Vision, Goals and Targets

In this CAP, DKI Jakarta has set targets aligned to the Paris Agreement and commits itself to provide the benefits of climate action to all the inhabitants of Jakarta.

Adaptation Vision, Goals and Targets

Jakarta is a climate resilient province that provides equal opportunity to all its inhabitants to live safely, healthily and prosperously through urban planning, public services, education, strong cultural heritage and sustainable innovation.

To become climate resilient, DKI Jakarta's adaptation goals include:

- **Preparing responses to climate risk:** Minimizing casualties or health risks resulting from climate hazards through improved healthcare and early warning systems.
- **Reducing exposure to climate risk:** Land-use control to limit exposure to climate hazards and also ensure water supply is readily available and of good quality during droughts.
- **Protecting against climate risk:** Regulating that buildings, the urban drainage system, coastal protection, water supply and waste water are retrofitted to reduce flood and climate-related health risks.

Mitigation Vision, Goals and Targets

Jakarta is a carbon neutral province by using clean energy in an efficient way across the built environment and industry as well as providing quality public transport and safe solid waste management provisions to all.

To become carbon neutral, DKI Jakarta commits itself to achieve a minimum of 49% GHG emission reductions from the business-as-usual scenario of 106.5 $MtCO_2e$ in 2030 and 62% GHG emission reductions from the business-as-usual scenario of 189.5 $MtCO_2e$ in 2050 in comparison with the base year of 2016. To achieve this, DKI Jakarta formulated goals and targets on:

- **Buildings and industry**
- **Transportation**
- **Solid waste**

Prioritising Actions and Implementation Planning

To achieve the goals as set out under the CAP, DKI Jakarta identified 48 climate actions based on the climate risks and greenhouse gas (GHG) emissions profile of the province, as well as the climate actions already implemented or planned. Of these, 14 actions were identified to have the greatest impact and/or strategic importance. Actions were grouped into six action tracks according to their synergies, which are intended to achieve six respective goals.

To ensure the successful delivery of the CAP, roadmaps have been developed for both adaptation and mitigation. Each roadmap shows the relevant actions, targets and milestones that need to be accomplished in the short-term (2020–2022), medium-term (2022–2030) and long-term (2030–2050). Both roadmaps are shown in Chapter 4.



Funding

Funding for climate action can be either from government or other financing sources such as:

- DKI Jakarta provincial level: In line with the RPJMD, it is expected that the majority of the 14 strategic actions in this CAP require direct investment from the Provincial Annual Budget (APBD).
- National level: Utilizing the national State Revenue and Expenditure Budget (APBN) for large scale infrastructure actions that are considered of strategic national importance.
- Private sector participation: Some large-scale infrastructure could progress via non-government funding mechanisms such as a Public-Private Partnerships (PPP) or the assignment of Regional Owned Enterprises (BUMD).
- Multilaterals and non-governmental organizations: Bilateral, multilateral or global financing facilities in the form of, for example, grants, loans, profitable business agreements could be explored to close any funding or financing gaps.
- Non-capital-intensive climate actions: Not all climate actions in this CAP require capital investment, being policy-based incentives or standards towards emissions reductions and/or climate resilience.

Governance

The Governor's Decree on Climate Disaster Mitigation and Adaptation Working Team (KepGub 96/2020) published in 2020 sets out clear roles and responsibilities for any climate action planning. This includes implementation, monitoring, evaluation, reporting and future updating of the CAP.

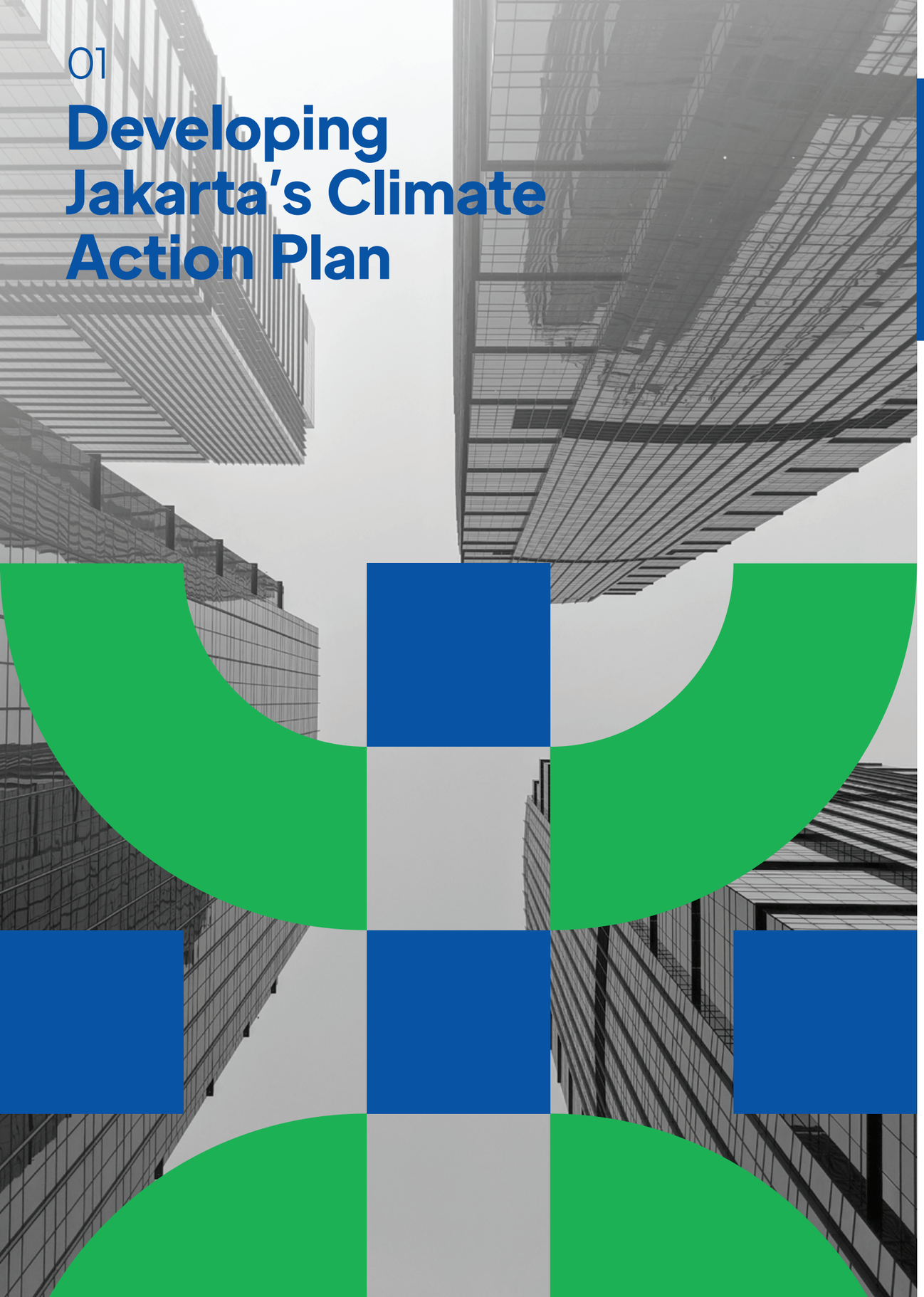
Monitoring, evaluation and reporting (MER) is a fundamental pillar of climate action to track progress and implementation over time via a structured system. Specifically, it will enable Jakarta to:

1. Assess progress and effectiveness of actions, and adjust climate actions and targets, if needed
2. Continue to make the case for expanding the current scope of action and/or other climate actions
3. Communicate relevant information on implementation and benefits to a wide range of partners and to the city population
4. Improve accountability and transparency to stakeholders in and around DKI Jakarta

Chapter 5 of this CAP sets out a MER process aligned to the Governor's Decree KepGub 96/2020. This includes key indicators, evaluation questions and reporting structures for tracking and communicating on climate action in DKI Jakarta.

The Next Iteration of DKI Jakarta's CAP

Updating the Climate Action Plan is crucial, as the environmental, governmental, financial and planning contexts in Jakarta are constantly evolving. As stipulated under the Governor's Decree on Climate Disaster Mitigation and Adaptation Working Team, the CAP will be updated every five years at least. This is to allow adjustments and revisions to be made that incorporate the latest local developments and learnings from action implementation. The next CAP will be developed in 2025 and aligned with the Jakarta Medium-Term Development Plan (RPJMD), strategic plans (RENSTRA) and spatial plans (RTRW). Each updated CAP will provide additions or adjustments to the existing actions and will be in alignment with the commitments and priorities of DKI Jakarta, such as the goals stipulated under the Paris Agreement.



01

Developing Jakarta's Climate Action Plan

1.1 The Context of Climate Action Planning in Jakarta

Climate change is an international crisis of unprecedented magnitude. Due to its widespread impact across all continents, climate action is being implemented globally. On 31 October 2016[1], Indonesia ratified the Paris Agreement outlining the international commitment to limit global average temperature rise to well below 2°C from pre-industrial levels and pursue efforts to limit the temperature increase even further to 1.5°C. The agreement also sets goals to enhance adaptive capacity and resilience as well as to reduce vulnerability in relation to climate change with a view to contributing to sustainable development. The Paris Agreement is a decisive achievement in the efforts to limit climate change and prevent potentially disastrous impacts.

Given the extent of impact that climate change has already had in Indonesia and the expected future risks to the country, there is great urgency to act. This not only involves becoming carbon neutral across all industries and sectors through mitigation measures, but also increasing the resilience of the country to climate risks such as floods and drought through adaptation measures. Immediate action is required with collaboration among policy makers, academics, businesses and the community in order to achieve the goals and targets set out in the Paris Agreement.

Jakarta is Especially Vulnerable to a Changing Climate

Situated in a delta area along the coast and as one of the largest and fastest growing megacities in Asia, DKI Jakarta is extremely vulnerable to the impacts of climate change, which has resulted in more frequent floods from sea in the coastal areas, inland floods from heavy rainfall, prolonged periods of drought and rises in the peak temperatures in the province. At present, heavy rainfall results in regular flooding during the rainy season, causing heavy traffic jams and other disruptions, while sea level rise has caused existing flood protection dikes to overflow during high tide events. Droughts have led to excessive groundwater abstraction, resulting in land subsidence in north Jakarta, which has only compounded the impacts during flood events. All of these climate hazards affect on a daily basis the lives and livelihoods of the increasing number of people living and working in Jakarta. The climate impact on the economic development of the province continues to grow.

Besides climate change, Jakarta has other environmental and socio-economic challenges requiring immediate attention. These include air quality and transport planning. Any actions taken in the context of climate change provide opportunities for inclusive and sustainable growth that benefits the provincial economy and the livelihoods and health of its inhabitants. For example, shifting towards public transport does not only reduce GHG emissions but will also improve traffic congestion and air quality. Increasing green spaces and planting in Jakarta would help to reduce the impact of heat and floods, and also provide space for recreation and biodiversity within the province. DKI Jakarta acknowledges the importance and opportunity of integrated and inclusive climate action.

[1] https://unfccc.int/node/61083



Jakarta's Existing Climate Action Policies

As the province has been experiencing the effects of climate change for decades, Jakarta has already made progress on climate action. Currently, the provincial government of DKI Jakarta has a GHG gas emissions reduction plan (Rencana Aksi Daerah Gas Rumah Kaca 2012, hereafter referred to as 'RAD-GRK 2012') and a climate adaptation plan (Rencana Aksi Daerah Adaptasi Perubahan Iklim 2013, hereafter referred to as 'RAD-API 2013'). Both documents provide a vision, propose targets and present a broad variety of 60 climate actions.

These 60 actions have been incorporated into the Jakarta Medium-Term Development Plan (RPJMD) 2017–2022 and have already been implemented or are in the planning stages. Many of the 60 actions have been identified to have strategic importance and have been included in the Governor's Regional Strategic Activities (KSD) published annually. In 2020, the RAD-GRK and RAD-API were revisited, and the updated versions will be published later in 2021 (hereafter referred to as the 'RAD-GRK 2021' and 'RAD-API 2021', respectively).

Accelerating Climate Action Through the Climate Action Plan

This CAP is intended to be a province-wide strategic document. It sets out the evidence base used to develop Jakarta specific climate targets in line with the Paris Agreement, corresponding strategic actions and their implementation between now and 2050. It aims to strengthen existing climate actions and propose new ones that maximize economic and social benefits across six themes:

- Preparing responses to climate risk
- Reducing the exposure to climate risk
- Protecting against climate risk
- Energy
- Buildings and industry
- Transport
- Solid waste

The implementation roadmaps contained in this plan provide a clear route to achieving the mitigation and adaptation goals and targets. The governance, monitoring, evaluation and reporting frameworks provide details on who will be responsible for implementing the actions and how the progress made will be measured.

This CAP builds on the existing national and provincial policy framework, including the impending RAD-GRK 2021 and RAD-API 2021 documents, while also considering climate actions that have been implemented or are planned. Figure 1 shows how Jakarta's CAP fits in relation to national and provincial climate policies. Appendix II provides a full list of applicable frameworks and policies.

Provincial Policy Framework

The Jakarta Provincial Government has a measurable vision and commitment, especially to achieve GHG emission mitigation and more environment-oriented development program. This is clearly stated in the main references for development in Jakarta, namely the RPJMD 2017–2022 and the Spatial Masterplan 2030. Other supporting references are:

- **PerDa 1/2018** RPJMD 2017–2022
- **PerDa 1/2014** RDTR
- **PerDa 1/2012** RTRW 2030
- **PerGub 66/2020** Emission testing for motor vehicles
- **PerGub 131/2012** Regional GHG emission reduction plan
- **PerGub 156/2012** Energy and water conservation
- **PerGub 38/2012** Green buildings
- **InGub 52/2020** Flooding prevention infrastructure
- **InGub 66/2019** Air quality management
- **InGub 127/2017** Climate villages program
- **PerGub 96/2020** Provincial climate action working group
- **PerGub 1107/2019** Climate action KSDs

National Policy Framework*

The development of Jakarta concerning climate change can not be separated from the support of National Government and other regional governments surrounding Jakarta Province. The collaboration/cooperation should be managed/organized based on legal framework/policies, such as:

- **PerPres 16/2016** Ratification of Paris Agreement to UNFCCC
- **PerPres 18/2020** RPJMN 2020–2024
- **PerPres 61/2011** National GHG emission reduction plan
- **PerPres 71/2011** National GHG emission inventories
- **RAN-API 2013** National Guidelines for CAP development
- **BNPB 2016** Disaster Risk Appraisal

** Full national framework and policies provided in Appendix.*

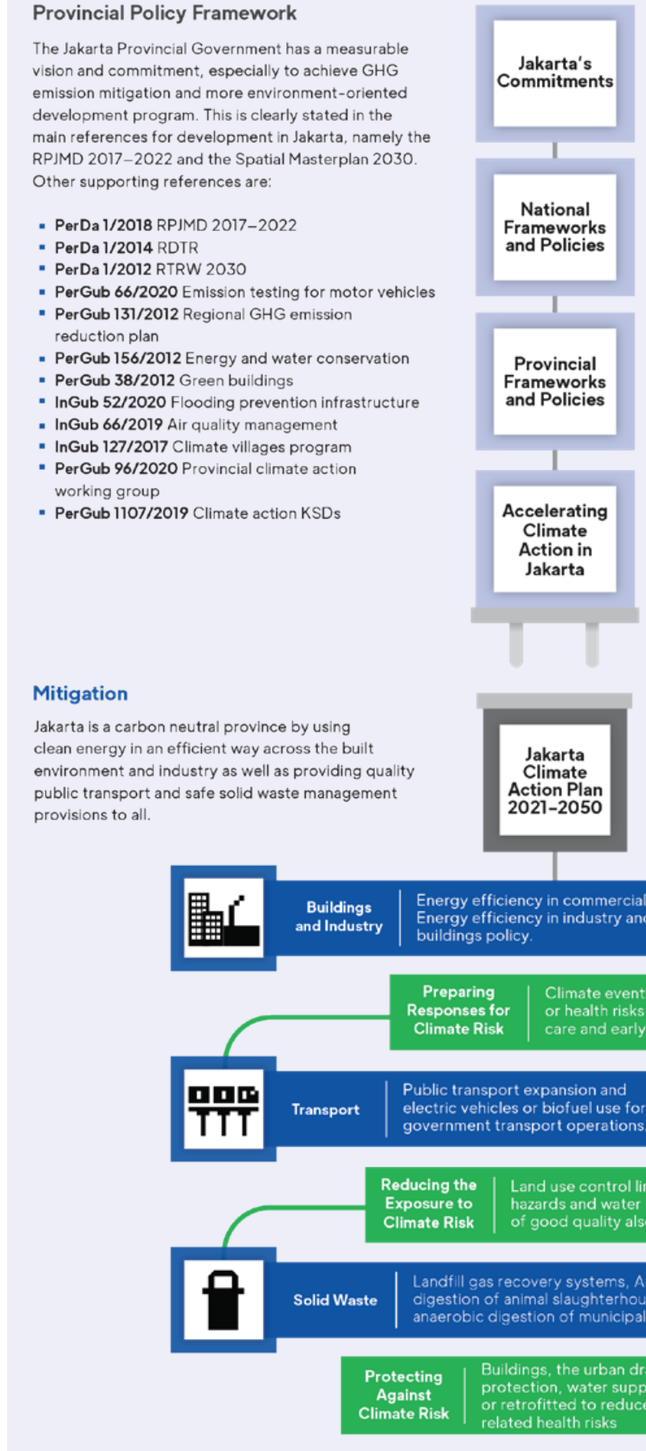


Figure 1. The relationship between national and provincial climate policy frameworks with the Climate Action Plan 2021–2050

Consultation activities ranged from identifying useful information to use in the climate action planning process, validating interim technical deliverables and preparing the CAP.

Stakeholder Consultation During the Development Process

Stakeholder engagement has played a critical role throughout the climate action planning process in Jakarta. It has ensured that the plan reflects the latest situation and direction of the province and has built ownership and accountability across provincial departments that are leading climate action implementation.

Jakarta's CAP was prepared in consultation with 41 different stakeholders in the province. The stakeholders engaged predominantly included Provincial Government Working Units (SKPDs), national government, academia, nationally recognized climate experts and non-governmental organizations. Consultation activities ranged from identifying useful information to use in the climate action planning process, validating interim technical deliverables and preparing the CAP. The SKPDs, in particular, were instrumental at designing the strategic climate actions proposed. The development of the CAP 2021–2050 would not have been possible without the commitment and dedication of all involved. A full list of all the organizations that contributed are provided in Chapter 6.



1.2 Climate Action Plan 2021–2050 Reading Guide

Chapter 1 has provided some background to the needs, objectives and development of this CAP. An overview of the following chapters is described below.

CHAPTER 2: The Basis of Climate Action in Jakarta

Chapter 2 provides details on the economic, geographic, social and environmental context of the province with a specific focus on the climate risks Jakarta faces and the GHG emissions profile of the province. Following this, key climate actions that have already been implemented from RAD-GRK 2012 and RAD-API 2013 are presented. This is to ensure the climate actions proposed in this CAP enhances the work already undertaken across Jakarta.

CHAPTER 3: Vision, Goals and Targets

Jakarta's vision, goals and targets related to mitigation and adaptation are set out in Chapter 3. The vision sets out the aspirational direction of the province in relation to climate action with specific goals and targets identified for climate resilience and emissions reduction. Insights are also provided on how the goals and targets align with other important agendas in Jakarta.

CHAPTER 4: Strategic Climate Actions and Their Roadmaps

In Chapter 4, strategic climate actions to focus implementation efforts in Jakarta are described using action factsheets. Two roadmaps—one for mitigation and one for adaptation—then set out how the strategic actions will achieve the goals and targets proposed in Chapter 3.

CHAPTER 5: Implementing Climate Action in Jakarta

Chapter 5 explains how the CAP will be implemented. The chapter looks at the governance structure across the provincial government and key provincial stakeholders to deliver climate action, the financial resources that have been agreed or planned to fund or finance climate actions, and how the strategic climate actions will undergo monitoring, evaluation and reporting to ensure the actions are delivering the impact they were intended to. The CAP concludes with how progress will be monitored in the future.

02

The Basis for Climate Action in Jakarta

2.1 A Thriving Megacity

Jakarta is the economic heart of Indonesia and together with the surrounding Greater Jakarta Region (Jabodetabekpunjur), is the fourth largest megacity in the world. The population of Jakarta is expected to grow from 10 million in 2020 to 12 million in 2050 (IGES, 2020). The population in the 25–39 age group, categorized as productive working ages, dominates the population. The ratio between the male and female population is relatively balanced. The province comprises five administrative districts (South Jakarta, East Jakarta, Central Jakarta, North Jakarta and West Jakarta) and one regency (Kepulauan Seribu). The population tends to be concentrated in East Jakarta, West Jakarta and South Jakarta. Kepuluan Seribu currently has the highest annual population growth rate.

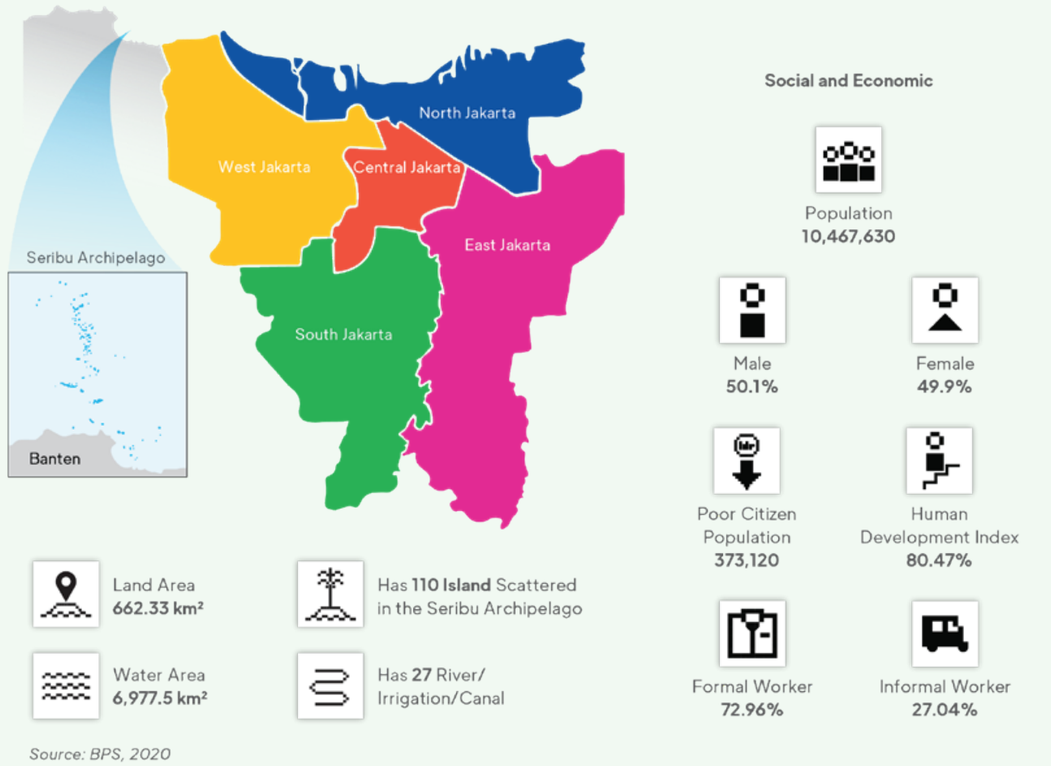


Figure 2. Overview of the geographic, economic and social status of Jakarta

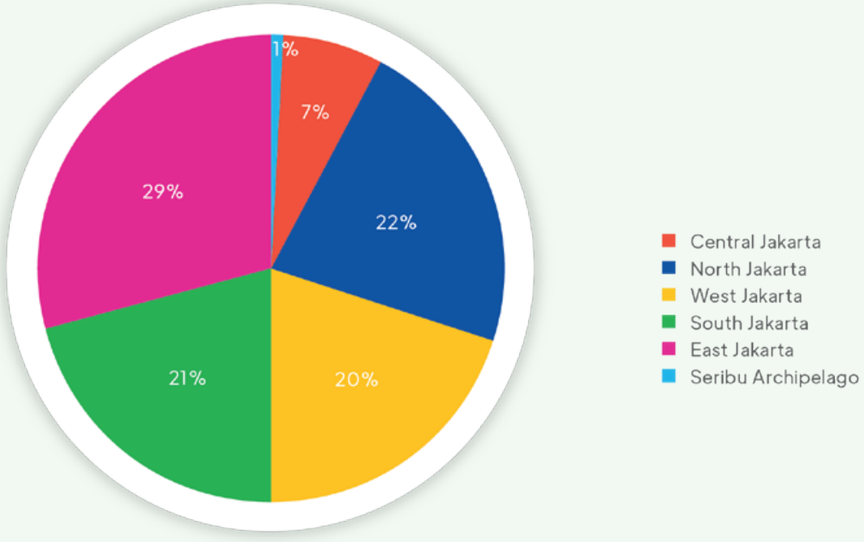


Figure 3. Population distribution in Jakarta by area

Jakarta was established on a low, deltaic plain with extensive swamp areas. Given that the province is located on the coast and along important maritime trade routes, it has experienced continuous growth over the centuries. This has resulted in a vast increase in the urbanized area and significant land use changes. Urbanization in Jakarta is characterized by dense sprawl as well as vertical growth of hundreds of towers and mixed-use developments. During a period of just over two decades from 1980 to 2002 almost one-quarter of all land in DKI Jakarta was converted from non-urban uses for agriculture or wetlands and water to urban uses for industry, commerce and housing (World Bank, 2012). This is in part influenced by the fact that Jakarta houses the largest international airport (Soekarno-Hatta) and port (Tanjung Priok) in Indonesia.

