NUSANTARA
Capital of Indonesia

Nusantara Net Zero Strategy 2045

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This document has also been developed through comprehensive preparation stages, including continuous discussions with several experts, academics, related ministries and government institutions, local and national NGOs, associations, and community groups through workshops, focus group discussions, panel discussions, and public consultation.

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Foreword

It is with great pleasure and enthusiasm that I introduce the publication of Nusantara's Net Zero Emission Strategy. This document affirms the commitment of Nusantara, the new capital of Indonesia, to achieving net zero emission by 2045. This net-zero goal aligns with Indonesia's broader objective to tackle climate change by 2060 or even earlier.

The Nusantara Capital Authority, in collaboration with various stakeholders, is actively developing an action plan to transform these goals into reality. Central to this initiative is this strategy, which aims to help us meet ambitious climate targets while addressing the unique challenges faced by our new capital.

The Strategy outlines Nusantara's Regionally and Locally Determined Contributions (RLDCs), which plays a vital role in aiding Indonesia's efforts to reduce greenhouse gas emissions and adapt to climate change. These local actions are in line with the nation's Enhanced National Determined Contributions, forming an integral part of a larger strategy that links to national policies outlined in the ENDC.

Furthermore, the RLDCs align with various national and local plans. These include the Action Plans to Reduce Greenhouse Gas Emissions, the National Medium-Term Development Plans for 2020-2024 and 2025-2029, and Indonesia's Low Carbon Development Initiative.

We hope this document will inspire other cities to take decisive steps in fighting climate change through both mitigation and adaptation strategies.

Bambang Susantono
Chairman, Nusantara Capital Authority

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1 Nusantara, Indonesia New Capital As Net Zero City

In 2024 Indonesia will establish the new city of Nusantara as its national capital. With ambitious goals to become a clean, climate-resilient, sustainable and livable city, Nusantara will be aligned with supporting Indonesia's efforts to mitigate and adapt to climate change as set forth in its Enhanced Nationally Determined Contribution under the Paris Agreement.

Nusantara embodies the vision of a modern and sustainable Indonesia. Indonesia aspires to be a high-income country that sits among the seven largest economies in the world by its centenary anniversary in 2045. The new capital symbolizes and facilitates this aspiration. It is envisaged to be a smart and sustainable city.

It will be a

"City in the forest with a forest in the city„

with the target to become a resilient, **net zero city by 2045.**

Designed as a "smart forest city," Nusantara is being planned and built to lead the way towards achieving Indonesia's vision of becoming a sovereign, advanced, just and prosperous archipelagic nation by 2045 (Vision of Indonesia 2045) and to achieve net zero emissions, in all sectors by 2060 or sooner (Long-Term Low Carbon and Climate Resilience Strategy).

The vision for Nusantara is to create a modern capital city that aims to balance emissions reduction, green economic growth, climate justice, climate-resilience, and socially inclusive development.

NUSANTARA

65%
natural forest
biodiversity and
ecological connectivity

The concept of Nusantara as a **'forest city'** is reflected in the plan for land use within the region, with nearly **200,000 hectares** (65%) of the area set aside for natural forest and marine reserves, including 'green' (terrestrial) and 'blue' (aquatic) corridors to enhance biodiversity and ecological connectivity.

The remaining 56,000 hectares will be developed as built-up urban areas interspersed with green space. The installation of renewable energy aims to meet 100% of Nusantara's energy needs, by 2045 or earlier, and at least 60% of solid waste is targeted to be recycled by 2045.

2 RLDC: Nusantara Roadmap To Achieve Net Zero

In order to achieve net zero emissions by 2045, Nusantara Capital Authority (NCA) created an action plan, named Nusantara's Regionally and Locally Determined Contributions (RLDC).

The concept of the RLDC was originally coined by the European Commission, under the European Committee of the Regions (ECR) to support a formal recognition of the role of cities and regions in tackling climate change as in the implementation of the Paris Agreement and to back a system of RLDC as a way to formally acknowledge, monitor, and encourage the reduction of carbon emissions by cities and regions globally under the United Nations Framework Convention on Climate Change (UNFCCC). It stems from the recognition that cities and districts are smaller than direct subnational jurisdictions such as states and provinces.

" RLDC is a sub-national implementation strategy of national climate change policies in Indonesia embodied in its Enhanced Nationally Determined Contribution (ENDC) in the jurisdiction of Nusantara. "

In Indonesia, national policies need to be implemented at all levels, including in sub-national jurisdictions and communications with the UNFCCC need to be carried out via the National Focal Point of the UNFCCC in Indonesia. As such, the RLDC is and shall be an integrated implementation strategy of its national policies, notably its latest NDC and LTS-LCCR and not an independent policy from prevailing national climate policies.

The RLDC is a road map as well as an implementation and investment plan identifying the efforts needed to mitigate and adapt to climate change. **It is regional in that the new capital district covers a substantial area (2,561 square kilometers—more than three times the size of Singapore) and will have the administrative status of a Province. It is also local in that the various districts and communities within the capital region will participate fully in the decisions and actions needed to achieve Nusantara's climate ambitions.**

The RLDC aims to define the pathway to achieve a resilient and net zero Nusantara. Specifically, this overall objective is broken down into three major outcomes, as follows:

Nusantara aims to **reach net zero by 2045 or earlier**, which is at least **15 years ahead** of the national net zero emissions target to be reached by 2060 or earlier.

Nusantara aims to **reverse the deforestation** trends and become a net carbon sink in the FOLU sector by 2030 or earlier in accordance with the national FOLU net sink target.

