Commonwealth of the Northern Mariana Islands

Priority Climate Action Plan

April 15, 2024

Prepared by the Climate Policy & Planning Program
Office of the Governor

CNMI GREEN
GROWTH
INITIATIVE

EPA

Acknowledgments

Key Definitions

Carbon sequestration – the process of storing carbon and reducing the amount of carbon dioxide in the atmosphere.

Comprehensive Climate Action Plan (CCAP) – a narrative report that provides an overview of significant GHG sources/sinks and sectors, establishes near-term and long-term GHG emission reduction goals, and provides strategies and identifies measures that address the highest priority sectors to meet those goals.

CO_2 – carbon dioxide.

CO_2e – carbon dioxide equivalent emissions, determined by multiplying the emissions of a greenhouse gas such as methane and nitrous oxide by their Global Warming Potential.

Fossil fuels – fuels that are derived from buried pre-historic organic matter, including petroleum products such as gasoline and diesel. Combustion of petroleum products releases greenhouse gases into the atmosphere.

Global Warming Potential – conversion factor developed to allow comparisons of the global warming impacts of different greenhouse gases to carbon dioxide equivalents.

Greenhouse gases (GHG) – gases that trap heat in the atmosphere, such as carbon dioxide, methane, nitrous oxide, and fluorinated gases, and contribute to the warming of the planet.

Greenhouse Gas Inventory – a list of greenhouse gas emission sources and sinks, and the associated emissions quantified using standard methods.

kWh – kilowatt-hour.

Mobile combustion – the combustion of fuel to power a moving vehicle, vessel, or aircraft.

MWh – megawatt-hour.

MT CO2e – metric ton of carbon dioxide equivalent, the standard unit of measurement for greenhouse gas emissions.

Priority Climate Action Plan (PCAP) – a narrative report that includes a focused list of near-term, high-priority, and implementation-ready measures to reduce GHG pollution and an analysis of GHG emissions reductions.

Stationary combustion – the on-site combustion of fuel to produce electricity, heat, or motive power using equipment in a fixed location.

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Executive Summary

This Priority Climate Action Plan (PCAP) aims to help the government and citizens of the Commonwealth of the Northern Mariana Islands (CNMI) better understand current and future greenhouse gas (GHG) emissions, identify priority actions to reduce these emissions as well as deliver other benefits, and engage a diversity of community stakeholders in the emissions reduction planning process. The PCAP includes near-term priority GHG reduction measures for which the departments, offices, agencies, and municipalities of the CNMI government intend to seek funding to implement.

Through a Climate Pollution Reduction Grant (CPRG) planning award provided by the U.S. Environmental Protection Agency (EPA), the Office of the Governor's Climate Policy and Planning (CPP) Program led the preparation of this PCAP, and consulted with departments and offices across the three branches of government, autonomous agencies, municipalities of Saipan, Rota, Tinian, and the Northern Islands, and other community stakeholders to identify priority GHG reduction measures for the CNMI. The CPP Program additionally worked with the National Renewable Energy Laboratory (NREL) to develop the CNMI's first GHG inventory for the following priority sectors:

    1) Electricity generation (stationary combustion);

    2) Transportation (mobile combustion);

    3) Solid waste;

    4) Wastewater treatment; and

    5) Carbon sequestration.

NREL also provided technical assistance in estimating quantified emission reductions for priority measures listed in this PCAP.

The CNMI's annual gross greenhouse gas emissions are estimated at 443,167 MT CO_2e, with electric power generation (224,574 MT CO_2e, or 51%) and transportation (212,788 MT CO_2e, or 48%) together accounting for 99% of emissions. The priority measures and specific actions identified in this PCAP focus on reducing emissions from these sectors. The GHG inventory also considers the impact of carbon sinks based on available CNMI forestry data: forests offset carbon emissions by almost half, or 45% (-199,228 MT CO_2e), resulting in net carbon emissions of 243,939 MT CO_2e for CNMI priority sectors. This PCAP includes measures and specific actions to enhance terrestrial as well as marine ecosystems that provide carbon sequestration benefits.