In 2019, Jakarta's workforce amounted to 5.13 million with an unemployment rate of 5.13%[2]. Between 2014 and 2018, Jakarta accounted for around 17% of the total national GDP while the average GDP per capita was estimated at more than four times the national average. As a result, Jakarta is considered relatively wealthy compared to other provinces in Indonesia. This has resulted in a booming real-estate market and a large influx of migrant workers, estimated at 250,000 annually (Quick scan ESIA IFSP, 2020).

On infrastructure, Jakarta receives the majority of its electricity from several power plants in the province, namely Muara Karang, Priok and Muara Tawar. They all currently use fossil fuels for generating electricity. The remaining electricity needs are supplied through the Java-Madura-Bali (JAMALI) interconnected system. The sewer and sanitation system in Jakarta are operated by PD PAL Jaya. At present, only 3% of the province is served by a sewer system for which the utilization rate is only 50% (Quick scan ESIA IFSP, 2020). Due to this, most households and businesses make use of septic tanks and arrange for collection by private wastewater treatment organizations, although sometimes waste water flows directly into the rivers.

[2] http://www.beritajakarta.id/en/read/32082/unemployment-rate-in-jakarta-declines#.X0EYo8gzbIU

Jakarta's Current Challenges

Being one of the fastest growing cities in South-East Asia, the province has a wide range of challenges, such as managing intensifying climate hazards (e.g. flooding and heat) and to keep up with the growing demand for housing and infrastructure. Some of the major challenges are explained in more detail below.

Housing and Infrastructure

With the fast-growing population, it is challenging to meet the housing and infrastructure demands. This has led to an increase of slums that encroach onto areas especially vulnerable to flooding. These informal settlements also lack basic amenities such as clean drinking water, sewerage or road infrastructure. Their location exposes them to climate hazards and they are less able to protect themselves during a disaster. Also, their impoverished state makes it more difficult for them to recover from a disaster. This has made recent migrants especially vulnerable to climate hazards.

Water Supply and Land Subsidence

Land subsidence has been a major driver behind the increasing flood risk in North Jakarta. On average, the area around Pluit (North Jakarta) subsides up to 18 cm/year, the Western part of the coast subsides by around 13 cm/year and the Eastern part by around 7.5 cm/year (NCICD, 2019). With land elevations falling, increasing portions of North Jakarta have become situated below sea level, turning the area into a polder. Studies have shown that excessive groundwater abstraction throughout Jakarta is the main cause of the observed subsidence. The high groundwater abstraction is partially the result of low service coverage for piped water in Jakarta as well as the unreliability of the quality and supply of the water. The regional drinking water company PAM Jaya is unable to provide the extent of water supply services required in Jakarta. As a result, about 73% of households in Jakarta and many industries rely on the cheaper and to a certain extent more reliable groundwater (RAD-API 2021).

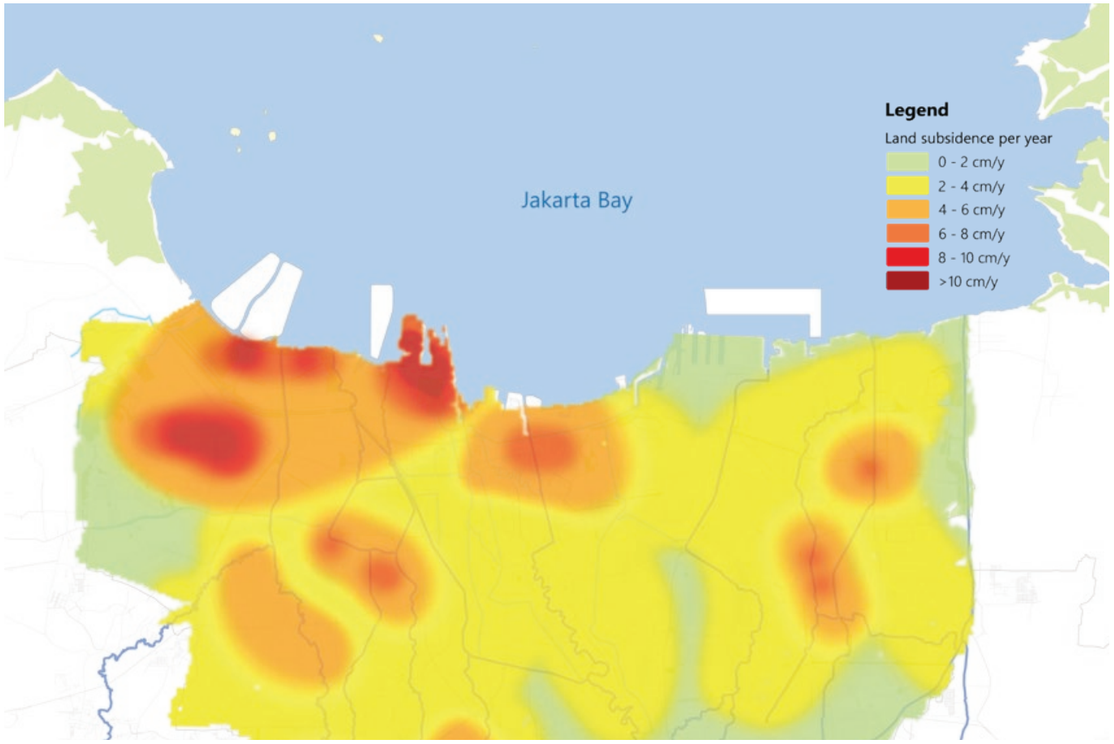


Figure 4. Current subsidence rates in North Jakarta (IFSP, 2020)

The pollution impacts the livelihoods and health of communities living along the coast and along rivers, including fishermen who catch polluted mussels from the sea and children who swim in the waters.



Water Quality

The Jakarta sewer system is operated by PD PAL Jaya. Currently, only 3% of all buildings are served by a sewer system. Hence, most of the domestic and industrial waste water flows directly into the rivers. The regional environmental monitoring agency (BPLHD) has concluded that many of the 13 rivers in Jakarta are heavily polluted with solid and liquid waste (Quick scan ESIA IFSP, 2020). As the rivers discharge into the sea, water quality in the Jakarta Bay fails to meet many of national required water quality standards. The pollution has a large impact on the natural environment as it causes mangroves, coral reefs and sea grass to degrade, subsequently resulting in a loss in biodiversity throughout the Jakarta Bay. It also impacts the livelihoods and health of communities living along the coast and along rivers, including fishermen who catch polluted mussels from the sea and children who swim in the waters. The Jakarta Provincial Regional Performance Information Document (DIKLHD, 2018) shows that the high prevalence of e-coli bacteria in water bodies throughout the province is responsible for the large number of incidences of diarrhoea in the province, especially in children.

Transport

Jakarta has had heavy traffic congestion for years. The province is a centre for economic development with Soekarno-Hatta International Airport and Tanjung Priok Port. It is also a thoroughfare connecting East Java with Sumatra. As a result, many vehicles enter the Jakarta road system. However, the expansion of the road network has not been able to keep up with the growing number of vehicles on the road resulting from the growth of the economy as well as the increasing number of private vehicles.

Air Quality

Jakarta experiences air quality issues. Based on the Jakarta Provincial Regional Environmental Performance Information Document (DIKLHD, 2018), the main sources of Jakarta's air quality issues are land transport, electricity generation from power plants, and domestic and industrial combustion activities. As highlighted in the Lestari study (2018), 75% of the harmful emissions, both for human health and climate change, are generated from land transport. Meanwhile, harmful emissions from the other two sources contribute less than 10% each.

2.2 Drivers for Change

Climate change has been internationally identified as the primary challenge of the 21st century. A major driver of the changing climate is the enormous amount of GHGs humans have emitted into the atmosphere since the industrial revolution by using fossil fuels (oil, coal and gas). Fossil fuels are still the main source of energy for Indonesia. A shift to renewable energy sources and a reduction in the amount of energy we consume is critical between now and 2050. The impacts of a fossil-fuel based society are already being felt throughout Jakarta. Evidence shows that under the business-as-usual scenario, the effects on Jakarta's environment and its inhabitants will be disastrous.



The changing climate projected in Jakarta

Climate change has historically affected Jakarta in many ways including sea level rise, changing rainfall patterns and increasing peak temperatures. Figure 5 shows the primary climate hazards for DKI Jakarta. These hazards have direct consequences for the health and livelihoods of Jakarta's inhabitants and Jakarta's economy. These and other climate hazards are described in this paragraph.

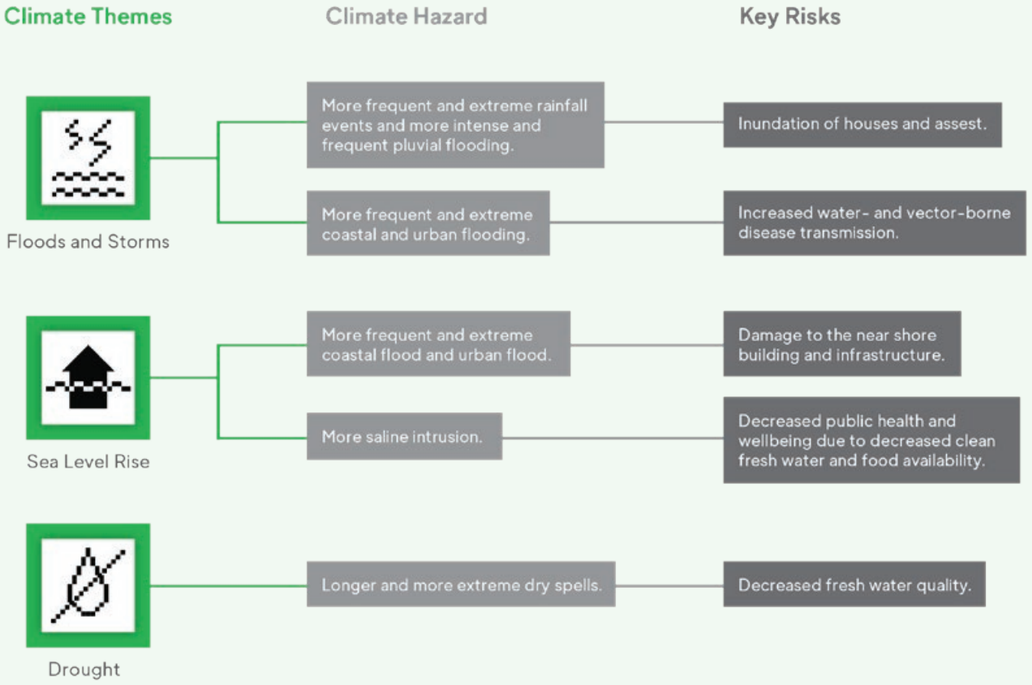


Figure 5. The primary climate hazards affecting Jakarta as discussed during the adaptation vision, goals and targets workshop undertaken during the process of developing this CAP

It is important to note that climate impacts are not evenly spread geographically. There are some community groups that are more vulnerable than others due to their exposure to a hazard, their adaptive capacity and their access to public services. Particularly vulnerable groups include those with low incomes, the elderly, the disabled and children. In Jakarta, the poor often live in places with a high risk of flooding. Furthermore, they do not have sufficient resources to deal with climate disasters and their access to public services is limited as they often live in informal settlements. The vulnerability of the disabled and elderly is mostly related to people within these communities that have limited physical and mental capacity to respond during climate events such as floods or extremely hot days and related challenges including the rise in vector-borne disease and higher levels of contaminated water.

There are some community groups that are more vulnerable than others due to their exposure to a hazard, their adaptive capacity and their access to public services. Particularly vulnerable groups include those with low incomes, the elderly, the disabled and children.

Sea Level Rise

With the melting of the polar ice caps, global sea levels are steadily rising. Jakarta is expected to experience a 1cm/year rise in sea levels as a result of this (RAD-API 2021). The effects of sea level rise are amplified by subsidence predominantly caused by excessive groundwater abstraction. The RPJMD 2017–2022 states that subsidence for the entire coastline ranges from 1–15 cm/year, although this varies spatially and temporally.

The rising sea level will increase the flood risk in two ways:

1. By 2050, larger parts of the province will have subsided below sea level and parts of the province that have always remained safely above sea level will now be situated at sea level. Without high coastal dikes, sea walls, a large drainage network and pumping system, parts of the province will become permanently inundated. Coastal flooding will occur more frequently and will have an increasing impact on the coastal communities. In Figure 6, the worsening situation of subsidence and flood risk is visualized.
2. As the sea level rises and land subsides, it becomes more difficult for the 13 rivers to discharge into the sea, resulting in higher river levels in the province. If river dikes are not improved, the risk of flooding throughout the province will increase.

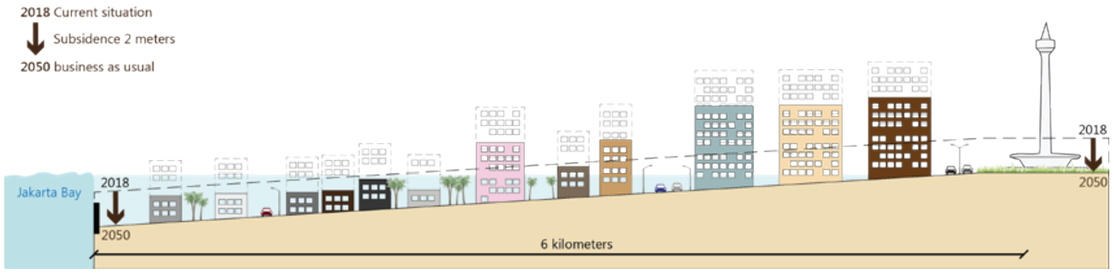


Figure 6. Land subsidence between 2018 and 2050 under a business-as-usual scenario (IFSP, 2020)

In Figure 7 and Figure 8, the flood levels in 2018 and the predicted flood levels in 2050 are shown, respectively.



Figure 7. Experienced flood levels in North Jakarta in 2018 (NCICD, 2018)

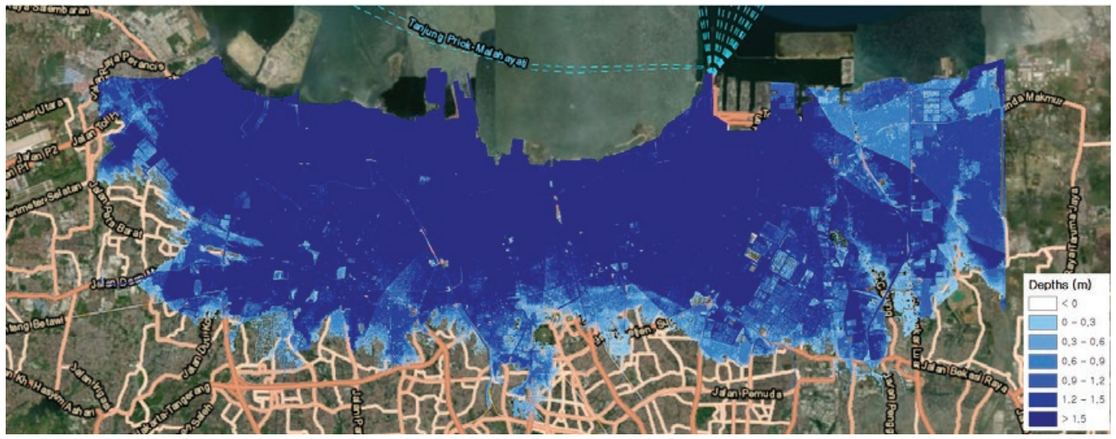


Figure 8. Predicted flood levels in North Jakarta in 2050 (NCICD, 2018)

Inhabitants living in coastal region of Jakarta and other economic activities taking place there are especially vulnerable to the increasing flood risk. In total, over 2.5 million people who live and work in the coastal areas are exposed to the risk of flooding from the sea and rivers. In 2018, the calculated annual expected damage in the coastal area was IDR 2 trillion, rapidly increasing to an annual expected damage of IDR 14 trillion over the next 10 years (NCICD, 2017).

Increased Intensity of Rainfall Events

The changing climate translates itself into changing rainfall patterns. Jakarta has not yet noticed significant changes in precipitation, but this is expected to change in the coming years. The result would be an increase in the intensity and frequency of rainfall events, which the current drainage system cannot cope with. If this happens, surface water will flood on the streets that cannot be drained by the sewers and higher water levels in rivers, leading to more frequent river floods. The high intensity rainfall events and floods often also cause landslides along rivers and hills. Flood events and landslides, most notably during the rainy season, bring economic activities in Jakarta to a halt with the entire province often becoming gridlocked with traffic, and houses, businesses and industry becoming inaccessible or damaged. The impact to people and assets will only increase with increasing severity and frequency of floods (RAD-API 2021).

Longer Periods of Drought

Changing rainfall patterns are also resulting in increased periods of drought, which will have a major impact on the already stressed water supply system in Jakarta. Both water quality and quantity will become more unreliable, forcing people to use deep groundwater instead. Drought has a significant effect on the already poor water quality in the province, which in turn has a direct impact on the health and livelihoods of inhabitants living adjacent to water bodies. Lastly, drought causes shallow groundwater tables to fall further, resulting in additional subsidence. This can damage infrastructure and buildings as well as exacerbate the existing and increasing flood risk in the province.

Increased Peak Temperatures

Besides an increase in average temperatures, Jakarta can also expect an increase in peak temperatures, further contributing to the urban heat island effect experienced in the province. This is where urbanized areas experience higher temperatures then the surrounding region as structures such as buildings, roads and other infrastructure absorb and re-emit the sun's heat more than natural landscapes such as forests and water bodies. Increasing temperatures will also worsen the air quality in Jakarta and higher peak temperatures will have a direct impact on the province's vulnerable inhabitants such as the elderly. With increasing temperatures, incidences of vector-borne diseases will increase, particularly impacting children. Lastly, the use of air conditioning will increase with rising temperatures, resulting in higher energy demand and additional GHG emissions when fossil fuels are the source of energy.

Spatial Vulnerability to Climate Hazards

Dense urban areas such as Jakarta are vulnerable to climate change because the impact and magnitude of climate risks have a significant effect on people's lives, especially those who live in vulnerable areas such as slums, industrial sites and riverbanks. Based on the vulnerability analysis in RAD-API 2021, there are 17 sub-districts that have been identified as highly vulnerable. Vulnerability was assessed based on exposure indicators such as population density, number of sanitation facilities or number of households on the riverbanks, and adaptive ability indicators including education level, poverty ratio or community involvement. When an area has a negative score on these indicators, it designates a high vulnerability towards climate hazards. Of the 17 sub-districts that have high vulnerability, 16 of them have slum areas as indicated in Table 1.

MUNICIPALITY	DISTRICT	SUB-DISTRICT	NUMBER OF SLUM AREAS
Jakarta Pusat	Johar Baru	Tanah Tinggi	8
	Sawah Besar	Mangga Dua Selatan	8
	Senen	Bungur	1
	Tanah Abang	Kampung Bali	4
		Kebon Melati	4
		Petamburan	5
Jakarta Barat	Palmerah	Kota Bambu Utara	1
		Palmerah	2
	Taman Sari	Pinangsia	2
	Tambora	Pekojan	3
Jakarta Selatan	Cilandak	Gandaria Selatan	2
	Kebayoran Lama	Grogol Selatan	4
		Kebayoran Lama Selatan	3
Jakarta Timur	Pasar Rebo	Cijantung	-
Jakarta Utara	Cilincing	Kali Baru	8
	Koja	Tugu Selatan	2
		Tugu Utara	4

Table 1. The areas of Jakarta categorized as highly vulnerable to climate hazards

The distribution of slums in the 17 sub-districts that have high vulnerability to climate hazards are mapped in Figure 9.

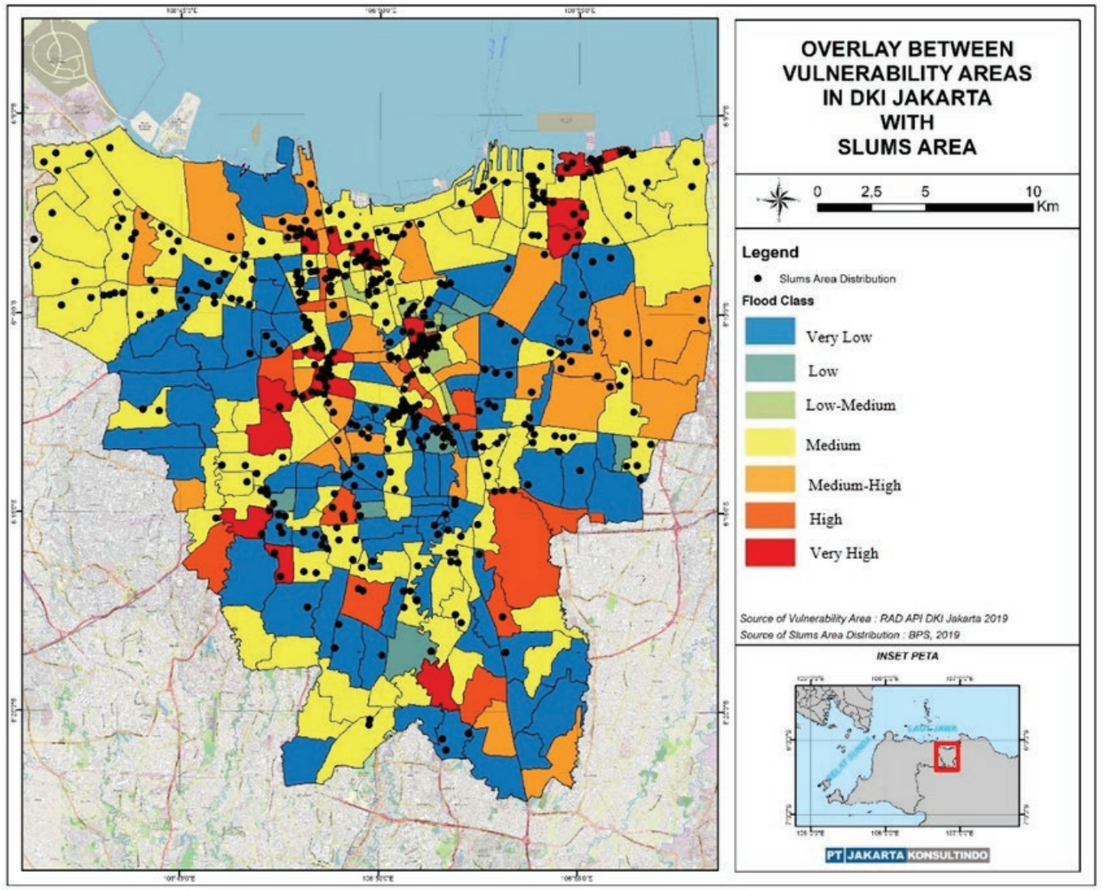


Figure 9. Map of vulnerability and the distribution of slum areas in Jakarta (From RAD-API 2021, with edited legend)

When updating the RAD-API 2013, Jakarta's climate hazards were simulated using the flood and landslide hazard model, built to simulate the period between 2017 and 2030. Figure 10 shows most of the slum areas are in high flood prone areas. As many as 50 slum areas are in high flood-prone areas and the rest are spread at medium and low flood-prone areas.

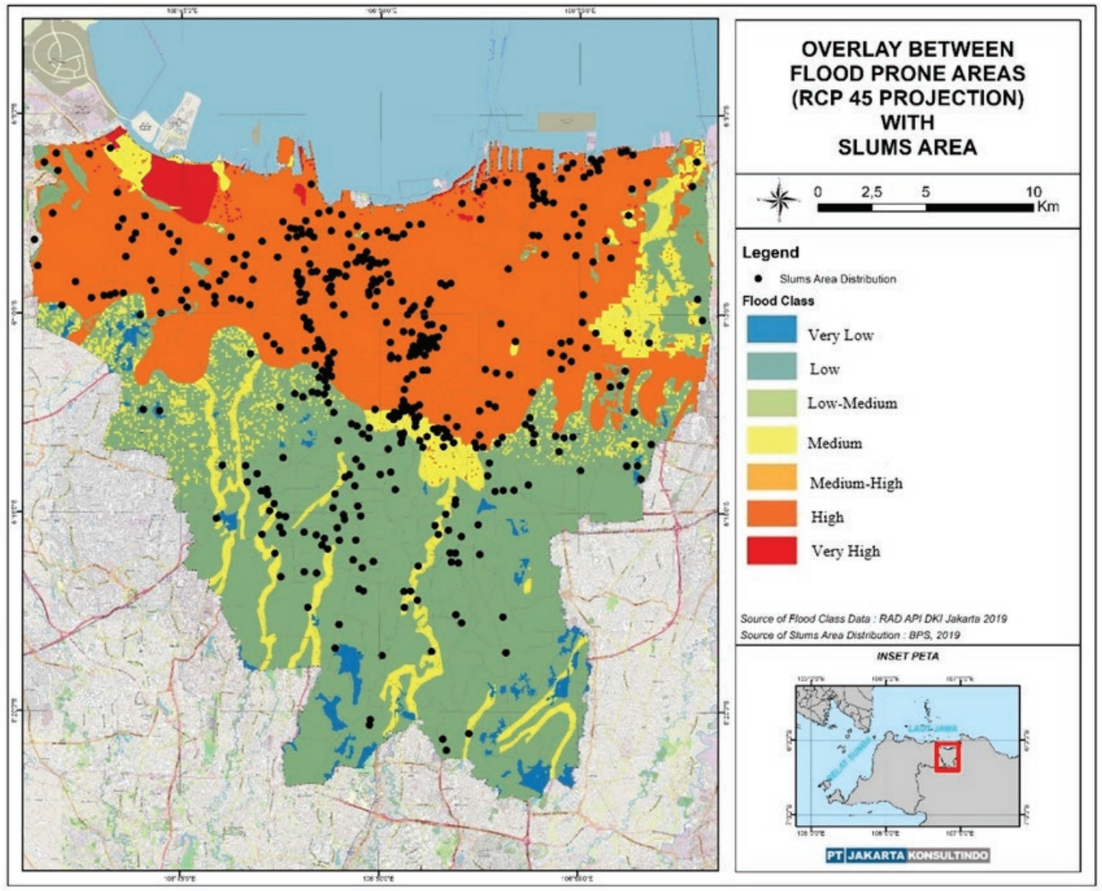


Figure 10. Map of flood prone areas and the distribution of slum areas in Jakarta (RAD-API 2021)

Jakarta's Projected Rise in GHG Emissions

Jakarta uses enormous amounts of energy to keep the province in motion. Energy demand primarily comes from transport, residential and commercial buildings and industrial processes. Most of the energy is derived from fossil fuels—combustion in either large-scale power plants, small-scale generators or different transport modes. This results in large amounts of GHG emissions that directly contribute to climate change. To identify strategic mitigation actions, develop specific targets and measure emissions reductions in the future, a GHG inventory is presented on the historical emissions as well as future emissions under different scenarios.