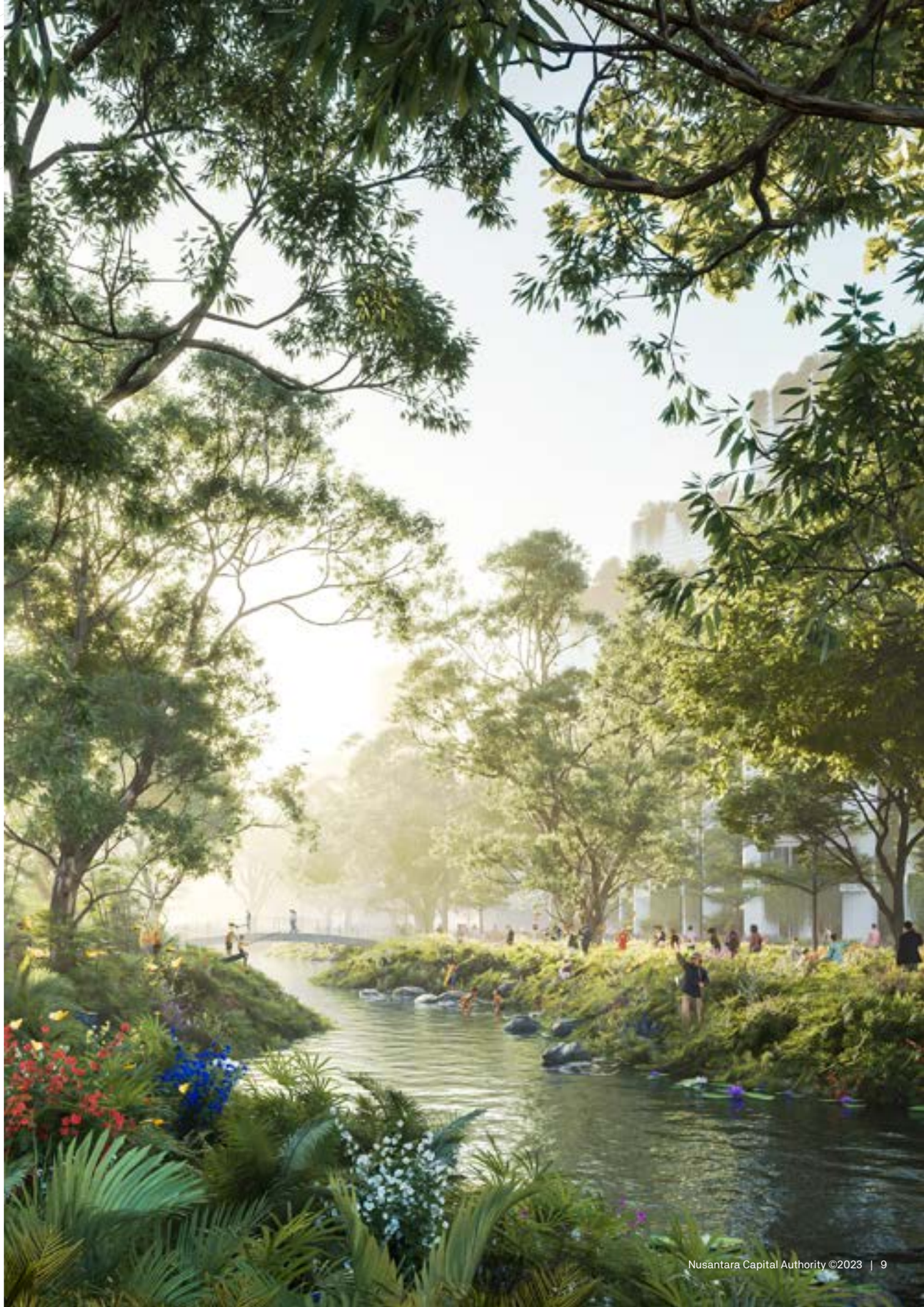
Nusantara aims to be **a resilient city**, with adaptive capacity to withstand the potential impacts of climate change.

This RLDC Roadmap contains the following three major components:

The Green Economy Nusantara (GENUS) is a bespoke **system dynamics model** based on the model structure used in Indonesia's NDC and LCDI, the Indonesia Vision 2045 (IV2045), which itself is based on a Green Economy Model (GEM). The model shows the economic implications of emission reduction policies and targets and develops a set of policy scenarios.

The Action Plan shows time-bound policies and actions to reach the objectives; and

The indicative financial and investment plan with a project pipeline, as well as an assessment of resource mobilization needed to finance the policies and actions in the Action Plan.



3 Nusantara Goes Beyond Net Zero Emissions, and aims to become a Carbon Negative Capital City

The RLDC roadmap shows a pathway that Nusantara will need to follow in order to be able to fulfill its mandate fully, becoming a net zero emissions city by 2045, or earlier.

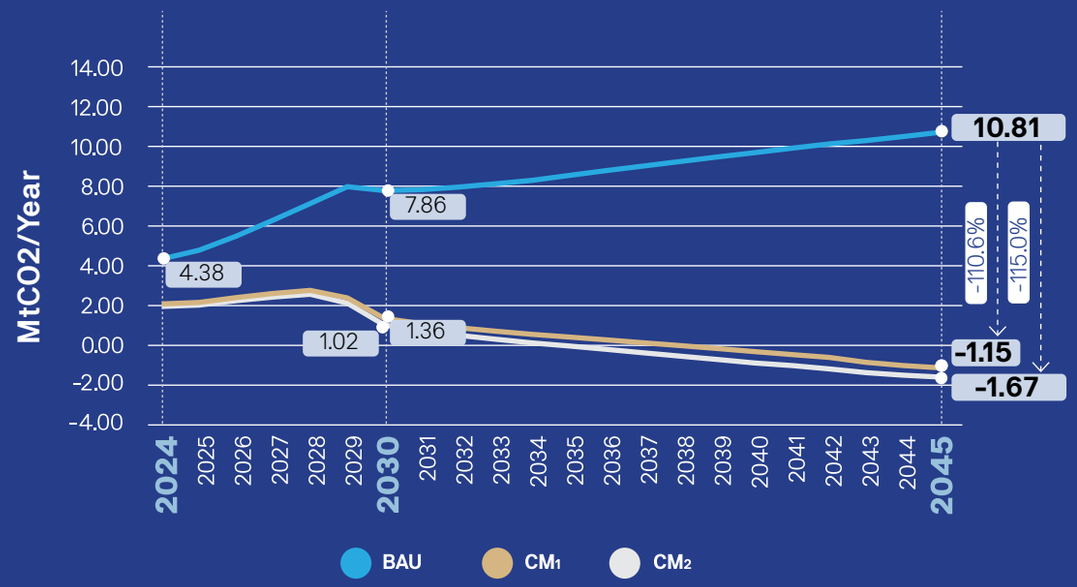
Quantitative studies to fulfill this mandate are carried out through simulations using a system dynamics model called the Green Economy Model for Nusantara (GENUS). This model uses the same logical structure as the model used to assess Indonesia's Nationally Determined Contribution (NDC) to the Low Carbon Development Initiative (LCDI) program. This model creates three scenarios with the result that by 2045.