This PCAP will inform the CNMI's Comprehensive Climate Action Plan (CCAP), which is due at the close of the CPRG planning grant, or by September 2027. The CCAP will review all sectors that are significant GHG sources or sinks and include both near- and long-term GHG emission reduction goals and strategies.

1 Introduction

As in other small island communities, the damaging effects of the climate crisis are acutely felt in the CNMI. Rising sea levels, hotter weather, stronger typhoons, dying coral reefs, and threats to fresh water and infrastructure are among the impacts to the CNMI of a warming climate. The climate crisis affects human health as well, and places vulnerable communities, such as the elderly, the young, the economically disadvantaged, and people with disabilities at greater risk of harm.[1]

Human activities, such as the burning of fossil fuels to generate electricity and transport people and goods, produce carbon dioxide and other greenhouse gases that contribute to the warming of the planet and the resulting disruptions to natural and social systems. The CNMI's current near-total dependence on fossil fuels to power the local economy presents opportunities to significantly reduce emissions and improve air quality, transition to cleaner sources of energy, increase energy security and climate resiliency, create good jobs for residents, and enhance natural systems that serve as carbon sinks.

This PCAP examines these opportunities in the following key sectors:

> 1) Electricity generation (stationary combustion);
>
> 2) Transportation (mobile combustion);
>
> 3) Solid waste;
>
> 4) Wastewater treatment; and
>
> 5) Carbon sequestration.

This PCAP provides a greenhouse gas (GHG) inventory that covers these priority sectors using available CNMI data, and identifies near-term, high-impact measures to reduce GHG emissions and enhance carbon sinks in the CNMI. For each priority measure this PCAP also includes an analysis of benefits and a review of implementation authority.

1.1 About the CNMI

The CNMI is a United States territory comprised of 14 tropical islands in the Western Pacific, located approximately 50 miles north of the U.S. territory of Guam, 3900 miles east of Hawaii, and 1500 miles south of Japan (Figure 1). Three of the 14 islands are permanently

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[1] Climate Change in the Commonwealth of the Northern Mariana Islands: Indicators and Considerations for Key Sectors. Prepared by Zena Grecni, Erin M. Derrington, Robbie Greene, Wendy Miles, and Victoria Keener. Report for the Pacific Islands Regional Climate Assessment. East-West Center, 2021. Available at https://www.eastwestcenter.org/publications/climate-change-in-the-commonwealth-the-northern-mariana-islands-indicators-and.

inhabited: Saipan, Tinian, and Rota. According to the 2020 census, 47,329 people reside in the CNMI. Most economic activities occur on Saipan, the commonwealth's largest and most populous island with a total land area of approximately 45 square miles and 43,385 residents, or 92% of the total. Tinian has a population of 2,044 residents, and Rota's population is 1,893. The 11 islands north of Saipan are collectively known as the Northern Islands and are mostly uninhabited with little to no infrastructure. Three of the Northern Islands have a small and transient population, with 7 residents recorded in the 2020 census.[2]
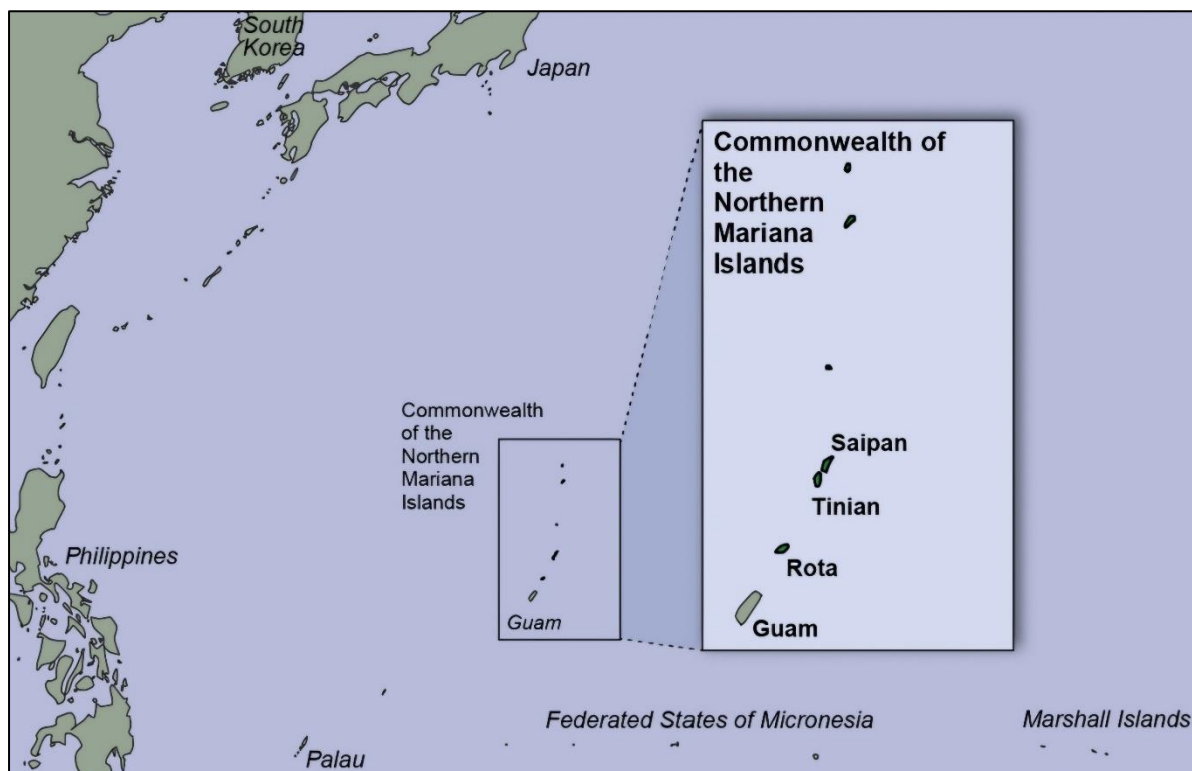
Figure 1. Map of the CNMI. (Source: U.S. Government Accountability Office, available at https://www.gao.gov/products/gao-22-105271)