GHG Emissions Inventory in 2016

The aim of the GHG inventory is to provide information about the profile of GHG emissions of DKI Jakarta, which forms the basis of projecting future emissions and understanding emission trends over time. As part of the work undertaken for RAD-GRK 2021, an IPCC compliant GHG inventory was produced for the year 2016. For the purposes of this Climate Action Plan, the results of the IPCC compliant inventory have been translated into an inventory compliant with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) standard used for cities. The BASIC level inventory covers scope 1 and scope 2 emissions from stationary energy and transport, as well as scope 1 and scope 3 emissions from waste. Table 2 shows the sector and sub sector emissions covered by a BASIC level GHG inventory in more detail and whether GHG emissions were reported by Jakarta for each source.

SECTOR	EMISSIONS SOURCE	BASIC LEVEL EMISSIONS SCOPE*		
		SCOPE 1	SCOPE 2	SCOPE 3
Stationary Energy	Residential buildings	✓	✓	
	Commercial and institutional buildings and facilities	✓	✓	
	Manufacturing industries and construction	✓	✓	
	Energy industries	✓**	✓**	
	Agriculture, forestry, and fishing activities	✓	✓**	
	Non-specified sources	✓	✓	
	Fugitive emissions from mining processing, storage, and transportation of coal	✓**	Not applicable	
	Fugitive emissions from oil and natural gas systems	✓	Not applicable	
Transportation	On-road	✓	✓**	
	Railways	✓	✓	
	Waterborne navigation	✓	✓**	
	Aviation	✓	✓**	
	Off-road	✓**	✓**	
Waste	Solid waste disposal	✓		✓**
	Biological treatment of waste	✓		✓**
	Incineration and open burning	✓**		✓**
	Waste water treatment and discharge	✓		✓**

* Activities taking place within a city can generate GHG emissions that occur inside the city boundary as well as outside. To distinguish among them, the GPC groups emissions into three categories based on where they occur:
** No emissions reporting in Jakarta

BASIC level emissions cover scope 1 and scope 2 emissions from stationary energy and transport, as well as scope 1 and scope 3 emissions from waste.
Scope 1: GHG emissions from sources located within the city boundary
Scope 2: GHG emissions occurring as a consequence of the use of grid supplied electricity, heat, steam and/or cooling within the city boundary.
Scope 3: All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary

Table 2. GHG emissions sources reported in Jakarta under the BASIC level GPC compliant inventory

In 2016, DKI Jakarta recorded GHG emissions of 53.6 $MtCO_2e$. Figure 11 indicates the primary source of these emissions. The largest contribution accounting for 57% of the total emissions came from scope 2 stationary energy emissions, which are the emissions from grid electricity consumption. The electricity is retrieved from power plants situated in the province and supplemented by the Java-Madura-Bali (JAMALI) interconnected system. Jamali is the largest and most established electricity grid in Indonesia and covers two special regions and five provinces; that is, Jakarta, Yogyakarta, Banten, West Java, Central Java, East Java and Bali.

Scope 1 emissions from stationary energy were the second largest contributor at 22%, which is mainly attributed to fuel use for non-grid electricity. The third largest source of emissions originated from the transport sector. Contributions from this sector amounted to 17%, which are mainly due to fuel consumption in internal combustion engines of vehicles. Finally, the waste sector contributed 4% of emissions.

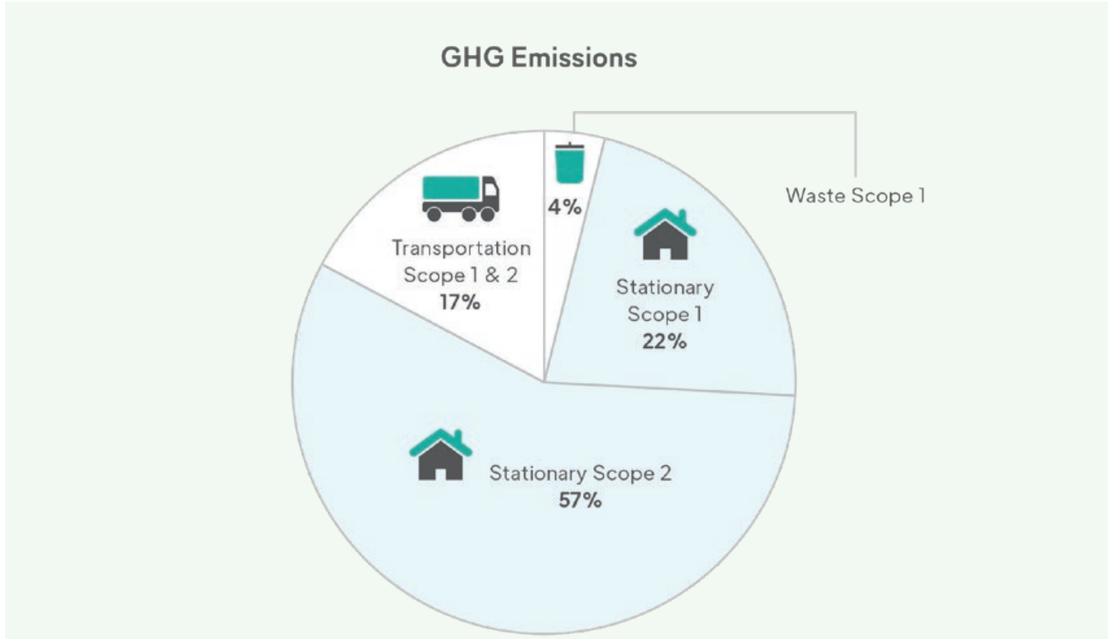


Figure 11. Jakarta's GPC compliant GHG emissions inventory by sector in 2016

Certain challenges with data quality and completeness were identified during the translation of IPCC data to the GPC standard. Trade-offs were made, for example, between scaled-down national data or modelling and provincial-specific data depending on the data required by the GPC standard. The provincial government is investing in its capacity for data collection and retention. A web-based platform is in the process of being developed to collect and retain GHG emission data from different sources in a more structured and standardized way. The data is also collected in a way that makes the final stages of calculating the GPC-compliant inventory more efficient. Over time, this platform will reduce the trade-offs that need to be made when compiling inventories leading to more accurate GHG projections and reliable inputs to monitoring, evaluation and reporting the impacts of climate action.

The largest contribution accounting for 57% of the total emissions came from scope 2 stationary energy emissions, which are the emissions from grid electricity consumption.

Business-as-usual GHG Emissions 2010–2050

The business-as-usual GHG emissions scenario demonstrates the emissions the province will generate if no mitigation actions are implemented. As with the GHG inventory, the business-as-usual scenario for DKI Jakarta presented in this CAP has been adopted from the modeling work undertaken for RAD-GRK 2021. It makes use of baseline GHG emissions in 2010 as well as projections related to population, economic (GDP per capita) and transport demand growth. Figure 12 shows the business-as-usual scenario, which projects a 400% growth in emissions between 2010 to 2050.

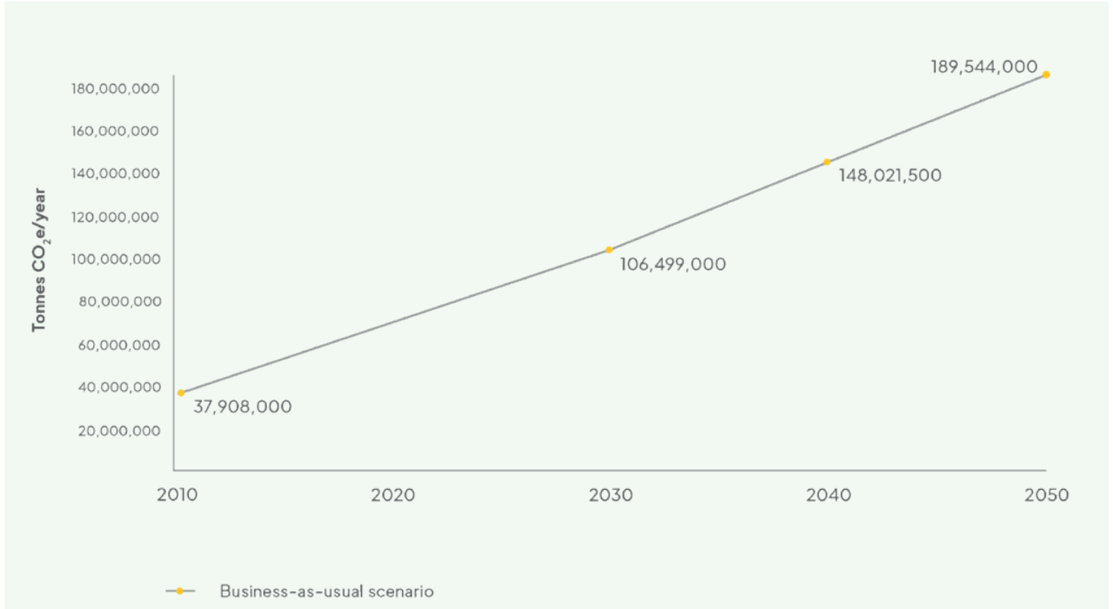


Figure 12. Jakarta's business-as-usual GHG emissions projections 2010–2050 (RAD-GRK 2021)

The Time to Act is Now

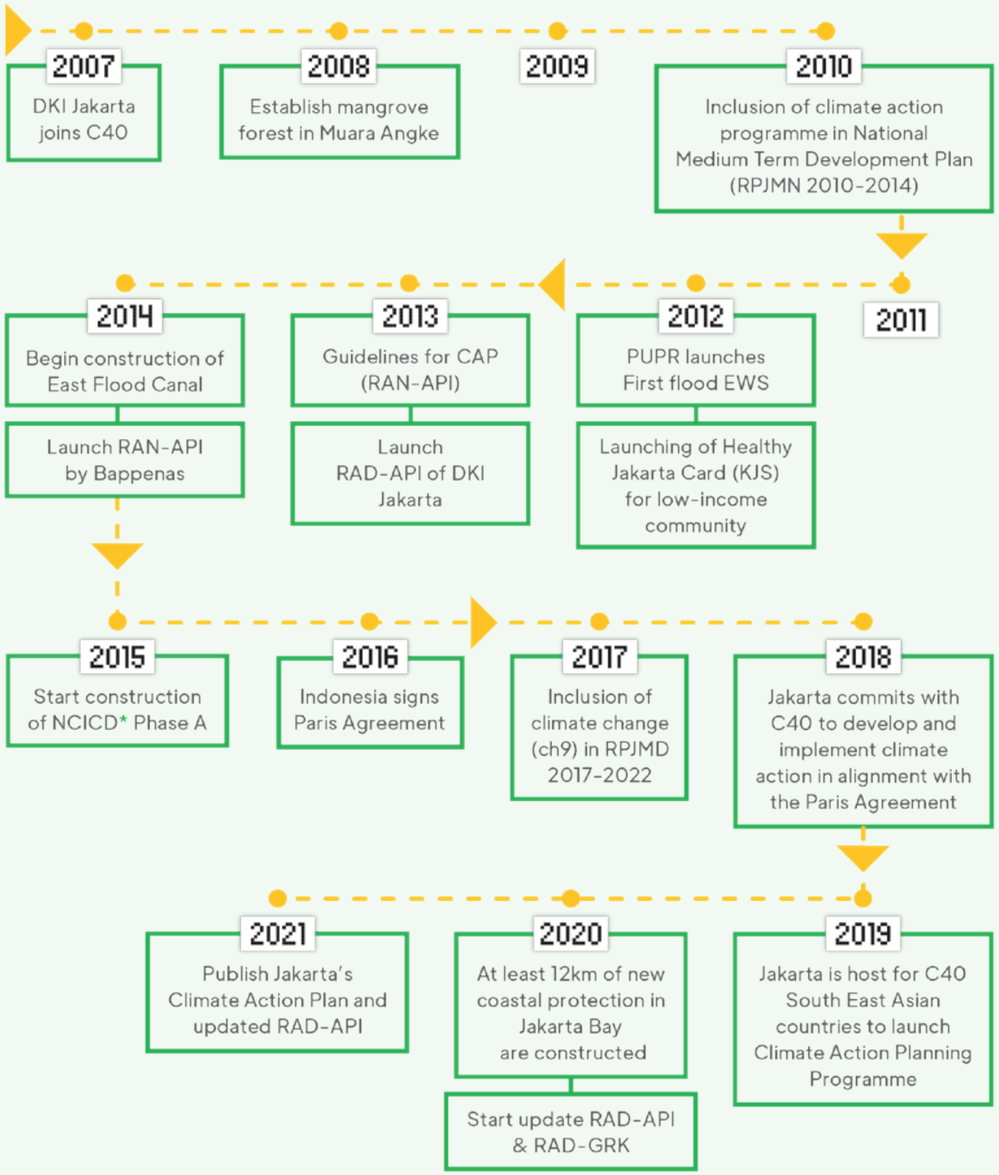
DKI Jakarta is particularly vulnerable to the effects of climate change. It is expected that without adaptation measures, the province will experience greater economic and social challenges. This limits Jakarta's potential to remain the economic heart of Indonesia. Furthermore, with GHG emissions between 2010 and 2050 projected to increase by 400%, DKI Jakarta must ramp up its efforts to bend that trajectory towards net zero emissions by 2050, to avoid further contributing to the climate crisis. The time to act is now.

2.3 Climate Action Milestones to Date

It is important to reflect and understand the progress of climate action to date in Jakarta to inform the direction and actions proposed in this CAP. It enables past successes and lessons learned to be embedded in the proposed climate actions on which to focus implementation. Figure 13 and Figure 14 provide an overview on Jakarta's key climate action milestones on climate adaptation and climate mitigation since 2007, respectively.



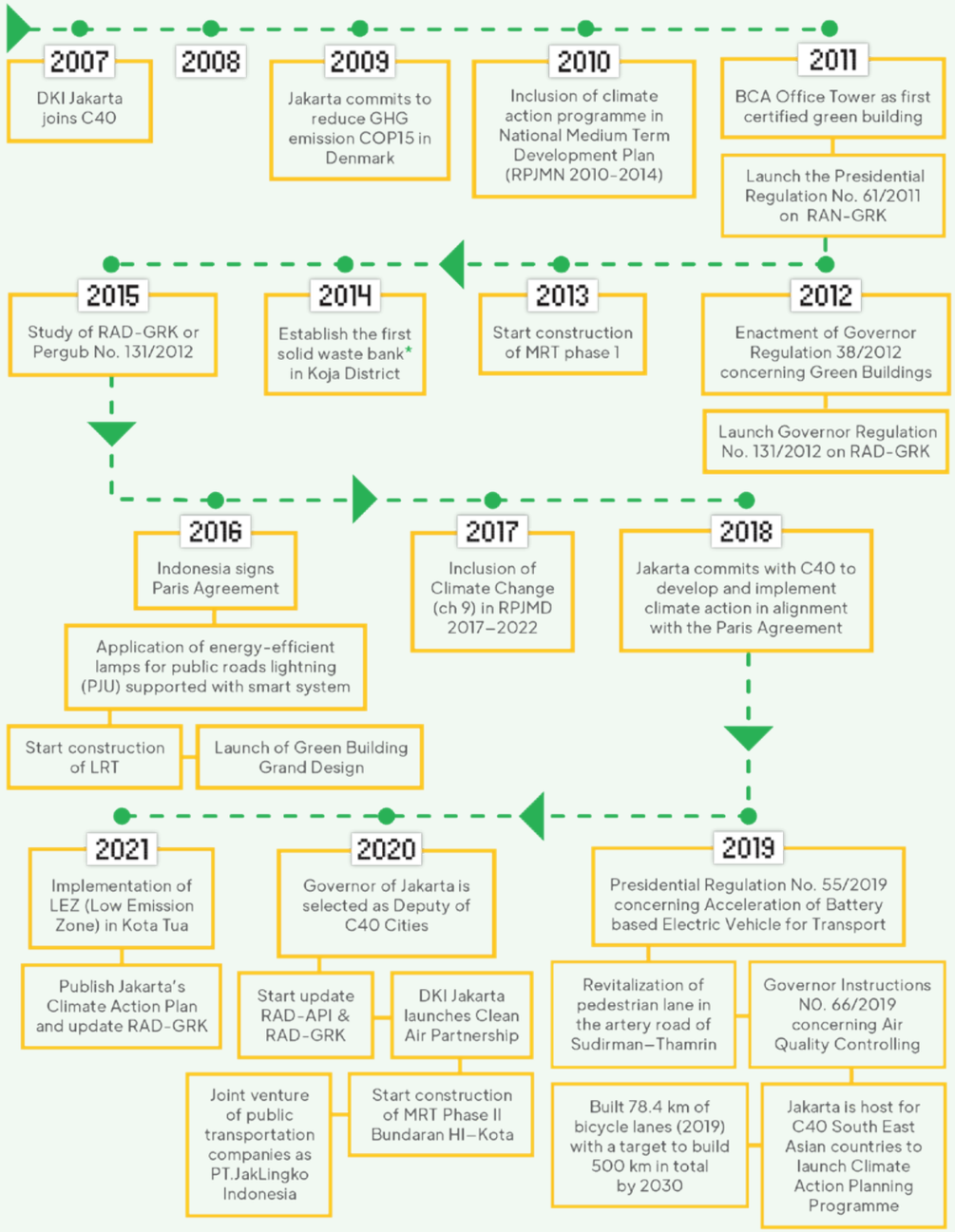
Timeline of Climate Adaptation Milestones in Jakarta 2007–2021



*National Capital Integrated Coastal Development.

Figure 13. Timeline of climate adaptation milestones in Jakarta 2007–2021

Timeline of Climate Mitigation Milestones in Jakarta 2007–2021



* *Solid waste bank is the place where community can sell their solid waste (plastic/paper) and get the bank account for saving the money after selling their solid waste.*

Figure 14. Timeline of climate mitigation milestones in Jakarta 2007–2021

03

Vision, Goals and Targets

3.1 Vision for Climate Action in Jakarta

DKI Jakarta has set itself on the path of becoming a climate resilient and carbon neutral province by 2050. Under the RPJMD 2018–2022 the following statement is made on climate action:

Sustainability is at the core of the development of the province. The world must integrate the social, economic and environmental dimensions of sustainability in its development plans and must act now to reduce the rate of climate change and environmental degradation, which pose an unprecedented threat to humanity.

In line with this statement, a shared vision for climate action in Jakarta has been developed that provides clear direction for everyone in the province to work towards.

Vision on Climate Adaptation

Jakarta is a climate resilient province that provides equal opportunity to all its inhabitants to live safely, healthily and prosperously through urban planning, public services, education, strong cultural heritage and sustainable innovation.

Vision on Climate Mitigation

Jakarta is a carbon neutral province by using clean energy in an efficient way across the built environment and industry as well as providing quality public transport and safe solid waste management provisions to all.

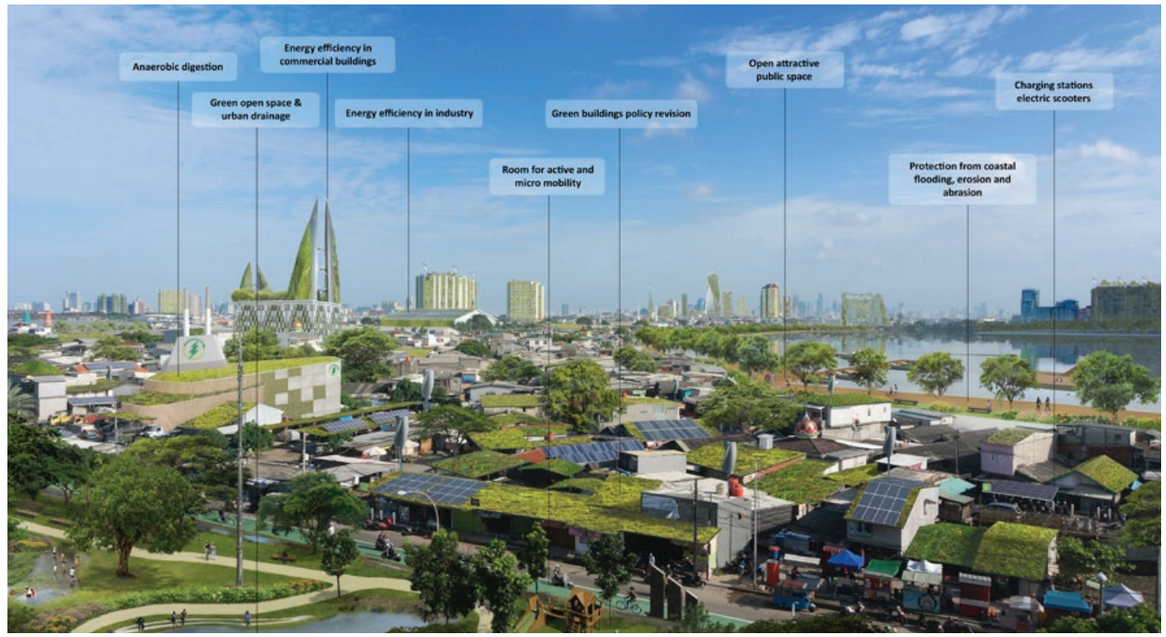


Figure 15. Artist impression of the vision for climate action in Jakarta in 2050



Figure 16. Artist impression of the vision for climate action in Jakarta in 2050 on the street level

To secure climate action as an issue beyond the environment, all policymakers across the provincial government should embed climate actions into their new and existing sectoral policies and plans.

Providing Additional Benefits Through Climate Action

Climate actions are often physical and institutional adjustments in the province. Each action provides opportunities to improve the social and economic wellbeing of the province. For example, a dike in itself is infrastructure that protects the people and economy from flooding. However, it can also provide Jakarta with a new public space where people relax and exercise. Incorporating these considerations into the design of climate actions provides benefits that also help the province accomplish other goals and targets. The objective is to identify these opportunities to make climate action more integrated.

Mainstreaming Climate Action

Climate actions range from simple quick-win actions to difficult system-changing actions that require multiple stakeholders for implementation. To secure climate action as an issue beyond the environment, all policymakers across the provincial government should embed climate actions into their new and existing sectoral policies and plans. This process is called mainstreaming and has the potential to:

- Improve support and commitment from stakeholders
- Ensure more efficient use of resources through multifunctional use of space or by adding multiple benefits to a design
- Improve the sustainability and scale of actions
- Reduce nuisance in daily lives by simultaneously implementing actions at one location
- Leverage existing resources and funding/finance already assigned to sectoral actions directly related to climate actions
- Raise the profile of climate actions
- Avoid maladaptation

The integrated nature of mainstreaming requires coordination among multiple actors, institutions and processes. Within this CAP, mainstreaming opportunities have been identified for the proposed climate actions with ways on how to take advantage of these opportunities in the future. This was done by engaging multiple provincial departments on their existing provincial plans, programmes, procedures, projects and people.

3.2 Goals and Targets to Achieve this Vision

To achieve the vision, DKI Jakarta has developed goals and targets on climate adaptation and mitigation. The goals are formulated to cover the broad spectrum of climate action that the provincial government aims to address over time. The targets are focused on high impact areas, which form the basis of the proposed climate actions in this CAP.

Climate Adaptation

The main goal on climate adaptation is that climate change does not result in economic damage or health risks for the people of Jakarta. This can be split up into more specific goals across three categories:

- **Preparing responses for climate risk:** Minimizing casualties or health risks resulting from climate hazards through improved healthcare and early warning systems.
- **Reducing the exposure to climate risk:** Land-use control to limit exposure to climate hazards and also ensuring water supply is readily available and of good quality during droughts.
- **Protecting against climate risk:** Regulating that buildings, the urban drainage system, coastal protection, water supply and waste water are built or retrofitted to reduce flood and climate-related health risks.

The specific adaptation targets for this Climate Action Plan are presented in Table 3.