The BAU scenario was formulated assuming that Nusantara will be built using the same type of infrastructure, power generation mix, transport modes, and waste management practices found in Jakarta. Data on emissions for Jakarta (e.g. emissions per person from energy use and power generation, and waste management) are obtained from the GHG inventory for Jakarta.

Emissions-reduction commitments and targets to be met unconditionally, with Indonesia's own resources, are incorporated in **the 'Master Plan Scenario' (Counter Measure scenario - CM1), in which Nusantara is built according to the Nusantara Indonesia New Capital City Master Plan established in 2022. The 'Enhanced Scenario' (Counter Measure scenario - CM2), incorporates even more ambitious mitigation commitments and targets than those in the Master Plan Scenario**, that may be achieved with additional national and international assistance.

Total GHG Emission from 3 Scenarios

The RLDC meticulously outlines specific actions and approaches to achieve the net zero goal through tangible efforts. Delving into priority sectors as mirrrored in the ENDC such as Forestry and Other Land Use (FOLU), Energy, Waste Management, Industrial Processes and Production Use (IPPU), Construction, and Agriculture.



GHG Emission Level (tonCO2/year)

Sector	BAU			CM1		CM2		CM1 vs BAU		CM2 vs BAU	
	2045	2030	2045	2030	2045	2030	2045	2030	2045	2030	2045
1. Energy	2,581,443	6,945,299	10,074,688	935,054	277,186	680,009	0	-86.5%	-97.2%	-90.2%	-100.0%
2. Waste Management	90,338	243,051	352,564	112,215	182,096	83,202	133,919	-53.8%	-48.4%	-65.8%	-62.0%
3. IPPU (and construction)	0	0	0	0	0	0	0	0	0	**0**	**0**
4. Agriculture	215,345	207,271	189,913	187,783	184,228	187,102	182,581	-9.4%	-3.0%	-9.7%	-3.9%
5. FOLU	1,491,841	458,359	196,864	128,515	-1,793,235	74,661	-1,933,858	-72.0%	-1010.9%	-83.7%	-1082.3%
Total	**4,378,967**	**7,853,980**	**10,814,029**	**1,363,568**	**-1,149,724**	**1,024,973**	**-1,671,358**	**-82.6%**	**-110.6%**	**-86.9%**	**-115.0%**

4 Strategies to Achieve a Net Zero City

CM1

STRATEGY I FOLU

Avoiding deforestation
Forest restoration of 45% of total land
Protecting natural mangrove
Law enforcement and fire control
Community based forest management

STRATEGY II ENERGY

100% renewable sources for electricity in 2030
“10-minute” city design
80% of motorized mobility served by public transport
100% electric vehicles by 2045

STRATEGY III IPPU

Use of more efficient cement for construction
Use 25% supplementary cementitious materials (SCM)

STRATEGY IV WASTE

85% reduction of waste from organic waste composting
80% of waste collection
60% of waste recycling

STRATEGY V AGRICULTURE

Sustainable practices from 2045
Zero emissions irrigation by 2045 by using solar water pumps.
Regenerative agricultural practices
Agroforestry will be applied in ex-plantation area

CM2

STRATEGY I FOLU

Avoiding deforestation
Forest restoration of 47% of total land
Protecting natural mangrove
Law enforcement and fire control
Community based forest management

STRATEGY II ENERGY

100% renewable sources for electricity in 2030
“10-minute” city design
80% of motorized mobility served by public transpor
100% electric vehicles by 2045
No city gas distribution network
All energy demand is fulfilled in the form of electricity

STRATEGY III IPPU

Use of more efficient cement in the construction
Use 50% supplementary cementitious materials (SCM)
Use of recycled concretes
Carbonization of concretes
Establishing top-of-industry factory that is produces the most efficient and the least carbon-intensive cement

STRATEGY IV WASTE

100% reduction of waste from organic waste composting
100% of waste collection
80% of waste recycling

STRATEGY V AGRICULTURE

Sustainable practices from 2045
Zero emissions irrigation (no agriculture irrigation)
Application of biochar in agricultural lands
Regenerative agricultural practices
Agroforestry in several degraded forest areas

STRATEGY I

Forestry and Other Land Uses (FOLU)

Reverse Deforestation to Reforestation

The FOLU sector is the most cost effective and strategic sector in reducing emissions in Nusantara. The Master Plan mandates the expansion of forest area to 65% of Nusantara's total area, or around 167,000 hectares (ha).