The CNMI's population is diverse, with most residents being of indigenous Chamorro, indigenous Carolinian, or Filipino descent. According to the 2020 census, the islands' population declined more than 12% from nearly 54,000 in 2010, primarily because of outmigration. Approximately 38% of the population had income below poverty levels and 20% of households received nutrition assistance benefits. Among those 16 and older in the civilian workforce, 14% were unemployed.[3]

Tourism is the CNMI's primary economic industry, with most visitor arrivals from Asian source markets. The industry was severely impacted by the Covid-19 pandemic in 2020, which followed multiple major typhoon disasters in the CNMI in 2015 and 2018. The CNMI's real gross domestic product dropped 29.7% in 2020 after decreasing 11.3% in 2019, reflecting declines in visitor spending, private sector construction activity, personal consumption

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[2] 2020 Island Areas Census for the Commonwealth of the Northern Mariana Islands. U.S. Census Bureau. Available at https://www.census.gov/data/tables/2020/dec/2020-commonwealth-northern-mariana-islands.html.
[3] Ibid.

expenditures, and government spending.[4] Economic recovery has been slow but is expected to improve over the next five years with anticipated increases in flights and visitors to the CNMI, destination enhancement projects, infrastructure development, military activities, and construction.

The CNMI imports petroleum products to meet almost all its energy needs. Diesel fuel is imported for electric power generation; gasoline and diesel are imported for land and marine transportation; and aviation fuel is imported to supply aircraft at three international airports on Saipan, Tinian, and Rota. For restaurants and household cooking, the CNMI imports butane and propane. The local economy is acutely sensitive to global and regional price volatility in the oil markets.[5]

1.2 The Climate Pollution Reduction Grants

Established by the 2022 Inflation Reduction Act, EPA's Climate Pollution Reduction Grants (CPRG) Program aims to achieve several broad objectives:

- Tackle damaging climate pollution while creating good jobs and reducing energy costs for families;
- Accelerate work to address environmental injustices and advance locally-driven solutions in overburdened communities; and
- Deliver cleaner air by reducing harmful air pollution.

The CPRG Program provides grants in two phases. The first is the planning phase, to help territories, tribes, local governments, and states to develop and expand climate action plans to reduce GHG emissions. The Inflation Reduction Act provides $250M in noncompetitive planning grants for eligible government entities, with a $2M set-aside for four U.S. territories. The Office of the Governor is the CNMI's lead organization for the CPRG planning grant.