CATEGORY	DESCRIPTION	TARGET 2030	TARGET 2050
Preparing Responses for Climate Risk	% communities in Jakarta trained and educated for climate disasters	50%	80%
	% Early warning systems and disaster information and monitoring systems operational	100%	100%
	% Regional healthcare coverage Jakarta for low income inhabitants	(TBC)[3]	100%
Reducing the Exposure to Climate Risk	% Reduction land subsidence	75%	100%
	% Served by clean, piped drinking water supply	70%	100%
	% Land used in compliance with province plans and regulations (RDTR)	75%	100%
Protecting Against Climate Risk	% Green space regulated by the province with the function for water retention/discharge	30%	>30%
	Km of new river dikes constructed	3 km	7.2 km
	% Inundation area managed by emergency response team	35%	80%

Table 3. Climate adaptation targets for Climate Action Plan 2021–2050

Overcoming the Barriers

Not all targets are easily achieved, owing to the fact that infrastructure development often requires a lot of time, large investments and collaboration between governments and businesses. For example, to reduce flood risk, dikes need to be built to keep seawater from entering the province and integrated water management across provincial borders is required to reduce solid waste load and reduce peak discharges in downstream rivers. Some of the flood risks related to rivers need to be addressed upstream beyond the provincial borders and require coordination beyond the provincial government. Likewise, coastal flood protection measures require coordination at and collaboration with national government. The collaboration required to address these risks are established in PerPres 60/2020, for the cross-boundary integration of land-use in the Jabodetabekpunjur region. Reliable, sufficient and clean drinking water is required to enable people to shift from groundwater to piped water and prevent subsidence induced by groundwater abstraction. Sanitation is required to prevent a health risk from water retained in reservoirs along the coast. Large investments are required to fund and finance flood safety programmes. Stakeholders must work together to coordinate efforts and acquire funds to achieve the goal of reducing flood risk from the coast. The provincial government will leverage the multi-stakeholder climate governance structure set out in Chapter 5 to facilitate collaboration across the province.

Climate Mitigation

The overarching goal on climate mitigation is for Jakarta to be carbon neutral by 2050. Jakarta's commitment to limiting global temperature increase to 1.5°C in line with the aspirations of the Paris Agreement has been translated into a GHG emissions trajectory to 2050 for the province (hereafter referred to as the '1.5° scenario'). Achieving the 1.5° scenario and carbon neutrality goal is conditional on overcoming practical, institutional, and data barriers that make it currently infeasible. Therefore, further scenarios have been modelled to set unconditional targets in the 'CAP 2021 scenario' which are ambitious but achievable.

[3] Target to be confirmed upon publication of the Jakarta Health Capacity Development Plan, expected in 2022

The GHG emissions reductions goals in the RAD-GRK 2021 are for Jakarta to achieve emission reductions of 30% from business-as-usual in 2030 and 29% from business-as-usual in 2050 (hereafter referred to as the 'RAD-GRK 2021 scenario'). This CAP commits Jakarta to elevated goals (hereafter referred to as the 'CAP 2021 scenario') that achieves a minimum of:

- 50% GHG emission reductions from the business-as-usual scenario of 106.5 $MtCO_2e$ in 2030, compared to the 2010 base year of 37.9 $MtCO_2e$
- 62% GHG emission reductions from the business-as-usual scenario of 189.5 $MtCO_2e$ in 2050, compared to the 2010 base year of 37.9 $MtCO_2e$

The CAP 2021 scenario has been developed by amplifying the emissions reduction potential for existing climate actions and proposing more in addition. Due to time and data constraints, only the expected emissions mitigated for the stationary energy sector in the CAP 2021 scenario have been quantified. This includes quantifying emissions reductions due to actions on grid decarbonization and distributed solar PV, which are estimated to be 51.7 $MtCO_2e$ in 2030 and 116.9 $MtCO_2e$ in 2050. These actions will be particularly effective in addressing Scope 2 emissions related to energy consumption in DKI Jakarta, which was the majority source of emissions found in the 2016 GHG inventory. The targets therefore serve as a useful representation of the minimum emissions reductions achieved in the CAP 2021 scenario and bring DKI Jakarta closer to achieving the 1.5°C scenario.

Figure 17 shows the emissions trajectory for the CAP 2021 scenario and how this compares to the business-as-usual scenario, RAD-GRK 2021 scenario and 1.5°C scenario. The remaining gap between the CAP 2021 and 1.5°C scenarios may be met by quantifying the full set of mitigation actions under the CAP 2021 scenario. This should be done following the completion of the next GPC-compliant GHG inventory where data becomes available to better model the CAP 2021 scenario.

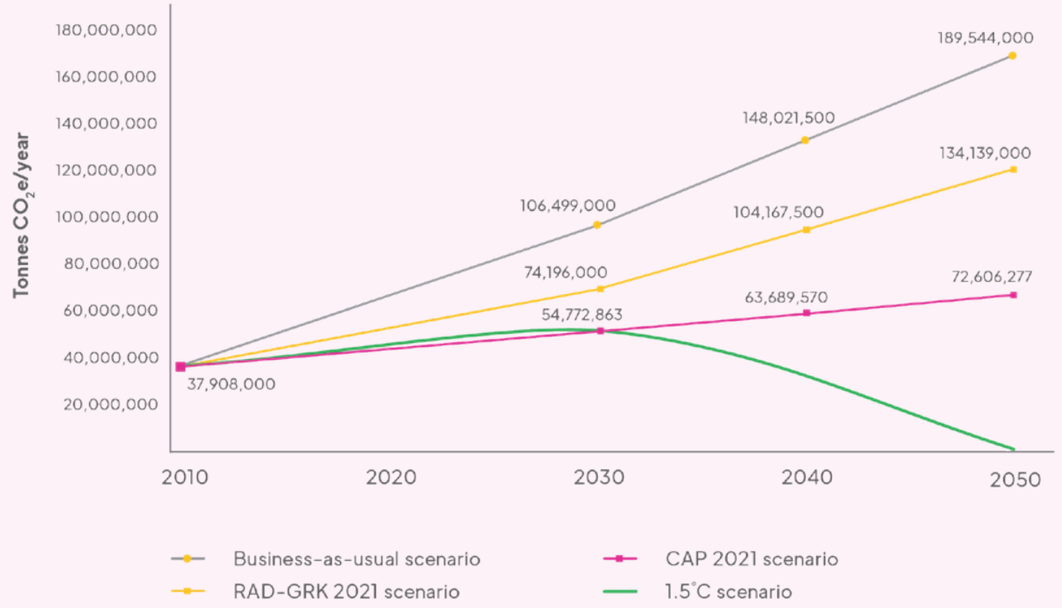


Figure 17. GHG emissions reductions scenarios to 2050 in Jakarta

The specific adaptation targets for this Climate Action Plan are presented in Table 4.

CATEGORY	DESCRIPTION	TARGET 2030	TARGET 2050
Energy (Percentage Grid-Mix*)	Solar (Photovoltaic)	10.0%	25.0%
	Hydro (Large)	5.0%	5.0%
	Geothermal	7.0%	7.0%
	Biofuel	2.0%	5.0%
	Natural Gas	14.0%	11.0%
	Distillate fuel oil No 2	37.0%	31.0%
	Coal (Bituminous or Black coal)	25.0%	16.0%
Buildings and Industry	% of total buildings that have upgraded their water heating systems to high-efficiency water heaters	40%[r]	80%[r]
		60%[c]	90%[c]
	% of total buildings equipped with energy efficient appliances	40%[r]	80%[r]
		60%[c]	90%[c]
Transport (Percentage Mode Share)	Bus (BRT)	7.7%	15.4%
	MRT and LRT	3.9%	11.6%
	Commuter Rail	7.7%	11.6%
	Cycling	1.0%	5.0%
	Walking	1.0%	5.0%
Solid Waste	% reduction of total waste generation	38.0%	70.0%
	% of waste recycled (diverted from landfills)	38.0%	70.0%
	% of waste composted (diverted from landfill)	5.0%	15.0%

[r] residential
[c] commercial
* Percentage share of total grid electricity by energy source

Table 4. Climate mitigation targets for Climate Action Plan 2021–2050

Overcoming the Barriers

The provincial government acknowledges that some of the targets are beyond its direct authority and are conditional upon overcoming certain barriers. The provincial government is committed to addressing these by bringing together and influencing the key decision-makers on these topics.

50% GHG emission reductions from the business-as-usual scenario of 106.5 $MtCO_2e$ in 2030, compared to the 2010 base year of 37.9 $MtCO_2e$.



ENERGY

Combined efforts to reduce emissions in the energy-generation sector are required. Power over grid-mix lie with the Ministry of Energy and Mining KESDM (grid-mix) and the ministry of Environment and Forestry KLHK (emissions) and is managed by PT Perusahaan Listrik Negara (PLN, state-owned power generation and grid operator) and PT Perusahaan Pertambangan Minyak dan Gas Bumi Negara (Pertamina, state-owned oil and natural gas mining corporation). For a country that experiences high solar irradiation, rooftop solar is a potential source of renewable energy. Despite this, the uptake of rooftop solar is slow, because it currently does not meet cost parity in Indonesia. To encourage installation, the private industry must be encouraged by technical and financial stability. This can be achieved by clear installation requirements issued by PLN and the national government, as well as upgrades to the national grid distribution system to enable it to handle the additional loads of distributed PV.

BUILDINGS AND INDUSTRY

Standardization and enforcement of energy-efficient electrical appliances poses a challenge. Energy-efficient technology is not fully regulated in Indonesia and limited options are available in the market. In addition, a significant proportion of DKI Jakarta inhabitants rely on diesel generators for daily energy use, supplementing or replacing grid power. This means that upgrading to energy-efficient appliances is less effective in achieving emissions reductions. However, at the national level, there have been regulations issued for energy conservation and energy-efficiency labelling. From the demand side, Jakarta's inhabitants at the consumer level should be made aware of the opportunities to upgrade to energy-efficient appliances. Therefore, a combination of approach will be taken from the supply and demand side.

TRANSPORT

The Greater Jakarta Transport Authority (GJTA) manages the planning and management of public transit (MRT, LRT and BRT). DKI Jakarta has the authority over the transport system within the province and is progressing with collaboration on public transit management between DKI Jakarta and GJTA. Public transit capacities need to be designed for the full Jabodetabek population, due to the high daytime population of DKI Jakarta as a political and commercial hub. However, high Jabodetabek population growth and limited monitoring capacities mean that there is limited data to inform urban spatial planning and transport network expansion. From demand side, behavioural change intervention is required to encourage a shift from private to public transport.

SOLID WASTE

Emissions reductions in this sector require new and upgraded waste collection processes and infrastructure. However, larger-scale projects for waste diversion and management utilize different financing and implementation schemes, such as Public-Private Partnerships (PPP) or assigning implementation to Regional Owned Enterprises (BUMD). These require more time and engagement to implement. In addition, waste management must be combined with significant behavioural changes in the DKI Jakarta population. With a rising middle class, this will require a shift in attitudes towards environmentally conscious consumption and waste disposal.

Residual Emissions in 2030 and 2050

Under the CAP 2021 scenario, DKI Jakarta will still have residual emissions that are very challenging to mitigate. These could include situations where further practical, institutional, and data barriers cannot be overcome. The residual emissions currently identified for Jakarta are provided in Table 5.

These residual emissions will be monitored when compiling future GHG inventories and updating the GHG scenario models to pinpoint further actions. Jakarta will focus on efforts that are able to close the gap between the CAP 2021 scenario and the 1.5°C scenario.

Energy	As mentioned earlier, DKI Jakarta does not have powers over the mix of energy sources for the power supplied by PLN. This means that if PLN continues to drive energy generation using coal, natural gas and related derivatives, DKI Jakarta emissions due to electricity consumption cannot be addressed.
Buildings and Industry	Informal settlement inhabitants and older commercial buildings are inherently unable to upgrade their fixtures and appliances to that of high energy efficiency, due to the prohibitive cost and unsuitability of such technology (e.g. reliance on diesel generators).
Transport	The political profile, urban density and economic activity of DKI Jakarta translates into a high provincial daytime population from across the Jabodetabek region. Tracking and planning for such traffic flows will continue to pose a great challenge in monitoring and analyzing what transport emissions are generated within DKI Jakarta's provincial boundaries, and what priority actions can be taken to address these emissions.
Waste	There will continue to be a proportion of waste that cannot be recycled or composted, while behavioural change is happening with the general DKI Jakarta population. There will also be waste that requires landfill solutions due to imperfect waste segregation and management, at the consumer level and waste collection centres.

Table 5. Residual emissions DKI Jakarta

Additional Benefits

Climate action will provide economic and social benefits in addition to the primary objective of becoming climate resilient and carbon neutral. These additional benefits contribute to the strategic development efforts as set out under the Provincial Regional Medium-Term Development plan (RPJMD) to create a Jakarta that is "Maju Kotanya Bahagia Warganya" (Developed Province, Happy Inhabitants). The five main efforts of the provincial development plan are human development, economy and infrastructure development, increasing transparency and accountability, sustainable urban development, and Jakarta development as a measure of progress.



Additional Adaptation Benefits

Chapter 2 has shown that low-income households are especially vulnerable to climate risks. Reducing climate risk has the ability to improve the adaptive capacity of communities, thereby improving the social and economic wellbeing of households and contributing to alleviating poverty within the province. As adaptation measures often require large infrastructural improvements and thereby a large workforce, adaptation actions also contribute to job creation. And, if infrastructure is designed to accommodate port development, sanitization and water supply infrastructure, social housing or recreational areas, commercial opportunities could be seized, the livability of an area can be improved and low income housing expanded.

Additional Mitigation Benefits

DKI Jakarta experiences the challenges of air quality, road congestion and water pollution, which currently reduce the social and economic development potential of the province. The use of clean energy, reduced energy consumption and improved waste management will significantly improve travel time and improve air and water quality, resulting in improved wellbeing and increased productivity of the provincial population. Furthermore, large scale retrofitting of buildings, installation of solar panels and infrastructural improvements to the electricity grid could result in in job growth and business opportunities.

Getting the Most Out of Climate Action Benefits

Additional benefits are only possible through engaging with stakeholders that will benefit or be impacted the most by climate actions. These stakeholders are often vulnerable to climate hazards and are likely to be impacted by climate policies and projects. DKI Jakarta has mapped these stakeholders, and their needs have been assessed. When implementing every action, it will be crucial for each key technical department of DKI Jakarta to continue engaging with its internal and external stakeholders as to how their input was integrated into climate actions. As actions are further defined, feedback will be needed from these stakeholders for detailed project implementation planning. Engaging with stakeholders can be done directly with the use of a digital platform such as, for example, the ProKlim Climate Village Programme, which has been developed in collaboration with the national government. To date, 48 villages have already been incorporated into this. Alternatively, it could be done via organizations that are able to represent their constituents. Stakeholder engagement goes hand-in-hand with a communications strategy that engages stakeholders, conveys the outcomes of resilience improvement, emission reduction and the co-benefits in order to build greater awareness and support for climate action.

04

Strategic Climate Actions and Their Roadmaps



4.1 Jakarta's Strategic Climate Actions

In this chapter, 14 strategic climate actions that have great impact potential and are of significant strategic importance to the province are presented. The 14 actions were selected from an initial list of 48 that were identified, based on the climate risks and GHG emissions profile of Jakarta as well as the climate actions already implemented or in the planning stage. The full list of 48 actions is provided in Appendix II. All 48 actions are important and will be implemented in due course. However, implementation will be phased to account for the provincial funding, financing and resources available. Therefore, the provincial government has decided to focus implementing climate actions based on the following criteria:

- Greatest contribution to climate risk reduction and GHG emissions reduction
- Ability to generate additional benefits in line with other strategic provincial agendas (e.g. Jakarta's vision and mission statement for health and wellbeing, economic prosperity, just and equal society, and sustainability for all)
- Technical and financial feasibility
- The control that the provincial government has over implementation

The final 14 actions were selected using the results of a multicriteria analysis and through a consultative process with relevant Regional Working Units (SKPDs). They have been split into adaptation and mitigation actions depending on their primary impact contribution. In each of these two areas, three action tracks have been developed made up of actions with strong interrelationships as shown in Table 6.

ACTION TRACK	STRATEGIC ACTIONS
ADAPTATION	
Track 1. **Preparing Responses for Climate Risks**	**Action 1.1:** Early warning systems and emergency response plans in anticipation of climate events
	Action 1.2: Increasing regional healthcare coverage during climate events
Track 2. **Reducing the Exposure to Climate Risks**	**Action 2.1:** Land use planning and controls
	Action 2.2: Providing reliable and clean drinking water
Track 3. **Protecting Against Climate Risks**	**Action 3.1:** Retrofit and construction of urban drainage systems for flood resilience
	Action 3.2: Protection from coastal flooding, erosion and abrasion
MITIGATION	
Track 4. **Buildings and Industry**	**Action 4.1:** Energy efficiency in commercial buildings
	Action 4.2: Energy efficiency in industry
	Action 4.3: Green buildings policy revisions
Track 5. **Transport**	**Action 5.1:** Public transport expansion
	Action 5.2: Electric vehicles for government transport operations
Track 6. **Solid Waste**	**Action 6.1:** Landfill gas recovery systems
	Action 6.2: Anaerobic digestion of animal slaughterhouse waste
	Action 6.3: Anaerobic digestion of municipal organic waste

Table 6. 14 strategic climate actions for Jakarta



Action Tracks and Factsheets

Each action track and strategic action is described in more detail below. A factsheet has been created for each strategic climate action to summarize the details of each action that was developed in collaboration with the lead implementing agency in the provincial government as well as other agencies. The factsheet provides information on the following aspects:

- **Description**—a brief overview of the scope of the action
- **Benefits**—the key United Nations Sustainable Development Goals (UN SDGs) that the action addresses
- **Governance**—the name of the lead implementing agency and other agencies that will support the implementation process
- **Mainstreaming opportunities**—a list of mainstreaming opportunities with other provincial plans, programmes, procedures, projects and people
- **Monitoring indicators**—primary indicators for measuring the outputs, outcomes and impacts of the action with the agencies responsible for collecting the relevant data

Adaptation and Mitigation Roadmaps

A roadmap has been developed for both adaptation and mitigation actions to help DKI Jakarta visualize the relevant actions, milestones and targets that need to be accomplished in the short term (2020–2022), medium-term (2022–2030) and long-term (2030–2050) to ensure the successful delivery of the CAP.

4.2 Adaptation Action Tracks and Factsheets

The three action tracks under adaptation are described below.

TRACK 1: Preparing Responses for Climate Risks

In the short term, climate risks and hazards (e.g. flooding) will inevitably occur in Jakarta as the current infrastructure does not have the capacity to cope. Therefore, a reactive approach that focuses on disaster response and management is required, such as flood preparation with early warning systems and increased regional healthcare coverage.

TRACK 2: Reducing the Exposure to Climate Risks

The reactive approach of Track 1 needs to be supplemented with a more preventive approach. This track aims to reduce holistically the exposure of DKI Jakarta's population and infrastructure via urban planning and the improved provision of essential public services. This is to create the systemic change needed to address flood risk, land subsidence and excessive groundwater abstraction in a transformative way.

TRACK 3: Protecting Against Climate Risks

This track focuses on an integrated approach to flood defence and urban drainage. An important part of this track is to design and construct a robust network of drainage measures, pumps, dikes and mangroves to reduce flood risks.



ACTION 1.1 Early Warning Systems and Emergency Response Plans in Anticipation of Climate Events

adaptation | multiple climate hazards

Description

Extreme weather events often result in flooding and other climate hazards in Jakarta. While significant efforts are already made to prepare and respond to such events by mobilizing more than 1,000 personnel, adopting additional measures will better equip the province with the resources and capacity to effectively manage the situation.

BPBD, as the agency leading disaster prevention in the province, will lead this action. They will work with DSDA to develop a robust early warning system that enables extreme weather events to be predicted including their likely scale of impact across the province.

The emergency response plans prepared by BPBD should consider and plan for different flooding and other climate risk scenarios in each district so that specific information can be provided to each district and that the right resources can be deployed in different flooding scenarios. The response plans will include the roles and responsibilities of different personnel, procedures to be followed by organizations and inhabitants alike, and the required resources just before, during and after any climate related disaster including shelter, healthcare, clean water and food provisions.

Communicating the emergency response plan to all city stakeholders in different forms will be key, particularly to those most vulnerable to the impacts of climate related disasters.

Benefits



Response plans will actively consider how to reduce water- and vector-borne diseases



Industry will need to develop early warning systems and keep them updated with the latest technology



Response measures will be effectively communicated, especially to vulnerable groups



Jakarta's inhabitants and province-wide capacity to adapt to climate change will be strengthened

ACTION 1.1

Governance

Lead Implementing Agency	BPBD
Supporting Agencies	BNPB, DSDA, Diskominfotik, BPPT, BMKG, NGOs

Mainstreaming Opportunities

Projects	Align response plans with other actions including Action 3.1 (urban drainage), Action 3.2 (coastal protection) and Action 4.3 (green buildings)

Monitoring Indicators

Output	# of early warning systems in place for each climate hazard (DSDA, DLH)
Output	% of province covered under the early warning systems and response plan (BPBD, DSDA)
Outcome	% timely responses by the emergency services during climate events (BPBD, DSDA)
Outcome	% population implementing response actions during climate events (BPBD, DISDIK)
Impact	IDR of asset repairs after climate events (DCKTRP, DPRKP)
Impact	# of people displaced from climate events (DINSOS, BPBD, TAPEM)
Impact	# of injuries or fatalities as a result of climate events (DINKES, BPBD, TAPEM)
Impact	% change in the employment rate following climate events (DINSOS, DTKTE)

ACTION 1.2 Increasing Regional Healthcare Coverage During Climate Events

adaptation | multiple climate hazards

Description

Climate change has had an impact on the health of Jakarta's inhabitants with a rise in the incidence of heat strokes as well as water- and vector-borne diseases. Dengue fever cases, which are correlated to rainfall and humidity, have risen to approximately 28 in every 100,000 people (DINKES, 2019). To reduce the impact of climate change on health, Jakarta needs to strengthen healthcare services.

DINKES is charged to increase overall healthcare provisions by growing both the number of primary service facilities (permanent but also temporary during climate events) and the number of staff, especially in rural areas that have the highest incidences. Healthcare providers will be provided with additional training on health issues related to climate hazards.

DINKES will support BPBD to develop healthcare response plans for a variety of climate scenarios to reduce health-related risks. DINKES will also help develop communications on how inhabitants can better protect themselves during climate events.

The provincial government will increase the roll out of Kartu Jakarta Sehat (Healthy Jakarta Card)—a system targeting the poor for access to free healthcare—to ensure healthcare services are available to all in need.

Benefits



Communicating protective measures and increasing healthcare provisions will support community health



Accessibility to healthcare services for low-income groups will be a priority through Kartu Jakarta Sehat



Healthcare capacity will increase to better manage climate-related health impacts of the community

ACTION 1.2

Governance

Lead Implementing Agency	DINKES
Supporting Agencies	KEMENKES, BPBD, DINSOS

Mainstreaming Opportunities

Programs	Align the DINKES Public Health Preparedness and Anticipation programs with BPBD disaster management measures
People	Establish a collaboration between provincial departments and the private sector in procuring sufficient medical tools and equipment in preparation for climate-related disasters

Monitoring Indicators

Outcome	% of healthcare providers trained to provide healthcare services during and after climate disasters (BPBD)
Outcome	% of population that has access to healthcare services in a timely manner during climate events
Outcome	% of population eligible for a Kartu Jakarta Sehat, and % of population who has a Kartu Jakarta Sehat
Impact	# of injuries or fatalities due to climate disasters—disaggregated for age, gender, race and socio-economic status (DINKES, BPBD, TAPEM)

ACTION 2.1 Land Use Planning and Controls

adaptation and mitigation | multiple climate hazards and urban planning

Description

Jakarta is a dynamic province with new developments being added on a daily basis. Land use planning already exists in the form of Jakarta's planning policy, zoning codes and building regulations to support the socio-economic development of the province. This action looks to improve and align land use planning and controls with the climate impacts across the province. Controlling land uses in flood-prone areas requires priority attention.

The action involves updating the Detailed Spatial Masterplan (RDTR) to prevent new developments being built in areas severely impacted or likely to be impacted by climate hazards both now and in the future, as well as mandating the relocation of existing buildings and infrastructure in areas at high risk of climate impacts. Furthermore, land use planning can require an increased area of tree cover and green spaces to reduce the urban heat island effect and air pollution, in accordance with the C40 Green and Healthy Streets declaration that was signed by DKI Jakarta. It also involves updating zoning code within the RDTR to ensure all income level housing has access to public transport and amenities within acceptable walking distances. The implementation will be supported by the development of an online portal for voluntary reporting of land use violation.

To drive the adoption of climate mitigation and adaptation, conditional planning permits should be given based on a new development's ability to achieve climate risk reduction and emissions reduction compared to business as usual. This should be coordinated with the Building Experts Team (TABG).

Benefits



Land use controls will support the expansion of recreational green spaces in the province for all to use



Urban planning will consider current and future climate hazards and minimize impact



Allocation of space and building permits approvals will consider adaption and mitigation measures

ACTION 2.1

Governance

Lead Implementing Agency	DCKTRP
Supporting Agencies	ATRBPN, DPMPTSP, Municipal Governments (Kotamadya), Districts (Kecamatan), Sub-Districts (Kelurahan)

Mainstreaming Opportunities

Programmes	Critical evaluation and updates to the RDTR by provincial representatives (DPRD) and provincial government (BAPPEDA)

Monitoring Indicators

Output	RDTR updated in line with the province's climate risk assessment (DCKTRP, DPRKP)
Output	# of assets relocated from areas prone to climate impacts (DCKTRP, DPRKP)
Outcome	% decrease of new developments built in areas with high climate risk (DCKTRP, DPRKP)
Impact	# of people displaced from their homes (DINSOS, BPBD, TAPEM)
Impact	# of injuries or fatalities due to improper or illegal land use (DINKES, BPBD, TAPEM)
Impact	# of buildings and infrastructure assets located in areas prone to climate impacts damaged during climate events (DCKTRP, DPRKP)
Impact	IDR of economic damage to buildings and infrastructure located in areas with high climate risk during climate events (BAPPEDA, DPPKUKM)

ACTION 2.2 **Providing Reliable and Clean Drinking Water**

adaptation | floods and drought

Description

Providing reliable and clean drinking water to all of Jakarta's inhabitants is not only important for their health and wellbeing during periods of drought but should also reduce the need to extract groundwater, which is the main cause of subsidence in North Jakarta and a contributing risk factor to flooding experienced in the province.