This will be achieved by:

Avoiding or reducing deforestation
by protecting about

59,000 ha

of natural forests and mangroves that still exist

Enhancing carbon stock
by restoring more than

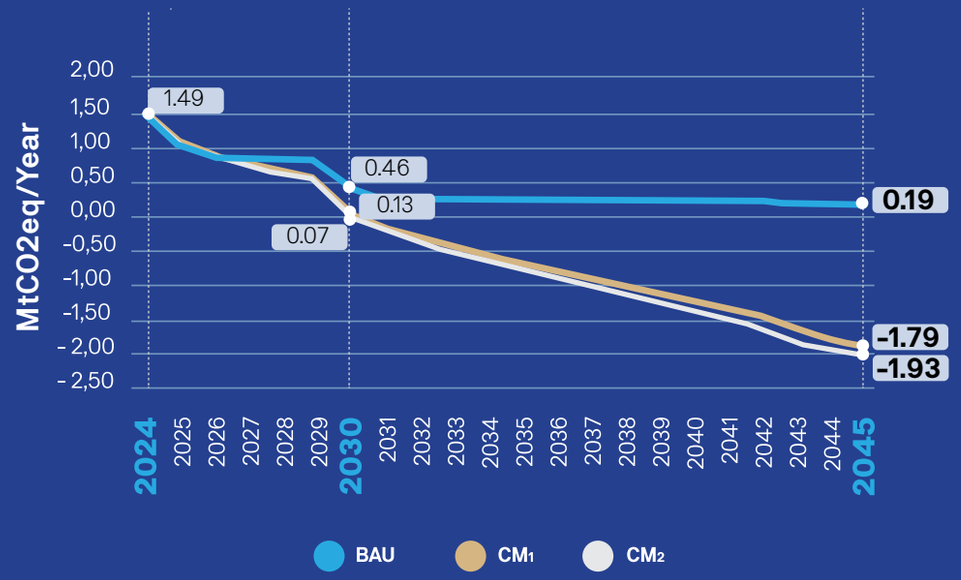
83,000 ha

of remaining industrial forests as well as deforested land and coal mining sites

Providing livelihood opportunities
for communities through the management and use of forests and mangroves.

These strategies are in line with the commitment to make Nusantara a forest city. Conservation, rehabilitation, and increasing forest area are not only beneficial for reducing emissions and increasing carbon sequestration, but also maintaining biodiversity and wildlife habitats, providing ecosystem services such as water resources, and providing livelihood opportunities for communities through the management and use of forests and mangroves.

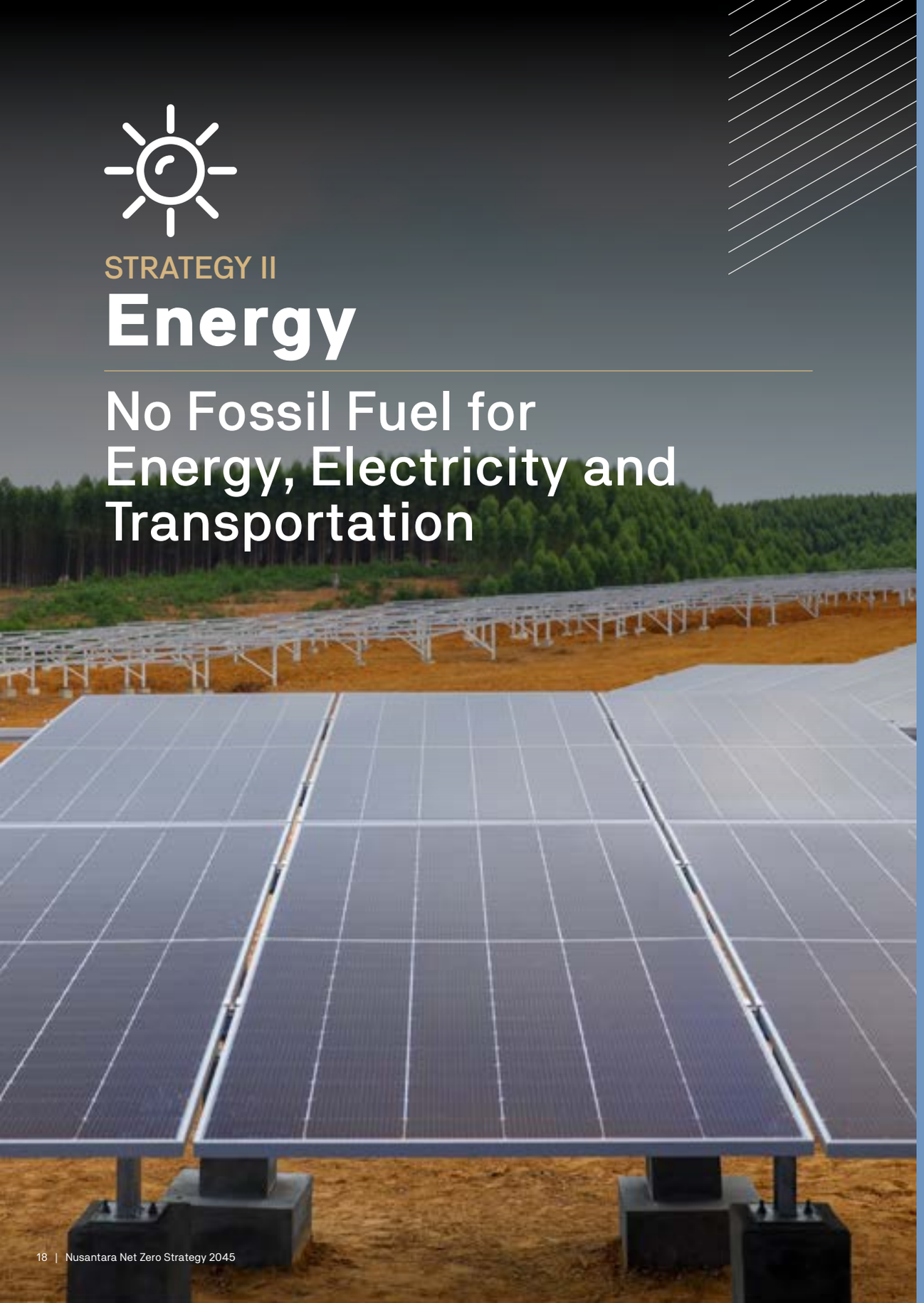
Land emissions



STRATEGY II

Energy

No Fossil Fuel for Energy, Electricity and Transportation



Emissions in the energy sector will peak in 2028 and will be reduced to zero by 2030 and remain zero until 2045. From around 95 MtCO2 in 2024, power sector emissions will peak at around 600 MtCO2 by 2028 and then fall to zero by 2030 when energy needs can be met entirely by renewable sources. This is because before 2030 Nusantara will still have to use non-renewable energy sources, including those already around Nusantara.