This action requires DSDA to identify sustainable sources of drinking water and build associated infrastructure in collaboration with DCKTRP, PUPR and neighboring provinces such as West Java and Bantam for the Jatiluhur and Karian reservoirs to ensure there is an integrated approach to water resources. Water supply infrastructure could include treated water from lakes or ponds. It could also involve constructing sea water desalination plants and rainwater harvesting. The drinking water supply pipe network will need expanding across all areas of the province, including slum areas, to increase access to clean drinking water for all income groups. A participatory approach will be taken when planning the network.

To accompany this, DSDA will embark on a non-revenue water programme in Jakarta to monitor leakages and theft of water from the network in order to then manage. To reduce the overall demand of water and preserve freshwater resources, the reuse and recycling of greywater will be encouraged and enforced through building regulations where possible. This includes greywater reuse for irrigation in people's homes, toilets in commercial buildings, industrial processes and sanitation efforts throughout the province to preserve freshwater resources.

Benefits



Transboundary co-operation to deliver a safe and reliable drinking water supply to everyone in the province



Low-energy desalination plants, water reuse and water recycling technologies will be required



A robust drinking water network will support Jakarta to be more resilient during droughts and floods



An approach that conserves, restores and sustainably uses terrestrial and inland freshwater ecosystems will be taken

ACTION 2.2

Governance

Lead Implementing Agency	DSDA
Supporting Agencies	PUPR, PDAM, DCKTRP, Municipal Governments (Kotamadya), Districts (Kecamatan), Sub-Districts (Kelurahan)

Mainstreaming Opportunities

Projects	Potential synergies with RDTR project to develop a portal for voluntary reporting of land use violation

Monitoring Indicators

Output	% of Jakarta's inhabitants involved in planning the water supply network (DSDA)
Output	km expansion of the water supply network (DSDA)
Outcome	% of population with access to safe and reliable drinking water—disaggregated for age, gender, race and socio-economic status (DSDA)
Impact	# of water-borne diseases—disaggregated for age, gender and socio-economic status (DINKES)

ACTION 3.1 Retrofit and Construction of Urban Drainage Systems for Flood Resilience

adaptation | floods

Description

Retrofitting and constructing urban drainage systems aims to increase the capacity of the urban drainage system in Jakarta. The current system faces conveyance challenges from blockages caused by waste and backwater issues from subsidence and sea level rise. This leads to flooding in the province. To meet the challenge, several measures will be taken forward by DCKTRP.

It will begin with an assessment mapping all the issues in the entire river basin to understand how the peak discharge into the drainage system can be reduced. This will be undertaken in collaboration with adjacent provinces including Bogor and Depok to ensure integrated water management.

DCKTRP will use the data to develop an overall design, building, operational, maintenance and finance plan that covers both retrofitting existing infrastructure and constructing new infrastructure. Specific measures may include widening river channels, increasing the storage and infiltration capacity of the basin and integrating 47 secondary polder systems into one primary polder and unblocking pipes. Opportunities to maximize other benefits will be considered e,g. building dikes that also serve as attractive boulevards.

Important measures that indirectly support this action include community participation on proper waste management practices, increased waste management service provisions by DLH, increased water sanitation measures by DSDA, land use control by DCKTRP and limiting the rate of groundwater extraction to reduce the rate of subsidence in North Jakarta by DSDA.

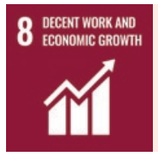
Benefits



Improving drainage capacity reduces health impacts from flood related water and soil contamination



Transboundary and community co-operation for integrated water resource management



Increased flood resilience will support Jakarta's economy to continue or recover quickly after flood events



Infrastructure upgrades will consider many factors including nature-based solutions, durability and feasibility



The increase in drainage capacity will consider rainfall projections under different climate scenarios



Conservation and restoration of the entire river basin and its services

ACTION 3.1

Governance

Lead Implementing Agency	DCKTRP
Supporting Agencies	Kementerian Pekerjaan Umum, DSDA, DLH, DSDA

Mainstreaming Opportunities

Programs	In some locations, DCKTRP could retrofit the existing urban drainage system and integrate the drainage system with other flood safety infrastructure (e.g. pumps and reservoirs) at the same time

Monitoring Indicators

Output	km of drainage infrastructure retrofitted to adapt to flood events (DCKTRP, DPRKP, DPMPTSP)
Output	% increase in capacity of the water conveyance system including pipes and open water channels (DSDA)
Outcome	hours of inundation during flood events (DSDA, DCKTRP, BPBD)
Outcome	% of assets protected from floods (DCKTRP, DSDA)
Impact	# of displaced people due to inundation (DINSOS, BPBD, TAPEM)
Impact	# of injuries or fatalities due to flood events (DINKES, BPBD, TAPEM)

ACTION 3.2 Protection from Coastal Flooding, Erosion and Abrasion

adaptation | floods

Description

The coastal area of Jakarta is currently facing the extreme risk of coastal flooding, erosion and abrasion, exacerbated by land subsidence from excessive groundwater extraction and sea level rise from the melting polar ice caps. An integrated flood safety plan—the National Capital Integrated Coastal Development Plan—is currently being developed by PUPR, the provincial government and other relevant stakeholders. There are several key measures that should be included.

With the support of BPBD, DSDA should immediately reduce, and in time stop, legal and illegal groundwater extraction activities by providing clean and reliable water to inhabitants and industry in Jakarta.

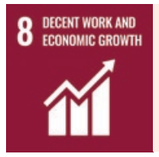
Existing coastal protection infrastructure must be immediately reinforced. There are currently 12 km of coastal dikes, leaving around 33 km of critical coastline unprotected. Each segment of coastal protection requires a tailor-made solution such as dikes that also serve as ports, mangroves and beaches. Nature-based solutions are preferred to maximize wider ecological benefits of the infrastructure.

BAPPEDA in coordination with other relevant departments such as DSDA, DLH, DCKTRP and DKPKP, will implement a plan that provides integrated long-term protection from coastal flooding with added social, economic and natural benefits. The following topics can be included: water quality, water supply, sanitation, nature, space for development, job growth, tourism and fisheries. The efforts should be aligned with solution for the urban drainage problems in North Jakarta.

Benefits



Prevents sea water intrusion to maintain the quality of fresh water supply



Reduces asset damage and the disruption to economic activities while providing opportunities for new economic activities



Low-income coastal communities will be better protected against the physical and mental impacts of flooding



Infrastructure is designed to provide both adaptation and mitigation benefits where possible, such as mangroves



The design of infrastructure will consider the conservation and restoration of coastal areas and their ecosystems



Growing mangroves to reduce flood risk also improves the aquatic ecosystem

ACTION 3.2

Governance

Lead Implementing Agency	PUPR
Supporting Agencies	DSDA, private businesses (who fund the coastal protection program), DKPKP, DCKTRP, DLH, BAPPEDA

Mainstreaming Opportunities

Projects	Align coastal protection with other actions including Action 2.1 (land use controlling) and Action 3.1 (urban drainage)

Monitoring Indicators

Output	area of coastline protection built (m^2/km^2) (DSDA)
Outcome	% of storm surges leading to flooding (DSDA)
Impact	% of assets protected during storm surges (DCKTRP, DPRKP)
Impact	# of displaced people due to coastal flooding (DINSOS, BPBD, TAPEM)
Impact	# of injuries or fatalities during coastal flooding (DINSOS, BPBD, TAPEM)

4.3 Mitigation Action Tracks and Factsheets

The three action tracks under mitigation are described below.

TRACK 4: **Buildings and Industry**

This action track focuses on reducing the GHG emissions across buildings and industry through energy efficiency measures. The focus is on introducing or updating regulations on energy efficiency and revising green building regulations.

TRACK 5: **Transport**

Track 5 contributes to GHG emissions reduction in the transport sector by supporting a mode shift towards public transport. In addition, the provincial government lead by example in the private vehicle ownership space by transitioning their own vehicle fleet to electric.

TRACK 6: **Solid Waste**

This action track takes on Jakarta's waste sector where emissions reductions can be achieved through anaerobic digestion and landfill gas capture.



ACTION 4.1 Energy Efficiency in Commercial Buildings

mitigation | energy

Description

Commercial buildings including offices, malls and hotels require a large amount of energy for lighting and air conditioning etc. According to PLN, the national electricity company, the commercial sector represented almost 25% of total energy consumption in 2013, primarily for lighting and air conditioning. The provincial government recognized the need to reduce energy demand by adopting building regulations, standards and targets and launching the Ministerial Regulation Number 14/2012 to manage and emphasize energy efficiency. The Regulation offers an approach to achieve energy efficiency through design, eco-friendly material, housing appliances, plus other building technology or by promoting energy-efficient devices. Energy efficiency reduces the amount of energy needed to cool buildings and the urban heat island effect as less waste heat is released into the atmosphere from air conditioning units.

In the current Pergub 38/2012 on green buildings, energy efficiency targets for buildings larger than >50.000 m^2 and hotels >20.000 m^2 have been stipulated. The regulation will be updated to cover smaller commercial buildings as well as both existing and new buildings. Every commercial building will be required to have an ISO 50001 Energy Management System in place to drive down their energy use and, in turn, cost. Energy efficiency and the use of energy saving systems can be stimulated with other incentives such as subsidies for insulation.

This action will be led by DCKTE with support from DPMPTSP, DLH and the Green Building Council Indonesia to develop specific guidance on developing the Energy Management System and approaches and technologies that are available on the market to reduce energy consumption. Data will be compiled on energy consumption for different commercial building typologies to develop more ambitious targets, measure progress and improve energy efficiency.

Benefits



Low energy efficiency fittings will be replaced with high energy efficiency fittings



Innovation to deliver affordable energy efficient products and building design approaches



Lower energy usage reduces GHG emissions and also reduces the urban heat island effect

ACTION 4.1

Governance

Lead Implementing Agency	DTKTE
Supporting Agencies	DCKTRP, DLH, DPMPTSP, DPPKUKM, Green Building Council Indonesia

Mainstreaming Opportunities

Projects	Align with Action 2.1, 4.2 and 4.3

Monitoring Indicators

Output	% of commercial buildings that the updated standards apply to—disaggregated by district and organization size (DCKTRP, DPMPTSP)
Output	% of commercial buildings that have an ISO 50001 Energy Management System in place—disaggregated by district and organization size (DCKTRP, DPMPTSP)
Outcome	kWh/m^2 average energy intensity—disaggregated by commercial typology (DTKTE)
Outcome	MW or IDR of energy efficiency measures installed—disaggregated by commercial typology (DTKE, DPMPTSP, DPPKUM)
Impact	tonnes CO_2e emissions from commercial buildings (DINOS, DPPAPP)
Impact	# of permanent jobs created in the buildings energy efficiency sector—disaggregated for age, gender, race and socio-economic status (DTKTE, DINSOS)

ACTION 4.2 Energy Efficiency in Industry

mitigation | energy

Description

According to data from PLN, the industry sector that represents 0.1% of customers in Indonesia consumes over 30% of the annual energy demand. Reducing energy demand will lessen the amount of GHG emissions, which will create cost savings and a less polluted working environment.

Minimizing energy use in industry can be achieved by replacing existing equipment with energy-efficient alternatives, improved building insulation and by processing waste heat capture. KESDM launched the Ministry Regulation Number 14/2012 on energy management mentions that companies have a responsibility to apply energy conservation and energy efficient technology as well as to produce energy-efficient products. However, there are no specific guidelines directly related to industrial buildings, nor mechanisms and incentives for the industry, as the sector have not yet been included in the Green Building of Government Regulation.

Therefore, another government regulation is required to set the standard for energy efficiency in industry, making reference to ISO 50001 on Energy Management Systems. As the action is implemented by DTKTE to stimulate energy efficiency solutions in the private sector, this will involve coordination between the private sector, national and provincial government, as well as NGOs, to promote the awareness on energy-saving opportunities in the industry sector.

Benefits



Reduced pollution from industry creates a healthier working environment



Saving energy reduces energy costs for industrial companies



Innovation in plant, equipment, process design and building design is encouraged by this action



Reduced GHG emissions from lighting and cooling but also production processes

ACTION 4.2

Governance

Lead Implementing Agency	DTKTE
Supporting Agencies	DPMPTSP, SCKTRP, DPPKUKM, DLH, Green Building Council Indonesia

Mainstreaming Opportunities

Projects	Align with Action 2.1, 4.1 and 4.3

Monitoring Indicators

Output	% of industry buildings that the new standards apply to—disaggregated by industry subsector and organization size (DCKTRP, DPMPTSP)
Output	% of industry companies that have an ISO 50001 Energy Management System in place—disaggregated by industry subsector and organization size (DCKTRP, DPMPTSP)
Outcome	kWh/m^2 average energy intensity—disaggregated by industry subsector (DTKTE)
Outcome	MW or IDR of energy efficiency measures installed in industry—disaggregated by subsector (DTKTE, DPMPTSP, DPPKUKM)
Impact	tonnes CO_2e emissions from commercial buildings (DINOS, DPPAPP)
Impact	# of permanent jobs created in the industry energy efficiency sector—disaggregated for age, gender, race and socio-economic status (DTKTE, DINSOS)

ACTION 4.3 Green Buildings Policy Revisions

mitigation and adaptation | buildings and multiple climate hazards

Description

DCKTRP is currently leading the consultation process for updating the existing policy on green buildings. This action is to ensure the updates align with the goals and targets set out in this CAP. The policy should cover all building typologies, new and existing buildings and both mitigation and adaptation measures. Thresholds can be proposed based on features such as floor area, income level or zoning, which requires different buildings to adopt different levels of measures.

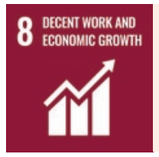
The policy will need to incorporate proposals across the life-cycle of the building (brief, design, construction, operation, maintenance, end-of-life) on aspects such as energy efficiency, on-site renewable energy generation, water efficiency, waste reduction and low carbon building materials. Specific measures may include building refurbishment (over demolition and rebuild), flexible and adaptable design, design for deconstruction, green infrastructure, rooftop solar photovoltaics, natural ventilation, covered recreational spaces, rainwater harvesting, sustainable urban drainage systems, recycled content specifications, performance procurement and ethical sourcing.

Involving the entire construction value chain and communities using the buildings in the development of green building standards is critical to promote and disseminate the results and raise awareness at all levels.

Benefits



Green buildings policy supports energy efficiency and renewable energy generation on-site



The extent of retrofit required and new developments that need to meet the policy objectives will create jobs



Resource efficiency by promoting refurbishment and a life-cycle approach to building design and operation



The policy is centered around GHG emissions reduction and designing buildings that can adapt to the impacts of climate change

ACTION 4.3

Governance

Lead Implementing Agency	DCKTRP
Supporting Agencies	DLH, DPMPTSP, DTKTE

Mainstreaming Opportunities

Procedures	Align with Action 2.1, 4.1 and 4.2

Monitoring Indicators

Output	% of buildings covered by the new policy (DCKTRP, DPMPTSP)
Output	% Landscape replacement areas in comparison with overall build up area (DKCKTRP, DLH)
Outcome	Average energy consumption intensity by building typology/index (DTKTE)
Outcome	% of buildings that meet new building policy (DCKTRP, DPMPTSP)
Outcome	Overall Thermal Transfer Value (OTTV) or Roof Thermal Transfer Value (RTTV) (DLH, DTKTE)
Outcome	°C temperature difference before and after green infrastructure (DLH)
Impact	Tonnes CO_2e GHG emissions from stationary energy—disaggregated by building typology (DLH)
Impact	# of permanent jobs created in green building sector—disaggregated by age, gender, race and socio-economic status (DTKTE, DINSOS)

ACTION 5.1 Public Transport Expansion

mitigation | transport

Description

Jakarta currently has three Light Rail Transit (LRT) lines, one Mass Rapid Transit (MRT) line and six Bus Rapid Transit (BRT) routes. The expansion and development of the public transport system involves increasing the number of routes served by existing modes of public transport to ensure that all residential units are within 500 metres of public transport. This will be supported by transport orientated development. It also involves bringing online new modes of public transport such as bicycles and e-scooters. Finally, the different modes and routes must be integrated, both in operations and payment systems, to create a well connected and intelligent public transport network with interchange points as indicated in the DKI Jakarta Transportation Masterplan 2018–2029 (RITJ).

The use of public transport must remain inclusive. All inhabitants should receive a similar level of service regardless of their income level. Therefore, extensive public engagement is required to ensure the expansion benefits various communities and specific impacted groups. For example, the travel patterns of low income and minority communities will be accounted for when determining the boundaries and payment structures. Community engagement will also improve the effectiveness of action when it comes to usage and financial feasibility.

The development and execution of the plan requires co-ordination between the Greater Jakarta Transport Authority (BPTJ), the Ministry of Transportation, Transportation Department (DISHUB), and state/regional owned enterprises including PT. Transportasi Jakarta, PT. MRT Jakarta and PT. LRT Jakarta.

Benefits

	Increasing the share of public transport will reduce private vehicles on the road and improve air quality
	Ensures affordable fares to low income groups and easy access to public transport in low income areas
	Integrating transport planning with urban planning using a participatory approach
	Reduced transport related GHG emissions

ACTION 5.1

Governance

Lead Implementing Agency	DISHUB
Supporting Agencies	BPTJ, Bappeda, DCKTRP, PT. LRT, PT. MRT, PT. DISHUB, KEMENHUB, PUPR, DINAS Bina Marga

Mainstreaming Opportunities

Plans	Jaklingko joint venture and other potential opportunities to provide mobility as a service

Monitoring Indicators

Output	km of public transport system per capita—disaggregated by district (DISHUB, BPTJ)
Output	# of mass transit nodes containing multiple transport options (DISHUB)
Outcome	% of net income spent on public transport—disaggregated by age, gender, race and socio-economic status (DISHUB)
Outcome	% public transport mode share (DISHUB, BPTJ)
Outcome	% of population with within 500 m walking access to public transport (DISHUB, BPTJ) Impact: tonnes CO_2e GHG emissions from transport (DLH)
Impact	tonnes CO_2e GHG emissions from transport (DLH)
Impact	$PM_{2.5}$ and PM_{10} air concentrations along main roads and public transport routes—disaggregated by district (DLH)
Impact	# of permanent jobs created in the transportation sector—disaggregated for age, gender, race and socio-economic status (DTKTE, DINSOS)

ACTION 5.2 Electric Vehicles Use for Government Transport Operations

mitigation | transport

Description

In 2019, Presidential Regulation (Perpres) Number 55/2019 Concerning Acceleration of Electric Motor Vehicle Programme (Battery Electric Vehicle) for Road Transport came into force. Following this in 2020, KESDM also enacted Ministerial Regulation Number 13/2020 Concerning Provision of Electricity Charging Infrastructure for Battery-Based Electric Motor Vehicles to support the use of electric vehicles by providing electric charging infrastructure to support this action.

This action seeks to transition government transport operation vehicles from fossil fuel to electric vehicles with the use of biofuels during the transition phase, if required, to lead by example and promote more sustainable modes of transport in the province. Vehicles in the government fleet will be changed to electric over time through new public procurement practices. This means that when vehicles need replacing in the future, electric will be procured over petrol or diesel.

To accompany this, charging stations and biofuel refuelling stations will be provided outside provincial government premises and other key locations. The objective is to encourage those who need private vehicles to use electric and to support innovation in this field.

Benefits



Electric vehicles produce little or no nitrous oxides or particulate matter resulting in better air quality



Biofuel is a form of renewable energy if derived from certified waste sources



Supports the growth of Jakarta's sustainable transport infrastructure market



Biofuels production from waste supports industrial symbiosis and higher value uses of waste material



Electric vehicles will contribute to GHG emissions reduction as the national energy grid decarbonizes

ACTION 5.2

Governance

Lead Implementing Agency	All agencies within DKI Jakarta
Supporting Agencies	DTKTE, KESDM

Mainstreaming Opportunities

People	Provincial government and provincial departments engage civil servants to be more aware of sustainable modes of transport

Monitoring Indicators

Output	% of electric and biofuel vehicles in the government fleet (DISHUB, DKI Jakarta)
Output	# of charging points installed for government operations (DISHUB, DKI Jakarta)
Outcome	% travelled in the reporting year by zero or low emissions transport (DISHUB, DKI Jakarta)
Impact	tonnes CO_2e emissions from transport (DLH)
Impact	$PM_{2.5}$ and PM_{10} air concentrations along high frequency government routes (DLH)

ACTION 6.1 Landfill Gas Recovery Systems

mitigation | solid waste

Description

The primary landfill for Jakarta is Bantar Gebang. In 2020, it received more than 7,400 tons of waste per day. The decomposition of organic waste produces landfill gas comprising mainly methane and carbon dioxide. The gas can be captured for processing into fuel or use in energy generation by installing a landfill gas recovery system.

This will require collaboration between DLH as the agency responsible for waste management and the environment, and DTKTE as the agency responsible for energy.

This retrofit landfill gas recovery system works by installing vertical perforated pipes into the waste, which collects the gas. This gas is then directed to a processing facility at the landfill site for treatment. The specific treatment depends on end use and could include, but is not limited to, moisture removal, sulphur removal, carbon dioxide removal and compression. Although the landfill might be closed for disposing of waste in the near future, landfill gas will continue to be generated for approximately the next 20 years.

Benefits

3 GOOD HEALTH AND WELL-BEING	Prevents methane from entering the atmosphere and produce ozone, resulting in reduced local smog
7 AFFORDABLE AND CLEAN ENERGY	The landfill gas can be used to produce affordable electricity for waste pickers who live in close vicinity to the landfill site
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	Upgrade of waste disposal infrastructure to be more sustainable from landfill gas capture
13 CLIMATE ACTION	Reduces GHG emissions from waste and potentially reduces emissions from the energy sector

ACTION 6.1

Governance

Lead Implementing Agency	DLH
Supporting Agencies	DTKTE, KLHK, KESDM, DLH Bekasi City

Mainstreaming Opportunities

Plans	Ensure that this plan is aligned with the waste to energy plan published by KESDM

Monitoring Indicators

Output	% of landfill sites in Jakarta with landfill gas recovery systems installed (DLH)
Outcome	MWh/annum energy generation from landfill gas recovery (DLH)
Impact	tonnes CO_2e emissions from waste (DLH)

ACTION 6.2 Anaerobic Digestion of Animal Slaughterhouse Waste

mitigation | solid waste

Description

According to 2020 data from Statistics Indonesia, there are 11 slaughterhouses in Jakarta.

In one of the provincial owned slaughterhouses in Cakung, East Jakarta, the average slaughter rate is around 200–300 cows per day, while on special days such as Idul Fitri and Idul Adha, this can reach 600 cows per day. Solid waste materials include grass feed residue, animal dung and rumen. About 300 m^3 per day of liquid waste such as blood is also generated. Part of this waste is currently disposed of in the sewer system.

An opportunity exists to capture the organic waste and send it for anaerobic digestion. Anaerobic digestion is the decomposition of organic waste into biogas and digestate in the absence of oxygen under controlled conditions. The biogas can be converted into electricity and heat for use in Jakarta. The digestate can be separated into its liquid and solid constituents and sold on as an alternative to fertilizer. The slaughterhouse waste would require a pasteurization step before being fed into the digester to eliminate pathogens.

Coordinated by DLH, anerobic digestion of slaughterhouse waste has been trialled successfully in Pondok Kopi, East Jakarta. This action looks to expand implementation across all of Jakarta's slaughterhouses.

Benefits



Prevents the spread of disease caused by pathogens in livestock if disposed in the sewer system



Prevents the pollution of soil and ground water by ensuring the waste is appropriately stored ahead of treatment



Biogas can be used to generate affordable renewable energy for the surrounding community



Converting waste into a resource



Reduces GHG emissions from waste and potentially reduces emissions from the energy sector

ACTION 6.2

Governance

Lead Implementing Agency	DLH
Supporting Agencies	DTKTE, DKPKP, KESDM, KLHK, provincial owned slaughterhouses, private slaughterhouse businesses

Mainstreaming Opportunities

Plans	Engage with Ministry of Environment, Ministry of Energy and Ministry of Agriculture to collaborate on setting up the strategy for better managing animal waste management in slaughterhouses

Monitoring Indicators

Output	% of total slaughterhouse waste generated in the province treated using anerobic digestion (DLH)
Outcome	MWh/annum of electricity and heat generated from the anaerobic digestion of slaughterhouse waste (DLH)
Impact	tonnes CO_2e emissions from waste (DLH)
Impact	BOD and COD of water bodies in close vicinity to slaughterhouses (DLH)

ACTION 6.3 Anaerobic Digestion of Municipal Organic Waste

mitigation | solid waste

Description

More than half of the municipal waste in Jakarta is organic waste, predominantly from food scraps. Organic waste is not only generated from municipal sources but also from river or other surface water bodies extracting waste in Jakarta. Organic waste is not typically source-segregated from other waste materials. Mixed municipal waste is collected and sent to Bantar Gebang landfill for disposal. Sometimes waste is dumped in rivers, in sewer systems and on land, which pollutes land, air and water bodies while also blocking drainage systems, generating bad odours and creating breeding sites for vectors. This action looks to collect source-segregated organic waste and send it for anaerobic digestion, similar to Action 6.2 on slaughterhouse waste.