The construction of renewable energy sources using solar panels will commence by 2024 with 50 megawatts (MW) and will eventually meet all energy needs in 2030 and 2045.

CM1

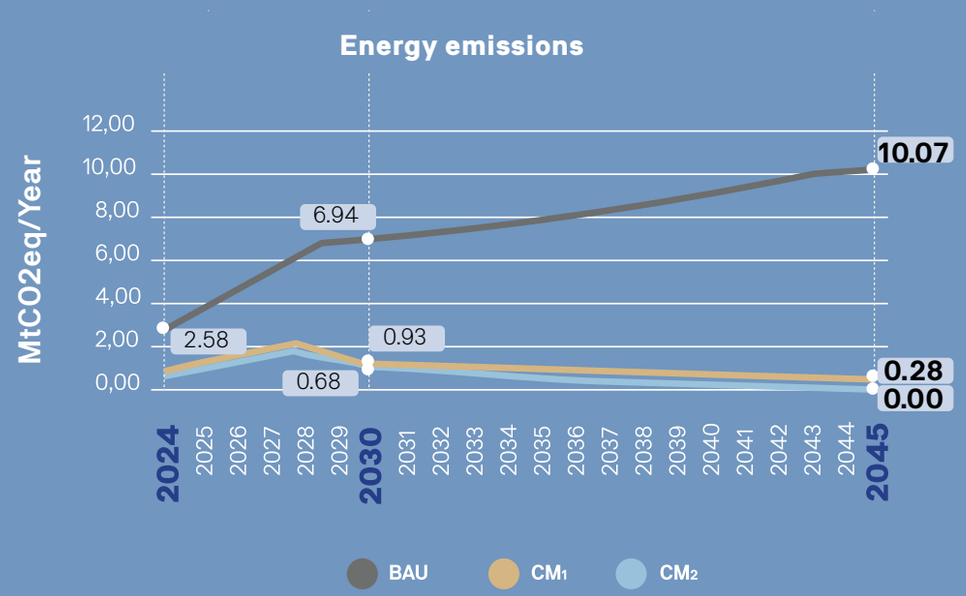
Electric Vehicle will serve **100%** motorized mobility by **2040**

City Gas will serve limited household needs (cooking)

CM2

Electric Vehicle will serve **100%** motorized mobility by **2030**

No City Gas Grid



STRATEGY III

IPPU

Green Building Design and Material

There will be no emissions from the IPPU sector in Nusantara. Carbon dioxide is released in the production and use of certain materials, in addition to the energy use in the production process of such materials. These materials include cement, iron and steel, and some chemical industries.

In Nusantara, there is no such industry, and as such emissions from the IPPU sector is zero. Emissions can be limited through the use of low-carbon building materials and design. By using cement and building design as usual in Indonesia, emissions will reach around 0.9 MtCO2 by 2045 (1.2 MtCO2 in 2024).

2045

By using cement with the latest low-carbon technology, this emission will drop to

0.5 MtCO2 ↓ 43%

Building materials such as cement have a fairly high embodied emissions content from the production process. **Because the production process is not in Nusantara, the emissions are not counted as Nusantara emissions. If a cement factory with the latest technology is built in Nusantara, then these emissions will be calculated as Nusantara emissions.**

STRATEGY IV

Waste Management

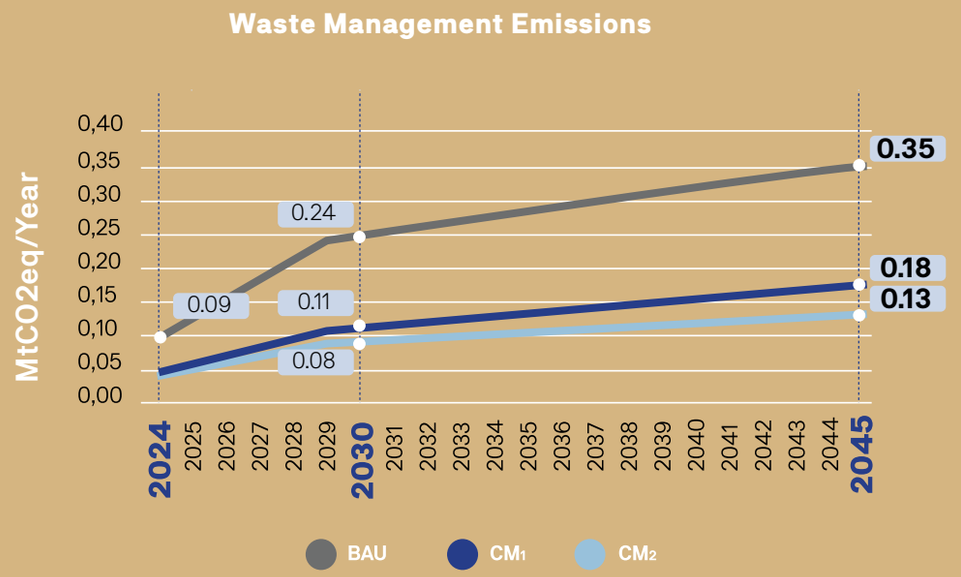
Reduce, Reuse, Recycle and Circular Approach

Waste management will be carried out through a Reduce, Reuse, Recycle (3R) system with a circular economy approach.

60% recovery and recycling of waste, using the 3R, circular economy approach

40% will be processed into energy (waste to energy) and / or products (waste to product) with a minor **10-12%** non-recoverable residue going to landfill.

Waste collection follows good principles and practices in sorting, collecting, transporting, processing, recycling, and reducing waste residues. Reducing the amount of waste sent to the Final Treatment Site (TPA) through recycling and composting contributes to reducing emissions and minimizing the need for landfill space.



STRATEGY V

Agriculture

Climate-Friendly Agriculture

The agriculture sector can become a net carbon sink if regenerative agriculture practices are fully adopted.

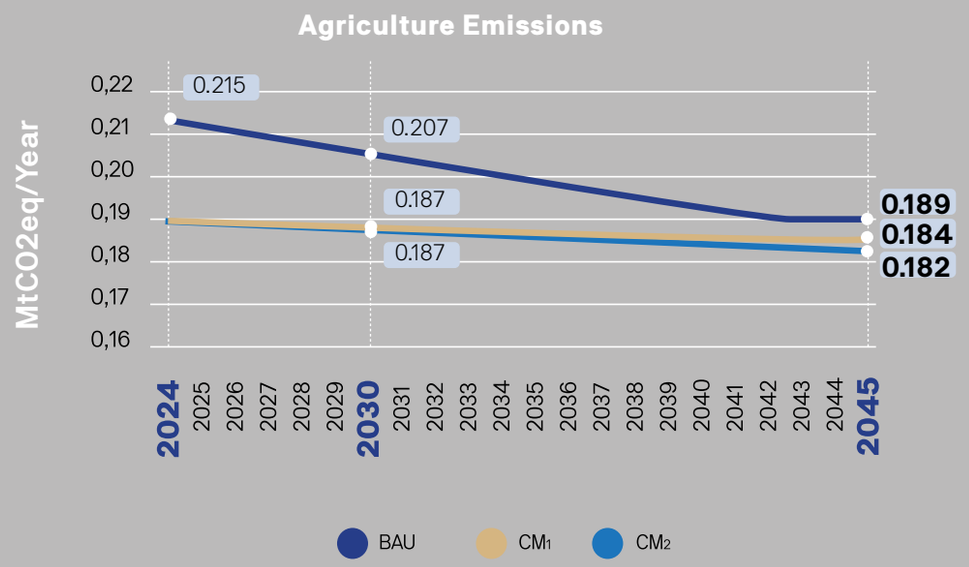
Under the Master Plan scenario, about 4.6 MtCO2e is projected to be sequestered in 42,194 ha of dryland agricultural areas. Under the Enhanced scenario, the area allocated to agriculture is reduced to 25,703 ha to align with the overall policy that 10 percent of the land will be allocated to agriculture while the remaining 17,000 ha will be developed for agroforestry - that is, as a forested area with agricultural functions.

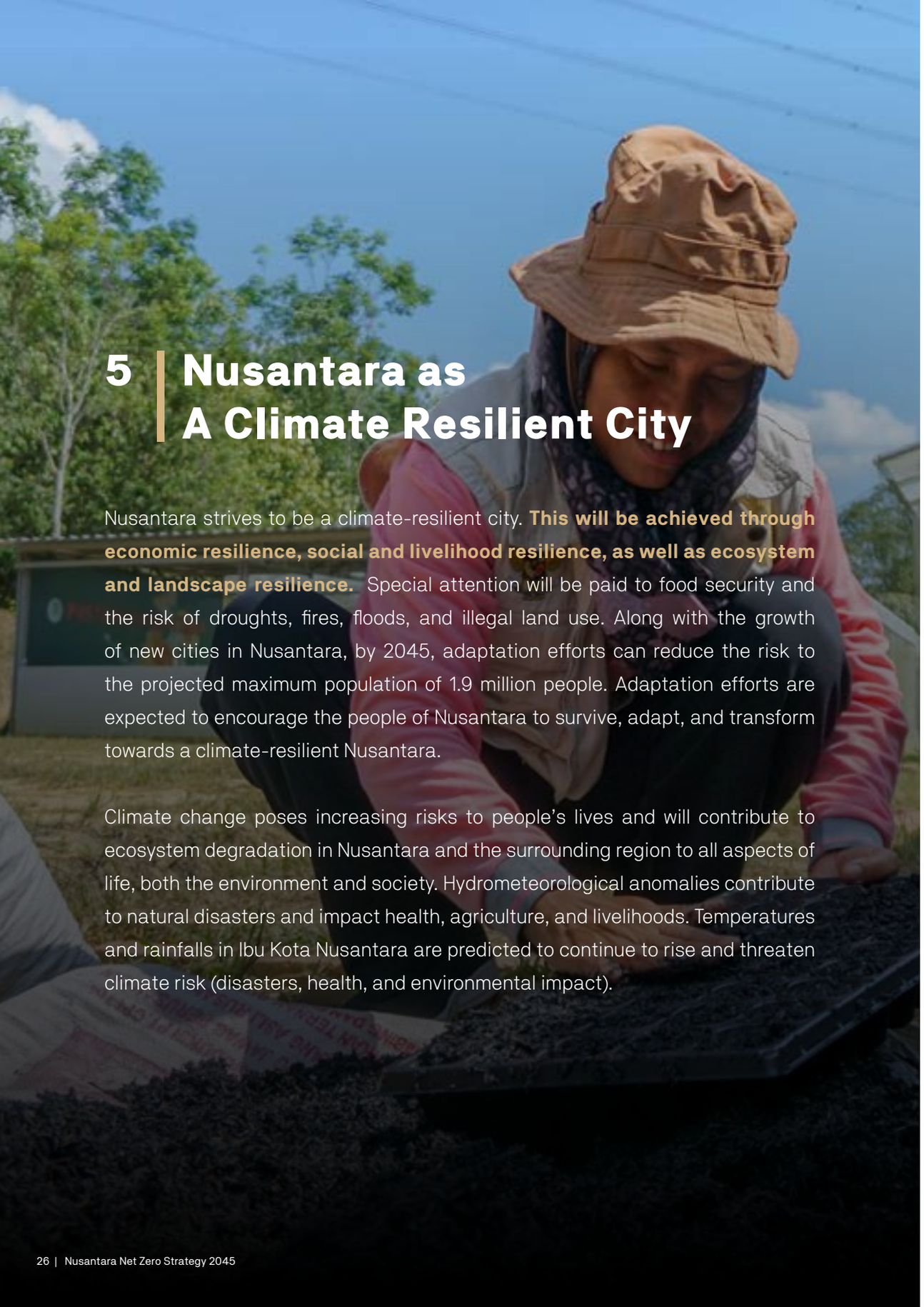
This is projected to result in about 2.5 MtCO2e being sequestered in the dryland agricultural area.