The design and capacity of the anaerobic digestion facilities would depend on waste projections of the likely quantity and composition of organic waste to be generated. The implementation steps include:
1) developing guidelines across the municipal organic waste management chain from waste reduction, reuse, source-segregation, storage, collection, treatment, disposal, use of by-products; 2) preparing the legal basis for anaerobic digestion facilities in parallel;
3) seek alignment with relevant stakeholders;
4) invest in and implement a biodigester system.

Lastly, to ensure more waste is separated at the source by households and businesses, this action should go hand-in-hand with an education and awareness campaign.

Benefits



Proper waste management reduces vector borne diseases and odors to improve livability in Jakarta



Waste collection and treatment will prevent the pollution of soil and ground water



Biogas can be used to generate affordable renewable energy for the surrounding community



The overarching guideline considering the entire waste management system aims to minimize waste generation in the first place, then maximize value creation from waste that is generated



Reduces GHG emissions due to waste and energy consumption in waste management

ACTION 6.3

Governance

Lead Implementing Agency	DLH
Supporting Agencies	DTKTE, DKPKP, KESDM, KLHK

Mainstreaming Opportunities

People	Engage with schools, households and private companies on organic waste collection Engage with universities and other academia on technology developments and optimization

Monitoring Indicators

Output	% of total municipal organic waste treated using anaerobic digestion (DLH)
Outcome	% municipal waste diverted from landfill (DLH)
Outcome	MWh/annum of electricity and heat generated from the anaerobic digestion of municipal organic waste (DLH)
Outcome	kg organic waste collected from unblocking drainage systems (DCKTRP)
Impact	tonnes CO_2e emissions from waste (DLH)

4.4 Adaptation Roadmap

A roadmap has been developed for the three adaptation action tracks to map out how goals and targets will be achieved by 2050. This is visually represented in Figure 18 followed by guiding visuals[4] for each target year; 2022, 2030 and 2050 are represented in Figure 19, Figure 20 and Figure 21, respectively.



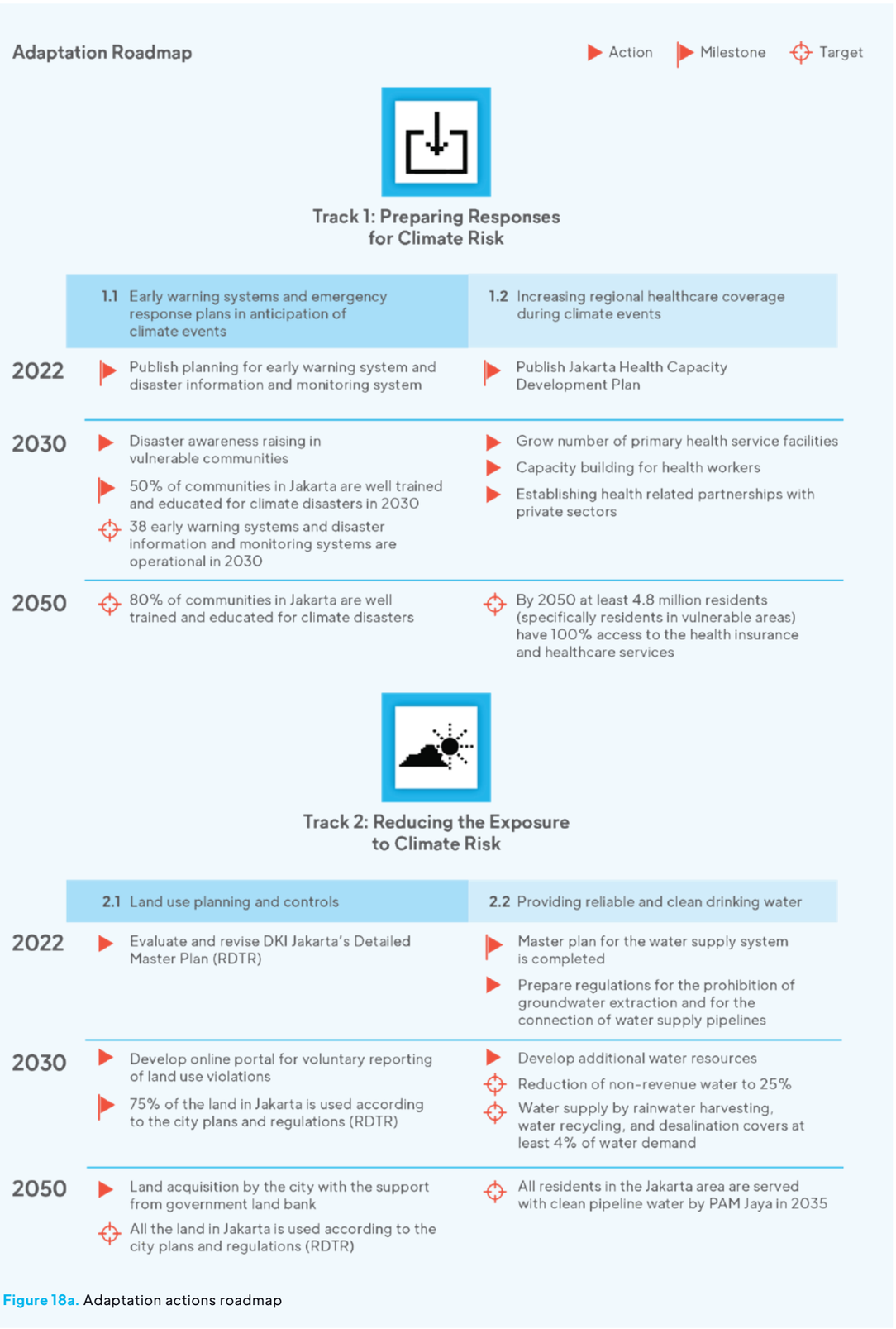


Figure 18a. Adaptation actions roadmap

Adaptation Roadmap

Action Milestone Target

Track 3: Protecting Against Climate Risk

	3.1 Retrofit and construction of urban drainage systems for flood resilience	3.2 Protection from coastal flooding, erosion and abrasion
2022	▶ Publish Jakarta urban drainage master plan ▶ 1,400m of river segment is completed as pilot projects for the application of the greening concept	▶ NCICD plan is published and all DKI departments act accordingly
2030	▶ Implementing Jakarta urban drainage masterplan ▶ At least 10 existing polders and drainage systems are revitalized in 2024 ⌖ At least 30% of the green space in the city is regulated by the city as having an important function for water retention or discharge	⌖ In 2025, 45km of the stage A dike is finished, including pumping stations and polder sections ▶ Conserve the mangrove ecosystem and develop public beaches integrated in the coastal protection
2050	⌖ Duration of inundation should be less than 0,5 hours anywhere in the city ⌖ Emergency teams can effectively respond in at least 80% of the total area during a large flood in 2050	⌖ Adaptive coastal management in relation to sea level rise and land subsidence: strengthen the stage A dike or create outer sea dike

(continued) **Figure 18b.** Adaptation actions roadmap

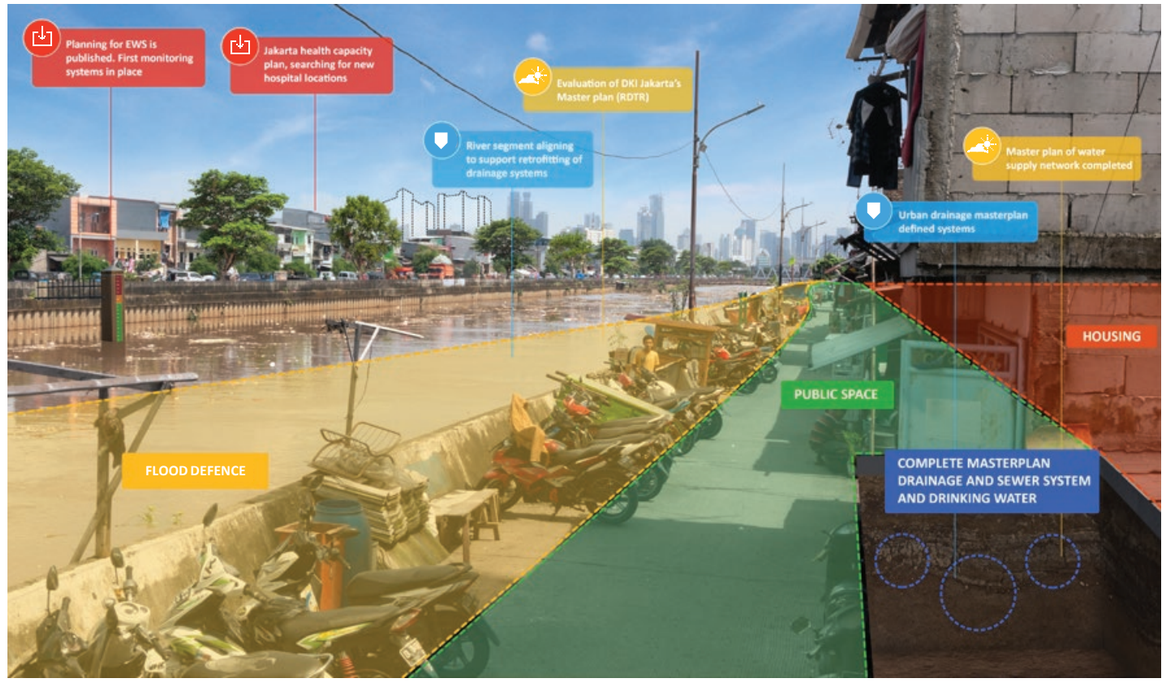


Figure 19. Guiding visual for adaptation actions in year 2022 (Artist impression)



Figure 20. Guiding visual for adaptation actions in year 2030 (Artist impression)



Figure 21. Guiding visual for adaptation actions in year 2050 (Artist impression)

TRACK 1: **Preparing Responses for Climate Risk**

It is very likely that floods and other climate events will continue to occur in the coming years. In order to secure safe and healthy living for all Jakarta's citizens, it is important for the province to improve its preparedness for upcoming extreme weather and flood events. Therefore, the province will develop an **early warning system and emergency response plans in anticipation of climate events.** By 2022, the planning for the early warning system and disaster information and monitoring system will be published, and one or two pilot systems will be operational.

In addition to the early warning system and disaster information and monitoring system, the provincial government will focus on raising disaster awareness in vulnerable communities by, for example, including climate disaster response in school curricula or by organizing public campaigns. The milestone for 2030 is that 50% of the communities in Jakarta will be well trained and prepared for climate disasters. Also, a target for 2030 is that 38 early warning systems and disaster information and monitoring system are operational. The provincial government will continue to raise awareness in order to reach the target that 80% of the communities in Jakarta are well trained and educated for climate disasters in 2050. In order to meet this target, the provincial government needs to ensure that the aforementioned systems and infrastructure are operational through regular checks and maintenance.

To improve the province's preparedness to respond to climate events, it is important to **increase regional healthcare coverage during climate events.** Currently, public health insurance does not specifically cover emergency situations during climate events. In 2022, the provincial government will publish the Jakarta Health Capacity Development Plan setting out measures to increase healthcare coverage and ensure health insurance for emergencies due to climate events.

Based on these plans, the DINKES will work on increasing the overall healthcare provisions by increasing the number of primary service facilities and by building capacity for health workers through training and workshops. The target is to have more than 1,000 volunteers trained for action during climate disasters by 2030. In order to reach this target, the province will establish health-related partnerships with the private sector for the provision and management of tools and equipment. The target for 2050 is that at least 4.8 million of Jakarta's inhabitants on low income, who are currently entitled to receive health funding assistance from the government, will have 100% access to the health insurance and healthcare services.

In order to secure safe and healthy living for all Jakarta's citizens, it is important for the province to improve its preparedness for upcoming extreme weather and flood events.

TRACK 2: **Reducing the Exposure to Climate Risk**

Land use planning and controls are important instruments in climate adaptation, essential to create sufficient water retention capacity for local rainfall and along rivers. By 2022, the province will complete the evaluation and revision of the Regional Detail Spatial Planning masterplan (RDTR). The implementation will be supported by the development of an online portal for voluntary reporting of land use violations. In 2030, the province will meet the milestone that 75% of the land in Jakarta is used in compliance with the RDTR. This leads to the final target that, by 2050, all the land in Jakarta is used according to the RDTR. Land acquisition by the province, with the support from government land banks, might be necessary to reach this target, considering that some land in Jakarta is occupied by informal settlements and illegal buildings, especially on the riverbanks and along the north coast of Jakarta.

One of the main factors contributing to increasing flood risk is land subsidence resulting from over-abstraction of groundwater, related to insufficient piped water supply and illegal groundwater wells. Land subsidence can be reduced by 75% within 10–15 years from the implementation of a complete ban on groundwater abstraction in a 5km zone along the nearby coastal area. Therefore, it is important that the province prohibits the abstraction of groundwater and improves the accessibility, reliability and quality of the piped water supply system.

Currently, the Water Resource Department (DSDA) is working on a masterplan for the water supply system to **provide reliable and clean drinking water,** which will be published in 2022. In the same year, regulations are planned to be drafted for the prohibition of groundwater abstraction. These will be submitted, reviewed and approved by Municipal Governments (Kotamadya), on a formal legal basis in the following years (preferably before 2025). Upon approval, the provincial government will begin implementing the masterplan. This includes working on clean water distribution by setting up and/or improving a water supply network, increasing the water storage capacity and improving water purifying services. While the drinking water supply network is upgraded, there will be opportunities simultaneously to improve sanitation in areas where these construction works take place.

[4] The visuals are artist impressions and should not be considered as precise representations of the areas shown

Additionally, the province will organize works to develop additional water resources by improving the raw water supply from reservoirs outside Jakarta (Jatiluhur 1 and 2, Karian, Saluran Tarum Barat). The target for 2030 is that at least 41.6 m^3 of additional water resources will be provided. DSDA will embark on a non-revenue water programme to reduce leakage. The target for 2050 is to reduce non-revenue water by 25%. To reduce the overall demand of water supply, the reuse and recycling of greywater will be encouraged and enforced, where possible. The target by 2030 is that water supply from rainwater harvesting, water recycling and desalinization will cover at least 4% of water demand. Progress will be monitored continuously, ensuring the alignment with the water supply masterplan. As a result, land subsidence will be reduced by 75% in 2040 i.e. 15 years after the prohibition of groundwater abstraction in 2025. The target for water supply is that 100% of Jakarta's inhabitants are served by clean piped water services from PAM Jaya by 2035.

A large portion of the drainage system in Jakarta is in poor condition as a result of overdue maintenance, uncontrolled development, improper waste management, subsidence and sea level rise.

TRACK 3: **Protecting Against Climate Risk**

Protection against flooding is better than dealing with the consequences. Properly functioning drainage systems are a key aspect in protecting the province from floods caused by high river discharge and local rainfall. A large portion of the drainage system in Jakarta is in poor condition as a result of overdue maintenance, uncontrolled development, improper waste management, subsidence and sea level rise. As a result, the conveyance capacity of the drainage system is no longer sufficient, which leads to regular flooding in the province. In order to improve the urban drainage capacity, the province will **retrofit and construct urban drainage systems for flood resilience.** By 2022, the province will have published and started the implementation of the Jakarta Urban Drainage Masterplan.

The province will map the existing urban drainage system and will identify issues within the system. These will be translated into specific measures to retrofit and improve existing infrastructure. This measure has synergies with updating the sanitation system of Jakarta; waste water is currently discharged into the urban drainage system without treatment. By separating clean rainwater and waste water, the quality of surface water in Jakarta will improve considerably.

The provincial government is also working on improving the functional capacity of existing rivers and reservoirs by developing green, vegetated areas along the rivers. These areas will flood in a controlled way during periods of high river discharge, thereby creating extra water storage and lowering water levels downstream. In normal circumstances, when discharge is lower, these green areas can be used as public parks. The milestone for 2022 is that the greening concept will be applied along at least 1,450m of river segment as a pilot project. Another milestone will be met in 2024 when at least 10 existing polders and drainage systems will be revitalized using the greening concept. In addition, by 2030, at least 30% of the green space in Jakarta will be regulated as having an important function in water retention or discharge.

In order to improve the drainage system continuously, Jakarta will integrate the urban drainage system with other flood safety infrastructure. As a result of the progressive implementation of the Urban Drainage Masterplan, the province will meet the targets that 7.2km of river dike are constructed by 2050, and that the duration of inundations is less than 0.5 hours anywhere in the province. As a result of improved drainage infrastructure and facilities (e.g. pumping stations) in combination with an increased amount of people trained for disaster management response (Action Track 1), the total inundation area that can be managed by the emergency response team will increase from 56% in 2022 to 80% in 2050.

In order to provide appropriate defence for flooding from the sea, the province needs to realise adequate **protection from coastal flooding, erosion and abrasion.** For the last 20 years, extensive research has been undertaken on the causes and consequences of coastal flooding and several coastal development plans have been developed. The required actions are described in the National Capital Integrated Coastal Development plan (NCICD). By 2022, the province will have published the final NCICD plan and all provincial government departments will act accordingly. In 2018, the implementation of the coastal dike (Stage A) began. The target is to finish the 45km of most urgent Stage A dike, including pumping stations and polder sections by 2025. The remaining dikes along the coast and river mouths will be closed by 2030. This needs to be done in close cooperation with DSDA, PUPR and private stakeholders. Organizations will co-operate in a follow-up on the existing memorandum of understanding.

The implementation of the plan consists of the construction of primary protection from coastal flooding and abrasion and erosion, downstream river management, and integration of actions with coastal development and community empowerment. If land subsidence is not significantly reduced by 2030, the province will need to strengthen and heighten the Stage A dike significantly. Another option is to create an open outer sea dike (OSD) for the western part of the province by 2030 and for the eastern part of the province by 2040. In principle, the OSD will not be a closed dike; the dike will not only protect the coast from big waves and thereby extend the lifetime of the Stage A dike but will also open opportunities for further northern Jakarta road networks and land development.

The implementation of the NCICD plan aims to provide social, economic and environmental benefits by integrating coastal protection and development. For example, mangrove systems (e.g. in Angke Kapuk) will be improved to strengthen coastal resilience and add ecological diversity. Another example is the development of new public beaches on locations where the coastal protection is improved (e.g. in Sunda Kelapa, Marina Ancol). This way, the attractiveness of the coastal area for residence, fishermen and tourists is improved.

Developing the OSD up to 2030 is a measure to prepare for the worst-case scenario in which soil subsidence does not significantly reduce in the period between 2030 and 2050. The OSD can be adapted to protect the coast completely and can function as a coastal reservoir.



4.5 Mitigation Roadmap

A roadmap has been developed for the three mitigation action tracks to map out how goals and targets will be achieved by 2050. This is visually represented in Figure 22 followed by guiding visuals[5] for each target year 2022, 2030 and 2050 represented in Figure 23, Figure 24, Figure 25, and accompanying narrative.



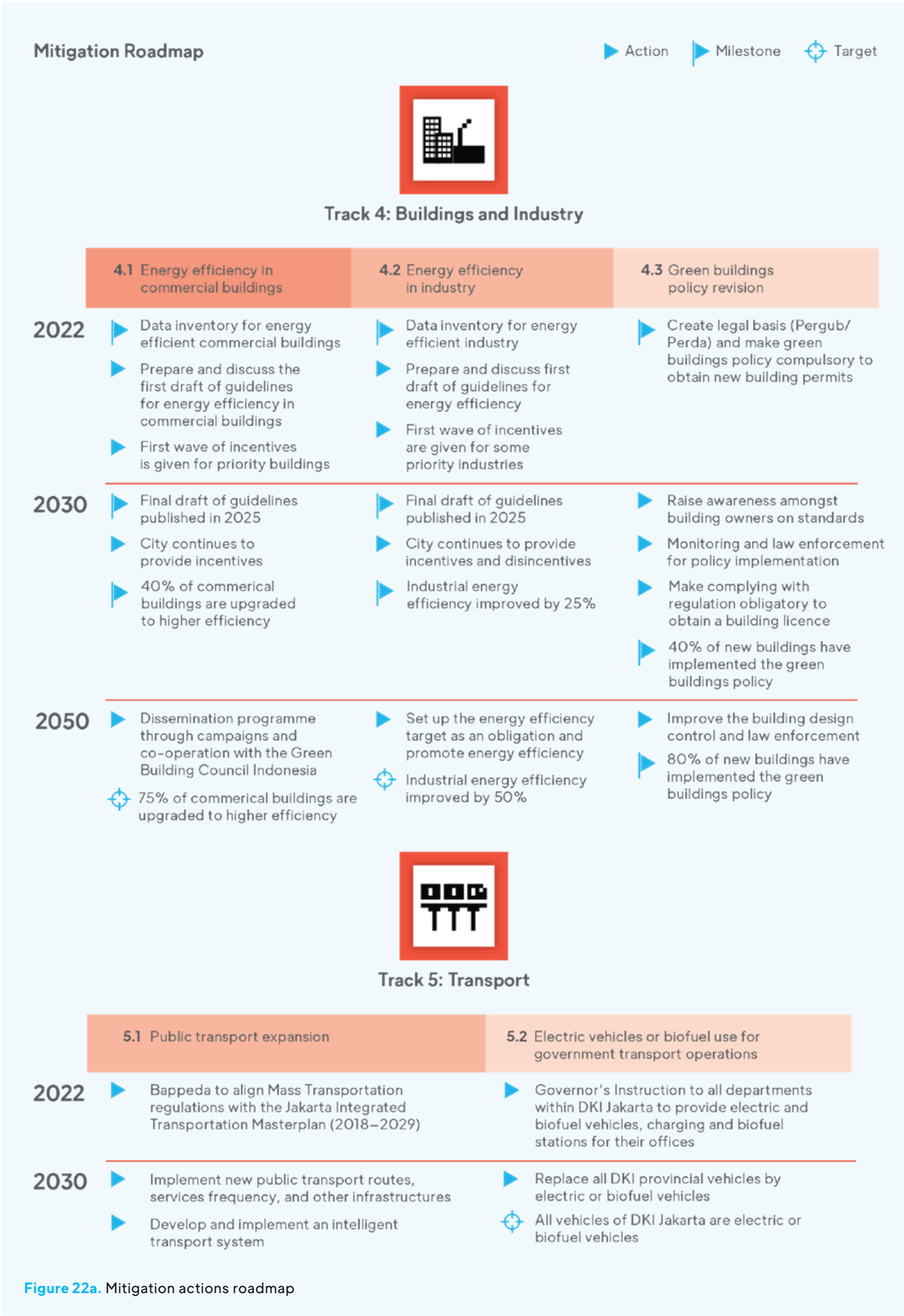


Figure 22a. Mitigation actions roadmap

Mitigation Roadmap

Action | Milestone | Target

- Total mode share of public transport increases to 40%
- 75% of primary road networks are covered by public transport services

2050

- Total mode share of public transport increases to 60%
- 100% of primary road networks are covered by public transport services

Track 6: Solid Waste

	6.1 Landfill gas recovery systems	6.2 Anaerobic digestion of animal slaughterhouse waste	6.3 Anaerobic digestion of municipal organic waste
2022	BAPPEDA to discuss and align plans regarding landfill gas recovery with ESDM	Preparation of all feasibility studies and required documents (AMDAL/EIA etc.) to initiate the pilot project 100% of suitable locations identified in overall feasibility study A pilot project is initiated, from AMDAL/EIA up to construction	DLH to set up guidelines for managing organic waste, covering waste reduction, source segregation, storage, collection and treatment
2030	Install landfill gas recovery (by DLH and DTKT) to extract landfill gas from organic wastes System installed in Bantar Gebang landfill	DLH, DTKTE, DKPKP disseminate the project to identified slaughterhouses in Jakarta At least 35% of all slaugtherhouses use anaerobic digestion as method for waste processing	Promote organic waste segregation through training on community level Establish organic waste collection Investment in anaerobic digestion system Contributes to target of 2.1 million tonnes CO_2e reduction in 2030 as a result of Reduce, Reuse and Recycle policies
2050		100% of animal slaughterhouses in Jakarta have implemented anaerobic digestion for their waste	

(continued) **Figure 22b.** Mitigation actions roadmap



Figure 23. Guiding visual roadmap mitigation year 2022 (Artist impression)



Figure 24. Guiding visual roadmap mitigation year 2030 (Artist impression)



Figure 25. Guiding visual roadmap mitigation year 2050 (Artist impression)

ACTION TRACK 4: **Buildings and Industry**

As in many cities around the world, residential, commercial and industrial buildings produce the most GHG emissions in Jakarta. To reduce emissions, a focus on energy efficiency, a more sustainable mix of energy sources, and installing on-site renewable energy systems is needed. This is important for both existing and new buildings.

To increase **energy efficiency in commercial buildings,** the provincial government will start with setting up energy efficiency regulations. The first draft will be prepared in 2022 and the final draft published in 2025. These regulations will be based on key commercial building development metrics such as, for example, floor area. The first step to develop robust guidelines will be to create an inventory of data on energy consumption for different building typologies. The regulations will be developed in collaboration with the Green Building Council Indonesia and other relevant organizations in academia, industry and NGOs. This is to ensure that views from the private sector are included to ensure greater buy-in from commercial building developers and to lay the foundation for communication and implementation.

The provincial government and its partners will seek to engage the commercial building sector as soon as possible through campaigns and providing incentives so that 40% of commercial buildings are upgraded in 2030 and 75% in 2050. In parallel, the provincial government will develop and regulate a system for compulsory reporting by building owners on the energy consumption of their assets.