Irrigated rice and aquaculture are projected to be the main sectors emitting greenhouse gases in the agriculture sector, even if carbon emission-reducing technologies are adopted. If the aim is to have zero greenhouse gas emissions in the agriculture sector, then no irrigated rice or aquaculture can be developed within the boundaries of Nusantara.

Regenerative agriculture practices, particularly agroforestry, permaculture, urban farming, and tree crop farming, will enable Nusantara to sequester significant amounts of carbon, on the order of 30 tCO2/ha/ year. Farmers will need support to transition to regenerative agriculture farming systems. Priority should be given to investing in tree crops that will help address the food security needs of the 2 million people in Nusantara and improve household income.

All agriculture waste should be converted to biochar and used as a soil ameliorant to improve soil fertility and store carbon in an inert form. Agriculture waste includes poultry and livestock manure, crop residues, and other agriculture waste products. Centrally located biochar facilities can be developed through PPP arrangements with farming communities.





5 | Nusantara as A Climate Resilient City

Nusantara strives to be a climate-resilient city. **This will be achieved through economic resilience, social and livelihood resilience, as well as ecosystem and landscape resilience.** Special attention will be paid to food security and the risk of droughts, fires, floods, and illegal land use. Along with the growth of new cities in Nusantara, by 2045, adaptation efforts can reduce the risk to the projected maximum population of 1.9 million people. Adaptation efforts are expected to encourage the people of Nusantara to survive, adapt, and transform towards a climate-resilient Nusantara.

Climate change poses increasing risks to people's lives and will contribute to ecosystem degradation in Nusantara and the surrounding region to all aspects of life, both the environment and society. Hydrometeorological anomalies contribute to natural disasters and impact health, agriculture, and livelihoods. Temperatures and rainfalls in Ibu Kota Nusantara are predicted to continue to rise and threaten climate risk (disasters, health, and environmental impact).

Risks	Action
Fire	1. Establish local policy and regulations applied to the Nusantara jurisdiction; 2. Develop fire prevention and mitigation strategy, guidelines, and protocols; 3. Raise awareness, educate, and train internally the NCCA staff and contractors, among local businesses and private sector, and among local communities for fire prevention and mitigation; 4. Establish a multi-stakeholder forum on fire management; 5. Acquire, maintain, and use sufficient devices to monitor leading indicators that can show fire risks; 6. Consolidate all fire-related indicators into a digital platform to allow for monitoring and early warning of an increased risk; 7. Acquire devices to mitigate fires; 8. Train fire brigades; 9. Provide sufficient budget to prevent and mitigate fire occurrences with simple mobilization procedures.
Flood and Drought	1. Apply Nature Based Solutions in water management; 2. Develop the flood and landslide early warning systems are a part of the smart city concept. Also included are adequate monitoring of discharge and water levels, signs of flood and landslide risk, emergency action plans, and river boundary arrangements; 3. Efforts to reduce disaster risks to the community are carried out through the inclusive development of community preparedness capacity; 4. Mainstreams the issue of climate change as part of developing spatial plans; 5. Forest reforestation, a process to maintain land cover, ecosystems, and green corridors increases the infiltration of rainwater into the soil; 6. Planning for an integrated and sustainable water supply system is part of efforts to reduce the impact of drought in Nusantara.
Food Security	Developing plant-based food production and by being responsive to innovations in health and wellness trends, focusing on vegetable proteins, herbs, nutrients, and plant extracts as the adaptation plants may fill the basic needs of the community in Nusantara.
Health	1. Provide access to quality and equitable health; 2. Develop a cost-effective and best-in-class pharmaceutical industry; 3. Develop strategy is to support the better delivery of medicines to meet domestic demand which in turn strengthens health resilience, and the healthcare system, including preparedness for handling pandemics and disasters.

6 Nusantara as A Nature Positive City – The Link Between Climate and Biodiversity

Indonesia is one of the most biologically diverse nations on Earth.

12%
of the world's mammals
(515 species)

16%
of the world's reptiles
(781 species)

35 species
of primates

Nusantara is located in East Kalimantan on the island of Borneo and is part of the Sundaland biogeographic zone which is considered one of the richest biodiversity hotspots on Earth. The island has a highly diverse and abundant terrestrial and marine flora and fauna, both in terms of species richness and population size.

Biodiversity Richness in Nusantara

10,000 to 15,000
SPECIES OF FLOWERING PLANTS

3,000
SPECIES OF TREES

> 2,000
ORCHIDS

1,000
FERNS

25
MAMMALS
such as the Bornean Orangutan, Proboscis Monkey, and the (Endangered) Irrawaddy dolphin, which are found in and around Balikpapan Bay.