A similar process will be followed to **increase energy efficiency in industry.** A data inventory will be done to determine the baseline of energy efficiency, and to identify and document industries that already use energy efficient equipment. Based on the inventory, the potential efficiency increase can be identified and quantified. Then new regulations for energy use will be developed to increase efficiency in the industry. A first draft will be ready in 2022 and final guidelines will be published in 2025. In discussion with the sector, these new regulations will be accompanied by policies that provide incentives for industry to increase efficiency of equipment via retrofits. Incentives related to streamlining the permits system will also be put in place. Progress will be verified through an energy consumption reporting system developed and regulated by the provincial government. A 25% increase in energy efficiency in industry should be achieved by 2030 as an intermediary milestone to reach the targeted 50% increase in energy efficiency by 2050.

Green building policies are broader than energy regulations alone and focus on both adaptation and mitigation, with considerations given to material selection, sustainable design and biodiversity. **Green building policy updates** at the local level are the first step. These will be followed by raising awareness and community interest up to 2030, contributing to the energy efficiency actions relating to all building typologies. Progress will be monitored through a self-reporting system for building owners. The target for residential buildings is that 80% of new buildings will implement a green building policy before 2050. This will also require measures in terms of enforcement and fines when rules are violated. It is crucial in the planning and implementation of these policy updates to consider how the measures improve the social, economic and spatial equity of Jakarta citizens, the distribution of these benefits, and manage any potential negative consequences on vulnerable and low-income communities.

It is crucial to consider how the measures improve the social, economic and spatial equity of Jakarta citizens, the distribution of these benefits, and manage any potential negative consequences on vulnerable and low-income communities.

ACTION TRACK 5: **Transport**

At present, transport is the second largest contributor to GHG emissions in Jakarta. The province is also one of the most congested cities in the world, which leads to economic losses and health issues. Emissions can be significantly reduced through a combination of actions including a shift away from personal vehicle use towards public transport and increasing the use of electric cars and buses. Reduced vehicle emissions will also improve air quality, which will have a positive impact on the health of citizens.

Public transport expansion starts with aligning plans. The Mass Transportation regulations of BAPPEDA need to be aligned with the Jakarta Integrated Transportation Masterplan (2018–2029). Also, the Greater Jakarta Transport Authority (BPTJ) has made suggestions for the improvement for the urban transport system (LRT & MRT Progress), which can be considered. With these plans aligned, the co-ordination and construction of new lines and other supporting infrastructure will be progressively implemented leading up to 2030, when the mode share of public transport should be 40%. By 2050, the target is to increase this to 60%, while covering 100% of primary road networks with public transport services.

[5] The visuals are artist impressions and should not be considered as precise representations of the areas shown

Reduced vehicle emissions will also improve air quality, which will have a positive impact on the health of citizens.

DKI intends to pursue the development and implementation of intelligent transport systems where feasible to help in achieving these targets. These could provide additional benefits such as detecting traffic violations of private vehicles using bus lanes, and to alert emergency services when an accident occurs in public transport, thereby improving its reliability.

The development and execution of the plan requires co-ordination between the Ministry of Transportation, Department of Transportation and state/regional-owned enterprises, and the provincial government will pro-actively pursue that this collaboration takes place in a fruitful manner.

Public transport access to all of Jakarta's inhabitants regardless of their income level and type of residence is key to increase the use of public transport. This is an important link to effective land use controlling and planning. Therefore, new residential developments will be planned in connection with the existing and planned public transport network.

To create opportunities and avoid malinvestment, the planning of extensions of the public transport networks shall be closely connected to development of coastal protection and urban drainage. Piggy-backing opportunities will be investigated when planning these developments.

A mode shift to public transport is only part of the solution. The use of electric vehicles will also be required. The provincial government will promote this by leading by example and transforming their fleet to electric vehicles for government transport operations, supplemented with biofuel vehicles during the transition phase, which will be as short as possible. The first step in this process would be a Governor's Instruction to all departments within the DKI Jakarta Provincial Government to provide electric and biofuel vehicles for government use, and to provide charging and biofuel stations in the vicinity of government buildings. The central procurement team (LPSE) will take the lead in implementing this action to reach the target to replace all provincial vehicles before 2030.

ACTION TRACK 6: **Solid Waste**

Although the waste sector contributes a small proportion of the overall GHG emissions, the potential for creating wider benefits remains significant.

Organic waste decomposition in existing landfills naturally produces landfill gas, which is usually emitted into the atmosphere. A **landfill gas recovery system** captures this gas. Such a system will be prioritized and progressed by BAPPEDA and by aligning implementation with plans from ESDM. The main target is to have a landfill gas recovery system installed in the Bantar Gebang landfill before 2030. This landfill collects most of the organic waste from DKI Jakarta, of at least 3,700 tonnes of organic waste per day.

The implementation of **anaerobic digestion of animal slaughterhouse waste** helps to manage the liquid fraction of this waste. When directly discharged, this potentially contaminates stormwater leading to unsanitary conditions in the city. In addition to reducing emissions, this system provides containment of pathogenetic diseases spread by livestock and thus improves sanitary



conditions. A first step is the development of a strategy for implementation and the publication of an AMDAL/EIA for a pilot project in 2022. This will be followed by implementation at a first project location, and all remaining suitable animal slaughterhouses by 2030.

Finally, **anaerobic digestion of municipal organic waste** will be implemented. For this action to succeed, proper waste separation at source is key. In the short-term, DLH will set up a guideline for municipal organic waste management (how to collect, segregate, and transport waste) and develop the option for communal processing of organic waste (at community level or at a municipal landfill). Following this, DLH will establish communal waste collection, promote waste segregation through community training, and invest in a system for anaerobic digestion. These actions will contribute to diverting waste from landfills. Anaerobic digestion will also be a way to process sludge from rivers and water bodies, which contain a high level of organic waste.

05

Implementing Climate Action in Jakarta



5.1 Funding, Financing and Human Resources

Provincial Level

Funding for climate action can be either through government funding at provincial or national level or other financing sources. It is expected that the majority of the 14 strategic actions highlighted in this plan that require direct investment will be funded through the Provincial Annual Budget (APBD). This is in accordance with chapter nine of the RPJMD, which states the commitment to climate action by DKI Jakarta. The funding could cover technical support and expertise, the procurement of equipment, or investment in new or retrofit hard infrastructure.

National Level

Large-scale infrastructure actions such as some transport or urban drainage projects require high capital investment that the provincial budget is insufficient to cover. For these types of actions that are considered of strategic national importance, the national government utilises its State Revenue and Expenditure Budget (APBN) through relevant ministries. This can be done either as an investment fully borne by the national government or as a combined investment with contributions from both national and provincial governments. In both cases, national ministries work with provincial technical departments to plan and deliver climate actions.

At the national level, there are three government institutions in Indonesia that have an important role in budgeting and coordinating climate action financing, namely the Ministry of Finance, the Ministry of National Development Planning (BAPPENAS), and the Ministry of Environment and Forestry. Specifically, the Ministry of Finance has the authority to allocate the budget and can thereby ensure the climate actions are funded as an urgent priority. Within the Ministry of Finance, there are two divisions that could play an active role to stimulate climate action. The Fiscal Policy Agency can help to introduce policies that stimulate and enforce climate action. The Directorate General of Fiscal Risk Management has the task of monitoring and reporting whether funds are spent to achieve the targets and should play an active role in the monitoring, evaluation and reporting.

Other national funding options include the regional loan mechanisms or issuance of debt securities. Both of these are further regulated in Presidential Law No. 56/2018 on Regional Loans. However, such schemes of financing will be pursued with careful consideration due to the long-term commitments associated with them.

Private Sector Participation

Where possible, funding for large-scale infrastructure could leverage non-government funding mechanisms such as a Public-Private Partnerships (PPP) or the assignment of Regional Owned Enterprises (BUMD). Such arrangements could either be managed at national or provincial level, depending on the relevant administrative and financial structure. The national government strongly encourages the regions to pursue PPPs, as stipulated in the Presidential Regulation No. 38/2015 on Government Cooperation with Business Entities in the Provision of Infrastructure. A potential advantage of PPPs or BUMDs could be to leverage private sector knowledge on the application of the latest technologies. Successful application of these funding mechanisms requires a careful and balanced distribution of risks for the collaboration to be mutually beneficial.

The private sector also plays another role in providing direct or indirect funding on climate action. Funding opportunities from the private sector that are available are, for example, the DKI Jakarta CSR Forum or green bonds. These options will be further explored where required.

Multilaterals and Non-Governmental Organisations

Funding for mitigation and adaptation actions could also come from bilaterals, multilaterals or global financing facilities under the form of grants, loans, profitable business agreements or other types of funding to close any gaps. These multilaterals or other non-governmental organisations could also provide technical support, or help small-scale pilot or demonstration projects, which could build the case for mobilizing financing to achieve larger-scale actions.

Non-Capital-Intensive Climate Actions

It should be noted that not all climate actions highlighted in this plan require capital investment. Some actions are predominantly policy driven rather than requiring direct investment by the public sector. One example is revision of the Green Building policy. The provincial government will drive the actions by proposing incentives or enforcing the standards in the policy.

Human Resources

DKI Jakarta has clearly identified the human resources required to execute the strategic climate actions, outlined in Chapter 5.2 on climate governance. The province acknowledges the importance of human resources throughout the provincial administration, but the urgency and technical understanding of climate action needs to be further mainstreamed into the different parts of the provincial administration. This requires capacity building that could be attained through the following measures:

- Strategically position senior staff with climate action expertise throughout the administration to ensure decision-making takes climate action into account
- Provide each department with expertise on climate action to allow for the inclusion of the relevant climate action analyses in projects and policies, and improve the dissemination of knowledge on climate action
- Support staff by providing a knowledge platform to disseminate knowledge in a structured and accessible manner, thereby improving the overall capacity on climate action of the entire administration
- Continuously identify barriers to action and proactively pursue solutions to overcome barriers, especially to make progress on the more challenging mitigation and/or adaptation actions
- Ensure that all collaboration with external parties to implement climate actions include skill and technology transfer to the province

5.2 Climate Governance

To ensure the effective delivery of Jakarta's Climate Action Plan 2021–2050, a clear governance structure is required for continued collaboration and co-ordination across the provincial government and other provincial stakeholders. The Governor's Decree on Climate Disaster Mitigation and Adaptation Working Team (KepGub 96/2020) published in 2020 set out clear roles and responsibilities for climate action planning and delivery. This includes implementation, monitoring, evaluation, reporting and future updating of the Climate Action Plan. The provincial government will co-ordinate climate action based on this structure, summarized in Figure 26.



The governance structure comprises a leadership committee and five working groups. The leadership committee consists of six tiers of leadership:

1. The governor of DKI Jakarta is the **Director** with the highest position of leadership. The director is responsible for giving guiding principles and direction regarding climate adaptation and mitigation in DKI Jakarta.
2. The second tier is the **Responsible Person**, responsible for leading and co-ordinating all activities regarding climate adaptation and mitigation in DKI Jakarta. Officially, this tier consists of three people: the regional secretary of DKI Jakarta Province, the deputy of the governor for spatial planning and environment and the deputy of the governor for transport, trade and industry.
3. The Director and the Responsible Person will be supported by the **Advisor**, the third tier of leadership. The advisor mainly provides instructions on policy considerations regarding climate adaptation and mitigation to support decisions on all of the six levels of leadership.
4. The fourth and the fifth tier of leadership are allocated to the **Chairman** (the head BAPPEDA) and the **Daily Chairman** (the head of DLH) respectively. The chairman has a specific expertise in action management whereas the daily chairman will mainly focus on environmental aspects. The chairman and daily chairman are both responsible for the co-ordination of the working teams and the correct implementation, monitoring, evaluation and reporting of climate actions.
5. The final tier of leadership is allocated to the **Secretary** whose responsibilities are compiling and preparing data and information for proper monitoring, evaluation and reporting of climate actions. The secretary is the head of environmental and development bureau of Regional Secretary and the secretary of DLH.



The leadership committee is supported by five technical working groups:

1. Working group A (**Mitigation**) is responsible for the creation of working plans for implementing climate change mitigation actions and the monitoring, evaluation and reporting of these actions.
2. Working group B (**Adaptation**) takes the lead for setting up working plans for implementing climate change adaptation actions and the monitoring, evaluation and reporting of them.
3. Working Group C (**Funding and Partnership Co-operation**) works on the provision of funding and partnership with other institutions in order to search for financial sources for both mitigation and adaptation actions.
4. Working Group D (**Communication and Community Participation**) is responsible for promoting participation of the community. It is their task to involve the community actively in the climate actions.
5. Working Group E (**Research and Innovation**) works on research and innovation on climate mitigation and adaptation actions.

Although working groups A and B each has a specific focus (A: mitigation, B: adaptation), they each need to consider the other group's responsibility in order to avoid malinvestments. Working groups C, D, E are cross-cutting working groups supporting both A and B according to the relevant co-ordination needed.

The lead implementing agencies are part of the above mentioned working groups. For example, the lead implementing agency for the action 'Increasing regional healthcare coverage during climate events' is DINKES. At the same time, DINKES is part of Working Group B.

A complete overview of the roles and responsibilities of the leadership committee and five technical working groups are presented in Figure 27 and Figure 28, respectively.

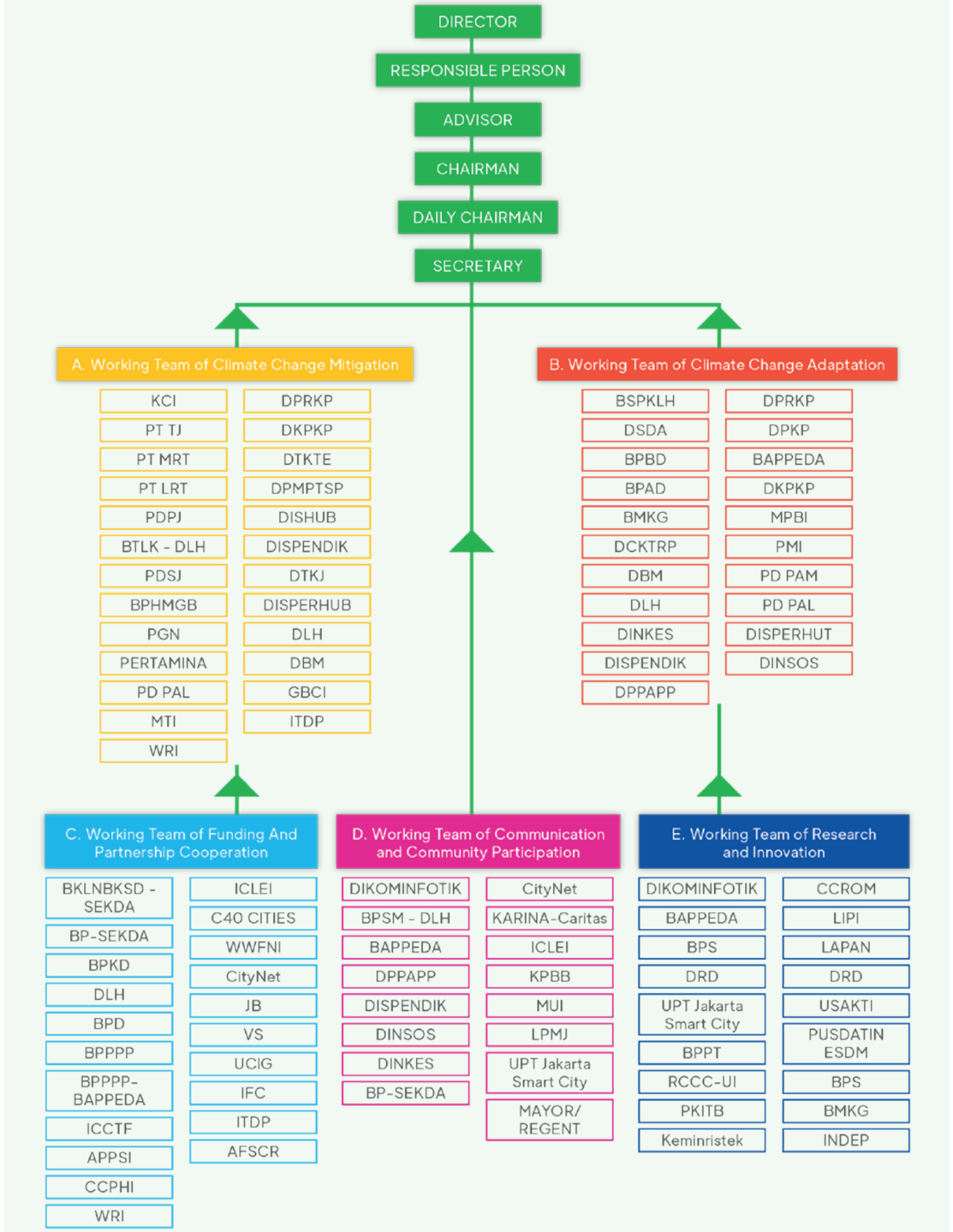


Figure 26. Governance structure DKI Jakarta for climate adaptation and mitigation

DIRECTOR
(Governor of DKI Jakarta)

Tasks and responsibilities:

To give guidelines/direction regarding climate adaptation and mitigation in DKI Jakarta

RESPONSIBLE PERSON
(SEKDA; Deputy of Governor for Spatial Planning and Environment Division; Deputy of Governor for Transportation, Trade and Industry Division)

Tasks and responsibilities:

To be responsible for all activities regarding climate adaptation and mitigation in DKI Jakarta

ADVISOR
(Assistants of SEKDA)

Tasks and responsibilities:

1. To give full support to the working team of climate adaptation and mitigation in DKI Jakarta
2. To give suggestions for policy consideration regarding climate adaptation and mitigation in DKI Jakarta
3. To lead and to co-ordinate all the elements of climate adaptation and mitigation in DKI Jakarta

CHAIRMAN
(Head of BAPPEDA)

Tasks and responsibilities:

1. To lead and to monitor the working team of climate adaptation and mitigation in DKI Jakarta
2. To decide and to lead the review of adaptation and mitigation climate action in DKI Jakarta
3. To report the implementation of climate adaptation and mitigation to the Advisor
4. To set up coordination to ensure the management of information database regarding climate adaptation and mitigation
5. To lead the plenary meeting and multi stakeholder public consultation forum

DAILY CHAIRMAN
(Head of DLH)

Tasks and responsibilities:

1. To co-ordinate the work plan for climate adaptation and mitigation activity implementation
2. To determine the target of climate adaptation and mitigation activities
3. To co-ordinate the implementation of data collecting activity and target achievement for climate adaptation and mitigation
4. To do monitoring and evaluation of climate adaptation and mitigation in DKI Jakarta
5. To compile the result of monitoring and evaluation of climate adaptation and mitigation
6. To lead the plenary meeting discussion and multi stakeholder public consultation forum if the Chairman cannot attend
7. To set up the report of climate adaptation and mitigation implementation activities in DKI Jakarta

SECRETARY
(SEKDA and secretary of DLH)

Tasks and responsibilities:

1. To prepare the administration support and substances regarding the climate adaptation and mitigation implementation activities in DKI Jakarta
2. To prepare the concept of evaluation report regarding the climate adaptation and mitigation implementation activities in DKI Jakarta
3. To compile, to keep and to manage all information documents regarding climate adaptation and mitigation in DKI Jakarta

Figure 27. Roles and responsibilities of the leadership committee in Jakarta

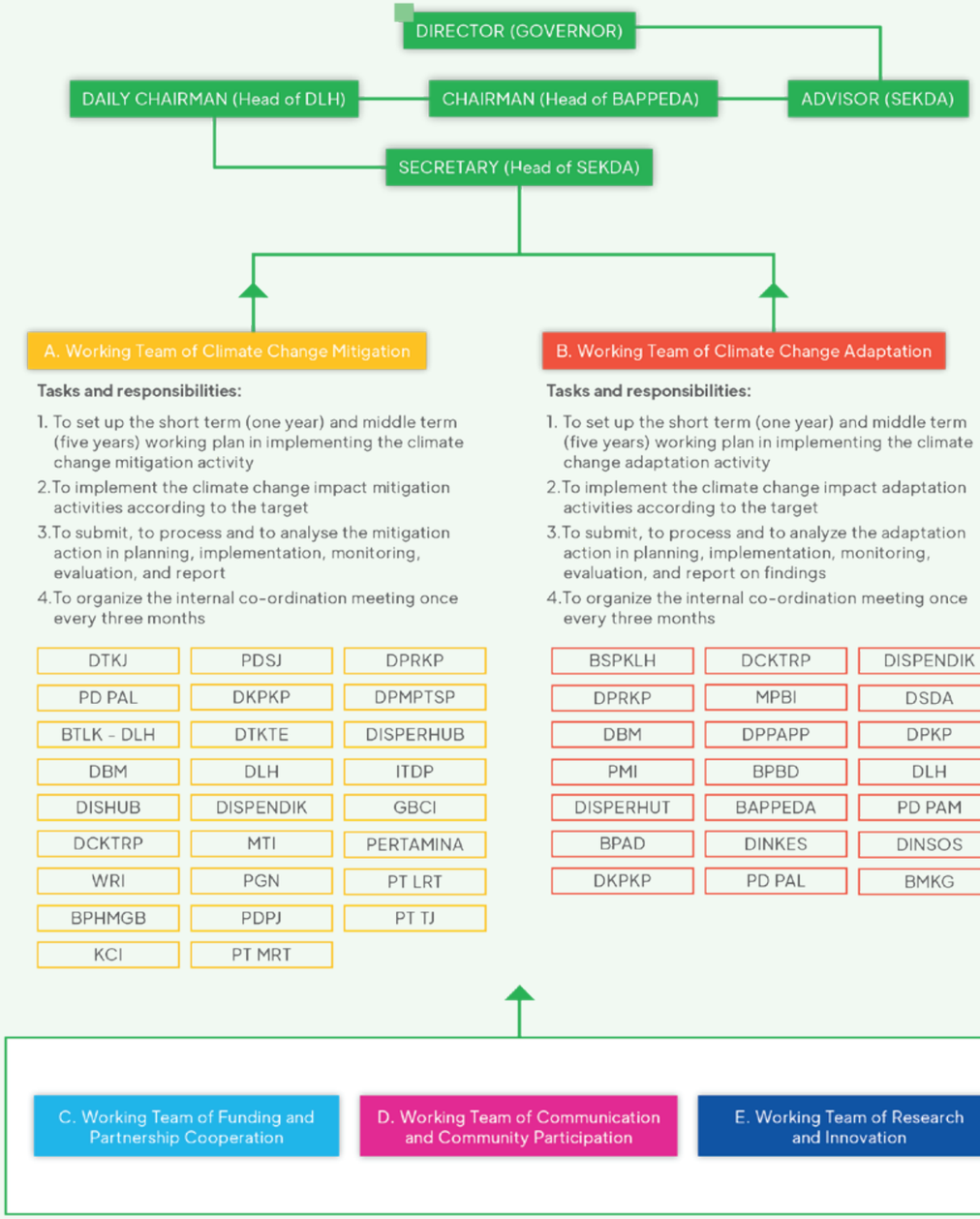
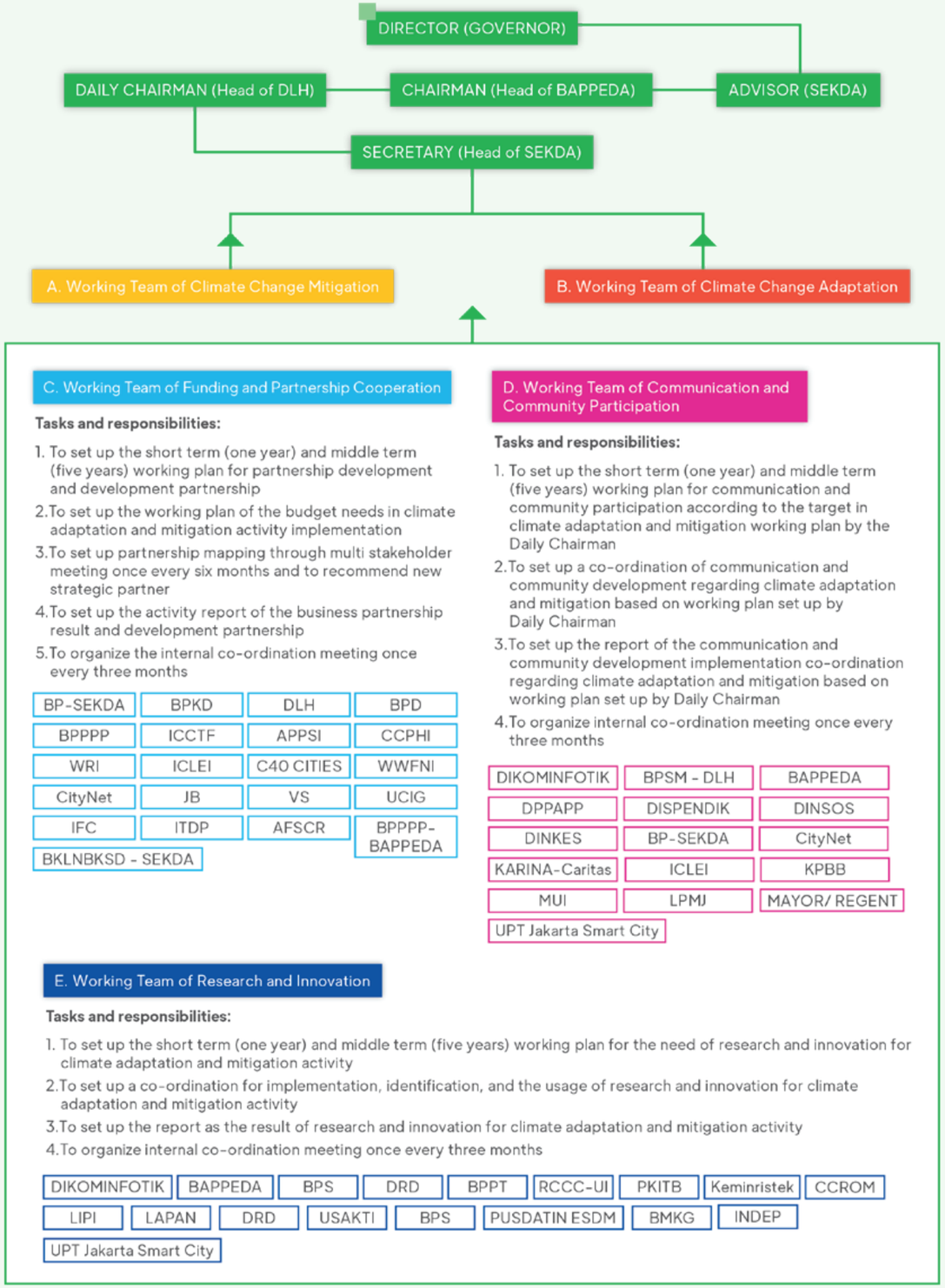