Indonesia is an early signatory to the Convention on Biological Diversity (CBD), and has made significant commitments to protect its rich biodiversity and contribute to global environmental conservation efforts. Biodiversity and habitat conservation are intrinsically linked with Nusantara's climate resilience and net zero target.

In line with national and International commitments, the Government of Indonesian issued Presidential Instruction Number 1 (January 2023) on Mainstreaming Biodiversity Conservation in Sustainable Development.

> The Nusantara Capital Authority is **one of the first authorities in Indonesia to prepare a Biodiversity Management Master Plan** which embodies global (Global Biodiversity Framework) and **national goals and objectives for protection and management of biodiversity.**

The vision of the **Nusantara Biodiversity Master Plan** is to realize a sustainable forest-city development that contributes to global biodiversity conservation goals. The objective is to provide the direction and strategy for biodiversity management in a structured, systematic, and measurable way that can be implemented realistically and effectively.

Nusantara, is envisioned to be a Smart Forest City with low carbon emissions. Nusantara also has the **"65x30" Biodiversity target** (65% of its area as a protected area in 2030, even earlier). **It is beyond the Global Biodiversity Framework "30x30".**

Nusantara's aim to rehabilitate, conserve and protect biodiversity in terrestrial and marine ecosystems, will produce co-benefits beyond increasing carbon stocks and reducing emissions:

Nusantara, as a Forest City, will aim to maximize forest areas providing homes to diverse animal and plant species. Forest areas will be linked by wildlife corridors ensuring ecological connectivity and strengthening biodiversity.

Forests also provide hydrological functions maintaining water catchments, reducing erosion, flood risks and water retention and storage capacity. Increasing forest cover will increase water catchment capacity and water security for Nusantara and reduce climate related flood risks.

Involving indigenous and local communities in reforestation and forest stewardship programmes both increases their capacity and awareness of the benefits of maintaining a biodiverse environment, ensures their knowledge and practices are valued and integrated into the conservation efforts, generates sustainable income that is not reliant on destructive deforestation and mining activities, and ensures that forests are safeguarded and maintained by communities.

7 Monitoring System

The progress of efforts towards achieving net zero emission and improving Nusantara's climate resilience will be monitored both locally by the Nusantara Capital Authority and by the central government. A dashboard will be built in Nusantara Capital Authority showing actions/achievements to meet emission limits and reductions, as well as other key indicators. As part of the adaptation and Disaster Risk Management strategy, key climate indicators such as air, temperature, humidity, rainfall, wind direction and speed, will be monitored, and will be cross checked against potential resulting increase to the threat of fires, droughts, and flooding.

The information on performance and achievements of the RLDC will be monitored and publicly reported regionally and locally using an approach and methodology consistent with those prevailed nationally and internationally, to and through the national government, especially through the National Registry System (Sistem Registri Nasional, SRN) as a part of its "One GHG Data Policy"

8 Just Transition

When it is completely constructed and inhabited, Nusantara has the potential to be a model for Indonesia's sustainable, low-carbon, and climate resilient development. Transitioning from a carbon-intensive economy such as that in Indonesia to sustainable and renewable-based development is necessary to avoid worsening the climate crisis. When it becomes a fully functional city, it will not only be a liveable city, but also lovable.

The extra emphasis on the use of renewables will develop the industrial ecosystem for renewable energy productions either for domestic use or to fulfill export markets. This will further develop the industrial capability to support renewable energy ecosystems domestically and internationally. In addition to renewable ecosystem development, Nusantara will also develop other high-value-added industries to move away from resource-based economies, especially the non-renewable ones.

Nusantara will facilitate transition and reorientation of the economy in East Kalimantan as the largest producer of coal. East Kalimantan has been greatly dependent on fossil fuel production. It is the largest coal-producing province in Indonesia and among the largest oil and gas-producing provinces in Indonesia. As such, global and nationwide energy transition will affect the economy of East Kalimantan. The transition may have unintended consequences that are not fairly distributed and some people will be victimized more than others.

Phasing out of coal-fired steam power plants will also reduce, even eliminate, the demand for coal that eventually will reduce coal productions. The people currently working in coal-fired steam power plants and those in coal mines will have their jobs eliminated in the future. Areas with strong dependence on coal production will also be negatively affected. Moreover, areas that contain substantial deposits of materials that are needed in the renewable energy ecosystem may also be affected by the sudden rush to mine these materials. These unintended consequences need to be addressed properly and comprehensively. **Establishing Nusantara in the fossil fuel-rich region, therefore, is a strategic direction for nationwide regionally just energy transition.**

There may be unintended consequences in the development of Nusantara, but they should not victimize local and marginalized communities.

150,000

local communities have settled in the area before the site to build Nusantara was established.

These people may be affected by the development of Nusantara. Development of new settlements, public amenities, even new protected forests may lead to their relocation. Whenever relocation is unavoidable, it needs to be carried out as amicable and with free and prior informed consent while providing sufficient benefits. This may not be easy. The more ambitious Enhanced scenario recommends minimizing relocation, if not avoiding it all together.

9 Financing Scheme

For the overall development of Nusantara, the government of Indonesia has committed to fund approximately 20% of the total investment cost and is seeking investment from the non-governmental and private sector to cover the remaining 80%.

For this reason, funding will be required from non-governmental sources such as:

- **Domestic and foreign private investment**
- **Banking funding**
- **Market-based public funding such as debt securities**
- **Multilateral and bilateral funding**
- **Domestic and foreign philanthropy**
- **Climate-specific finance**
- **Ecosystem service markets such as domestic and international carbon markets.**
  For example, Nusantara is currently developing climate financing through a Forest Carbon Project.

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https://ikn.go.id/NetZeroNusantara