Figure 28a. Climate governance working teams roles and responsibilities in Jakarta



(continued) **Figure 28b.** Climate governance working teams roles and responsibilities in Jakarta

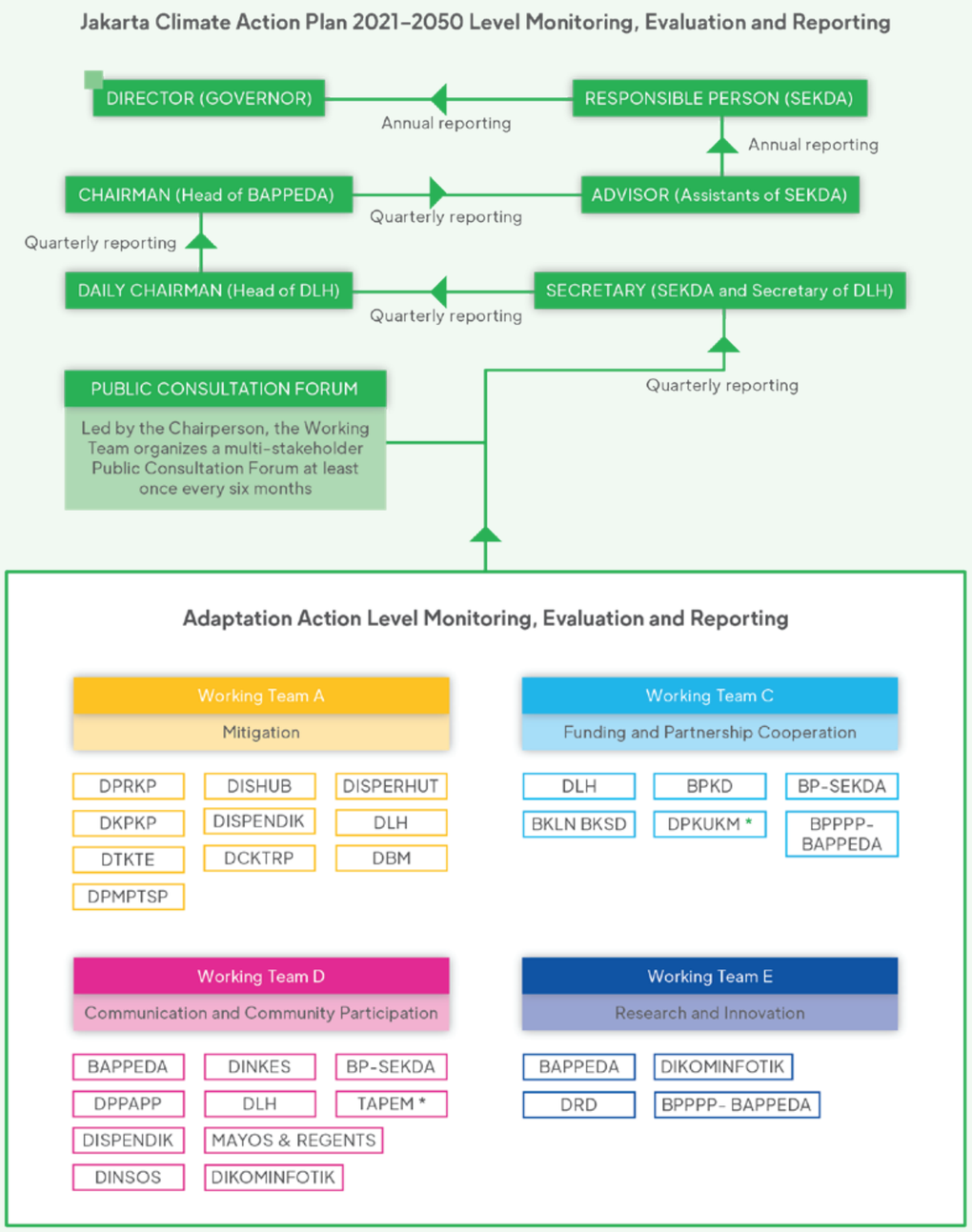
5.3 Monitoring, Evaluation and Reporting

Monitoring, evaluation and reporting are fundamental pillars of climate action. This CAP establishes a structured system for DKI Jakarta to monitor, evaluate and report the progress and impacts of its climate action to:

- assess progress and effectiveness and adapt climate actions and targets if needed
- continue to make the case for other possible climate actions
- provide relevant information to a wide range of partners and provincial inhabitants
- improve accountability and transparency

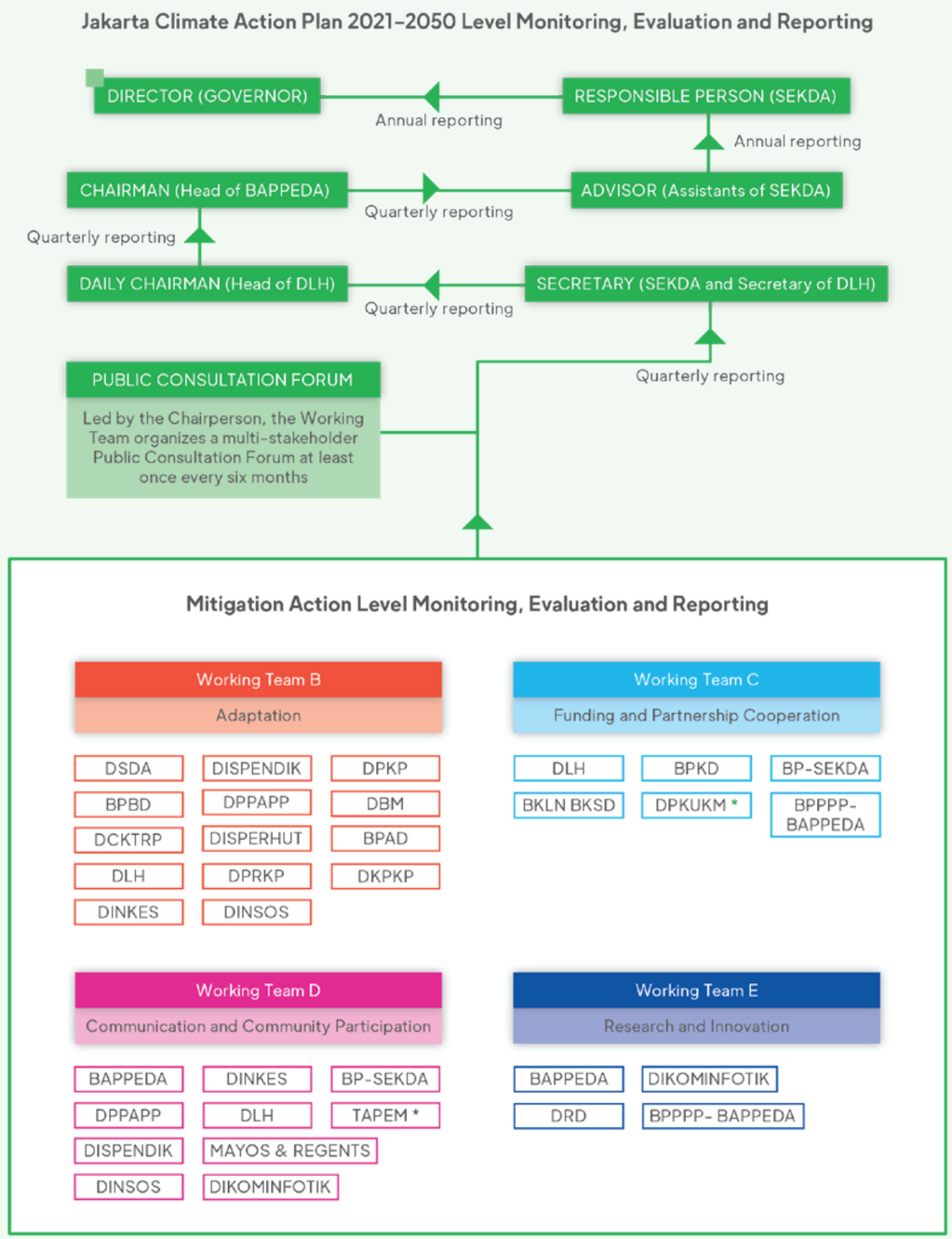
The monitoring, evaluation and reporting process set out in the Governor's Decree on Climate Disaster Mitigation and Adaptation Working Team is provided in Figure 29. This Climate Action Plan supports the process by proposing prime indicators that should be used to monitor the progress of each strategic action as a minimum, setting out the critical questions that should be answered when evaluating climate actions and further details about reporting.





** Not mentioned in Governor Decree on Climate Disaster Mitigation and Adaptation, Working team who will be involved in the monitoring component of the MER process.*

Figure 29a. Monitoring Evaluation and Reporting framework climate action plan based on the Governor's Decree on the Climate Working Group



** Not mentioned in Governor Decree on Climate Disaster Mitigation and Adaptation, Working team who will be involved in the monitoring component of the MER process.*

(continued) **Figure 29b.** Monitoring Evaluation and Reporting framework climate action plan based on the Governor's Decree on the Climate Working Group

Monitoring

Monitoring is a continuous activity of watching the relevant indicators of each action carefully to measure progress. Relevant and insightful indicators measure the planned outputs, outcomes and impacts of each action. The indicators of the actions are listed in each respective action factsheet in Chapter 4.

For meaningful data collection, the responsible department should establish a baseline for the purposes of understanding and communicating the level of impact due to the action.

Evaluation

DKI Jakarta will evaluate the results of the monitoring according to the reporting frequencies in Figure 29. These evaluations will provide an understanding of the progress of implementation, the effectiveness of the action thus far and provide an indication of positive and negative impacts.

Figure 30 provides an overview of evaluation questions that can be applied by the departments. By evaluating the action plan, outputs, outcomes and impacts, it provides a snapshot at that time interval of the effectiveness and impact of each action. These will inform the adjustment of the action or its implementation plan, where needed.



Figure 30. Overview of the evaluation questions

The evaluation questions also integrate considerations on inclusivity and equity, for DKI Jakarta to track that the outputs, outcomes and impacts of climate actions are distributed equitably across the population. In addition, evaluation allows departments to assess and mitigate any potentially negative impacts of actions on different communities in the province, especially for those particularly vulnerable to climate hazards and socio-economic changes.

Public consultation forums will also be organized. These will present the targets, progress and impacts of climate actions to the communities.

Reporting

DKI Jakarta will report the data and analysis compiled during the monitoring and evaluation to stakeholders to communicate benefits to a wider audience and to share knowledge. This will help to encourage the collaboration and dialogue that is central to accelerate the implementation of climate actions. DKI Jakarta reports to many diverse stakeholders including heads of national and provincial departments, the Governor and the wider population, sometimes via public consultation forums. The purpose and the timing of the reporting will differ according to the action and the relevant target audience. Reporting will include the following elements:



- For the Governor's office and for the "Responsible Person" (SEKDA), reporting will include a strategic and operational overview of action planning, implementation, newly identified barriers and overall performance. This reporting will take place annually
- For the Advisor (Assistants of SEKDA), Chairman (BAPPEDA), Daily Chairman (DLH) and Secretary (SEKDA and Secretary of DLH), the reporting will focus on outputs, outcomes and impacts in relation to Jakarta's vision, goals and targets for climate action. This reporting will take place quarterly
- Additionally, the reporting will include information on project management, including the allocation of human and financial resources to ensure possible gaps in finances or human resources are filled
- The reporting should also include proposed improvements on a climate action. The responsible department needs to report every three months to the lower levels of the leadership (Advisor, Chairman, Daily Chairman and Secretary) and annually to the higher levels of the leadership committee (Director and Responsible Person) (see Figure 29)

Public consultation forums will also be organized. These will present the targets, progress and impacts of climate actions to the communities. The reporting to the public consultation should include GHG emission reductions, progress on adaptation actions and the wider socioeconomic benefits that are achieved by implementing the climate actions. The responsible department needs to report to the public consultation forums once every six months.

For all of the target audiences, reporting should indicate the performance of a climate action measured against baselines or compared with business-as-usual scenarios (the scenario for when no action is taken) to track progress clearly.



Updating the Climate Action Plan

Updating the Climate Action Plan is vital for its success as environmental, governmental, financial and planning contexts are a constantly evolving reality that must be considered. As stipulated under the Governor's Decree on Climate Disaster Mitigation and Adaptation Working Team, the Climate Action Plan will be updated at least once every five years. This is to allow adjustments and revisions to be made that incorporate the latest developments.

Reasons that might require the Climate Action Plan to be updated sooner include:

- Changes to the National CAP affecting the provincial contribution to climate risk and GHG emission reductions
- Changes in key assumptions of the Climate Action Plan such as climate projections, occurrence of major climate hazards, socioeconomic and vulnerability factors, GHG residual emissions, major land use changes or spatial planning
- Changes in the provincial priorities resulting in changes in funding schemes or governance structures
- Results from monitoring show little or no progress towards the targets
- Climate actions need urgent adding or revision based on new insights or technologies

The next CAP will be developed in 2025 and aligned with the Jakarta Medium-Term Development Plan (RPJMD), strategic plans (RENSTRA) and spatial plans (RTRW). As the development of a CAP could be a complex process, updating and reviewing activities are foreseen to start as early as 2023.

06

Conclusion





DKI Jakarta is the economic, political and social heart of Indonesia, and is unfortunately no stranger to climate hazards and their wide range of impacts. With this CAP, the province is making climate action a priority; addressing the need to reduce emissions to keep temperature to below 1.5°C and develop the resilience of its population and infrastructure to intensifying climate hazards.

The analysis, actions and implementation planning in this CAP build upon previous provincial Instructions (InGub) and Regulations (PerGub) and their technical annexes. The action tracks allow DKI Jakarta to build its momentum towards improved disaster response, water management and supply, building energy efficiency, expansion and electrification of public transport, and waste management. These actions will also serve to bring benefits to everyone who live and work in DKI Jakarta in an inclusive and equitable way.

Where possible, the province has also committed to addressing the barriers that it faces in ambitious emissions reductions, especially around grid decarbonization, rooftop solar, mode shift to public transit, and the reduction and recycling of waste. DKI Jakarta also recognizes its data limitations for the detailed analysis of city GHG emissions and seeks to address this by following up with an annually updated GHG inventory as per national reporting regulation (Permen 73/2017), as well as an updated emissions scenario modelling.

Climate action does not end with this CAP. Instead, it is a significant milestone that establishes a low-carbon, climate resilient, inclusive and equitable orientation for DKI Jakarta's continued development towards 2050 and beyond.

Appendix 1: **Longlist of Climate Actions Considered for Climate Action Plan 2021–2050**

1. **Adaptation** (selected strategic actions are indicated in italics)

I	WATER RESOURCES
1	Water Catchment Area Management
2	Absorbing well, Biopore infiltration holes
3	Rivers, dams, basins naturalization
4	*Retrofit and construction of urban drainage systems for flood resilience*
5	Constructions of water canals to diverse abundant water
6	Prevent water flow from upstream through reforestation, micro-macro dam, trench/dike
7	Public movement to houses/buildings to provide rainwater harvesting with volume based on roof coefficient
8	Cleaning and normalization of water canal
9	Preparing of flood pumps to prevent run-off and for flood diversion
10	Integrated River watershed (DAS) management from upstream to downstream
11	Planting of pollutant absorbing plants and infrastructure to prevent river bank erosion, water basins as well as in upstream and buffer zones
12	*Providing reliable and clean drinking water*
13	Accelerating provision of water absorbing area and green open space in government buildings, commercial building, settlement and industry
14	Vertical drainage development
15	Adjustment to drainage design to be climate adaptive
16	Developing standard operating procedure for early disaster preparedness of climate change impact including La Nina (drought and extreme rainfall)
17	Public awareness campaign, preparedness for disaster risks
18	Preparing disaster prone map (flood, fire, epidemic, earthquake and other climate-related disasters)
19	Accelerating development of disaster management plan document 2020–2024
20	Conducting disaster preparedness drill regularly
21	*Early warning systems and emergency response plans in anticipation of climate events*
22	Increase Installation of early warning system for potentially high impact disaster
23	Dissemination of disaster early warning in local mass media (i.e. television, radio, online news, SMS broadcasting, local newspaper) to inform people from authorised institutions
24	Flood, landslide, strong wind anticipation and preparedness
25	Structural and non-structural measures for an integrated flood management
26	Zero Delta Q Movement to reduce surface water flows from buildings
27	Water reuse and optimalisation
28	Preparing evacuation track for climate disaster preparedness

II	MARINE AND COASTAL
1	Construction of automatic water gate to reduce flood in coastal area
2	Community empowerment and enhancing community awareness for environmental and green open space protection, mangrove planting and improve ecological function
3	*Land use planning and controls*
4	Increase Installation of early warning system for potentially high impact disaster
5	Dissemination of disaster early warning in local mass media (i.e. television, radio, online news, SMS broadcasting, local newspaper) to inform people from authorised institutions
6	Improving maritime climate weather information system (i.e. waves, current, wind)
7	*Protection from coastal flooding, erosion and abrasion*
8	Fishermen settlement upgrading
9	Construction of environmentally friendly fishing vessels
III	HEALTH
1	Upgrading quality of lab diagnostic equipment for dengue, malaria and pneumonia
2	Increasing regional healthcare coverage during climate events
3	Healthcare protection
4	Capacity building of health extension personnel
5	Public education to prevent and control disease in potential endemic area
6	Public education for disease vectors controlling and vigilance
7	Early education to students on climate change impacts
8	Adding health and climate change curriculum for elementary and junior high school in science subject
9	Food Security
10	Urban farming
11	Emission and pollution calculation from individual consumption
12	Food stocking
13	Land utilization for family herbs plant and fishponds
14	Reserve 25% from Taman maju Bersama (public park) and child-friendly integrated parks (RPTRA) for urban farming

2. **Mitigation** (selected strategic actions are indicated in italics)

I	ENERGY
1	Energy efficient City Public lighting (LED and solar PV)
2	Energy Efficiency in government owned buildings and houses from electric appliances
3	*Green buildings policy revision*
4	*Energy efficiency in commercial buildings*
5	Procurement on electricity efficient appliance for government offices and government-owned houses
6	*Energy efficiency in industrial buildings*
7	Industrial appliances efficiency (heat/furnace, electric motor and lighting)
8	Traffic light automation
9	Provision of Area Traffic Control System/Intelligent Transportation system
10	Transportation system management efficiency through Electronic Road Pricing
11	*Public transport expansion*

I	**ENERGY** (CONTINUED)
12	Pedestrian and biking facilities improvement (new lanes, traffic engineering, signages, and security)
13	Non-motorized (e-Bike) policy, park management and congestion charging
14	e-Bus (BRT including feeder)
15	Electric motor procurement
16	*Electric for government transport operations*
17	Vehicle emission testing for efficiency
18	Analysis of euro 4 policy application for the city
19	Fuel switching of government/picking up bus
20	Switching from LPG stove to electric stove in government building and government owned-house
21	Gas Network (Jargas) for Industry
22	Industrial supervision and development
23	Solar Thermal Power plant in Pulau Seribu
24	PLTSa (Waste Power Plant)
25	PLTS rooftop in government building (offices & houses)
26	PLTS rooftop in commercial buildings
27	*Anaerobic digestion of animal slaughterhouse waste*
28	Biofuel in industry
29	Inventory of emission and pollution from individual electricity consumption
II	**WASTE**
1	*Landfill gas recovery systems*
2	Methane recovery from waste water in IPLT Duri Kosambi and IPLS Pulogebang
3	Refuse Derived Fuel (RDF) from waste in TPA Bantar Gebang
4	Accelerating waste reduction at source through Samtama, 3R, Magot, composting dan recycling (some examples: Easte4Change, Rebricks, Panenabnormal) to prevent waste from source to dumping site (TPA)
5	Waste compacting technology in collecting trucks (compactor)
6	*Anaerobic digestion of municipal organic waste*
7	Efficient waste collecting trucks
8	Paper waste sorting from offices, shopping mall, schools etc.
9	Increasing volume of waste water processing in IPAL Setiabudi (aerobic)
III	**AFOLU**
1	Development of Taman Maju public Park and Urban forest through replanting of high GHG absorbing plants
2	Drafting and implementing Governor decree on urban parks and trees management
3	Increasing absorption and pollution reducing through vertical gardens
4	Increasing absorption and reducing pollution through replantation and plants care in green open space (RTH) area under carbon offset program from transportation fuel
5	Development of Green open space and increasing number of pollutant absorbing plants

Appendix 2: List of National and Provincial Policy Frameworks

National Policy Framework

- Law No. 16/2016 on Ratification of Paris Agreement
- Law No. 27/2007 on Management of coastal area and small islands
- Law No. 24/2007 on Disaster management
- Law No. 17/2004 on Ratification of Kyoto Protocol
- Law No. 6/1994 on Ratification of United Nations Framework Convention on Climate Change
- Law No. 28/2002 on Building Construction
- Government Regulation No. 25/2021 on Organizing energy and natural resource sector
- Government Regulation No. 22/2021 on Environmental protection and management
- Government Regulation No. 23/2021 on Forestry management
- Government Regulation No. 81/2012 on Domestic solid waste management
- Government Regulation No. 70/2009 on Energy conservation
- Government Regulation No. 21/2008 on Disaster management
- Government Regulation No. 39/2006 on Management and evaluation of development plan implementation
- Government Regulation No. 36/2005 on Regulation to implement Government Regulation No. 28/2002
- Government Regulation No. 16/2004 on Land use
- Presidential Regulation No. 18/2020 on National Medium-Term Plan (RPJMN) 2020–2024 Annex 3: Matrix of Development for National Medium-Term Development Plan (RPJMN) 2020–2024 regarding Developing environment, increasing climate resilience and climate change
- Presidential Regulation No. 55/2019 on Program acceleration for battery electrical vehicle
- Presidential Regulation No. 35/2018 on Development acceleration to install waste processing into electrical energy
- Presidential Regulation No. 97/2017 on National policy and strategy for domestic solid waste management
- Presidential Regulation No. 18/2016 on Development acceleration for electricity generation based on solid waste
- Presidential Regulation No. 61/2011 on National Action Plan to reduce GHG emission Paragraph 6, article 4: Regional Climate Action on GHG emission (RAD-GRK) should be submitted to Ministry of National Development Planning (Head of National Development Planning Board) and Ministry of Internal Affair
- Presidential Regulation No. 71/2011 on Organizing inventory for national GHG emission. Paragraph 12, article 6: Governor reports the result of inventory activity of GHG emission from the regency/municipality to the ministry once a year
- Presidential Regulation No. 22/2017 on General plan for national energy
- Regulation of Environment and Forestry Ministry No. 24/2019 on Funding support for solid waste management regarding development acceleration for electricity generation
- Regulation of Public Works and Public Housing Ministry No. 2/2015 on Green building
- Regulation of Energy and Mineral Resources Ministry No. 44/2015 on Electricity purchasing by National Electricity Company (PT PLN) from electricity generation based on solid waste
- Regulation of Energy and Mineral Resources Ministry No. 13/2012 on Saving electricity consumption
- National Guideline for developing a Climate Action Plan (RAN-API 2013)
- National Board for Disaster Management (BNPB) Disaster Risk Appraisal 2016

Provincial Policy Framework

- Regional Regulation of DKI Jakarta Province No. 1/2018 on Regional Medium-Term Plan (RPJMD) 2017–2022
- Regional Regulation of DKI Jakarta Province No. 1/2014 on Detail Spatial Plan (RDTR) & Zoning
- Regional Regulation of DKI Jakarta Province No. 1/2012 on Regional Spatial Plan (RTRW) 2030
- Governor Regulation No. 66/2020 on Emission test for motor vehicles
- Governor Regulation No. 131/2012 on Regional action plan to reduce GHG emission
- Governor Regulation No. 156/2012 on Saving energy and water
- Governor Regulation No. 38/2012 on Green building
- Governor Regulation No. 41/2016 Integrated waste management (Masterplan of Sewerage system)
- Governor Instruction No. 52/2020 on Acceleration for flooding prevention system in climate change time
- Governor Instruction No. 66/2019 on Air quality management
- Governor Instruction No 127 /2017 on Development of climate village program
- Governor Decree No. 96/2020 on Working team for climate change adaptation and mitigation
- Governor Decree No. 1107/2019 on List of regional strategic activities
- Governor Instruction No. 17/2021 on Quick win actions and collaboration
- Governor instruction No 14/2021 on Reducing public lighting as an emergency saving measure

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