The second phase is implementation; this phase is competitive. EPA is awarding grants to eligible government entities to implement near-term, high-impact measures from the GHG reduction plans developed with CPRG planning grants. The Inflation Reduction Act provides $4.6B for implementation grants. EPA has set aside $300M for implementation grants for the territories and tribes competition.

1.3 The Priority Climate Action Plan

The PCAP is the first deliverable due under the CPRG planning grant, and provides a simplified inventory of GHG emissions, and near-term, high-impact, priority GHG reduction measures. This PCAP aims to help the government and citizens of the CNMI better understand current

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[4] GDP for the Commonwealth of the Northern Mariana Islands, 2020. Bureau of Economic Analysis. Available at https://www.bea.gov/news/2023/gross-domestic-product-commonwealth-northern-mariana-islands-2020.
[5] Territory Energy Security Plan: Commonwealth of the Northern Mariana Islands. Prepared by Heidi Applegate, Eliza Hotchkiss, Erik Ness, and Andrew Kim under the direction of the CNMI Energy Security Plan Working Group. September 2023 (final draft).

and future greenhouse gas (GHG) emissions, identify priority measures to reduce these emissions and gain other potential benefits, and engage diverse stakeholders in emissions reduction planning and implementation across multiple important sectors.

The scope of this PCAP covers priority GHG emissions reduction measures for the CNMI from 2025 – 2030. This PCAP will inform and provide a foundation for the CNMI's Comprehensive Climate Action Plan (CCAP), which is due at the close of the CPRG planning grant, or by September 2027. The CCAP will review all sectors that are significant GHG sources or sinks and include both near- and long-term GHG emission reduction goals and strategies.

2 PCAP Coordination and Engagement

Through a CPRG planning grant, the Office of the Governor's Climate Policy and Planning (CPP) Program[6] led the preparation of this PCAP and consulted with departments and offices across the three branches of government, autonomous agencies, and municipalities of Saipan, Rota, Tinian, and the Northern Islands, as well as other community stakeholders to share information about the CPRG program and CNMI emissions data, and to identify priority GHG reduction measures.

2.1 Interagency and Intergovernmental Coordination

Between November 2023 and April 2024, the CPP Program held both in-person and virtual outreach and planning meetings with numerous government partners across Saipan, Tinian, Rota, and the Northern Islands, including:

Bureau of Environmental and Coastal Quality
Commonwealth Healthcare Corporation
Commonwealth Office of Transit Authority
Commonwealth Ports Authority
Commonwealth Utilities Corporation
Council on Developmental Disabilities
Department of Community and Cultural Affairs
Department of Corrections
Department of Finance
Department of Fire and Emergency Medical Services
Department of Labor
Department of Lands and Natural Resources
Department of Public Lands
Department of Public Safety

Department of Public Works
Joeten Kiyu Public Library
Judiciary
Legislature
Marianas Visitors Authority
Northern Islands Mayor's Office
Northern Marianas College
Northern Marianas Technical Institute
Office of Grants Management
Office of Planning and Development
Public School System
Rota Mayor's Office
Saipan Mayor's Office
Tinian Mayor's Office

The CPP Program also presented on the Climate Pollution Reduction Grant and PCAP planning process at the Office of Planning and Development's multi-agency All-Planners Task Forces quarterly meeting and a Department of Public Lands annual workshop in December 2023, and regularly briefed the Governor and Cabinet Members on PCAP and CPRG program updates. An online survey soliciting feedback on priority climate action measures was distributed to the government partners that participated in PCAP planning meetings; 43 responses were received from 33 departments, offices, agencies, and programs. The CPP Program presented the preliminary GHG inventory results, proposed priority GHG emission

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[6] In September 2023, Governor Arnold I. Palacios established the Climate Policy and Planning Program in the Office of the Governor through Directive 2023-008.

reduction measures, and proposed implementation approach to government partners in hybrid virtual and in-person meetings at the Governor's Office on April 5 and April 9, 2024.

The CPP Program additionally worked with the National Renewable Energy Laboratory (NREL) to develop the CNMI's first GHG inventory covering priority sectors in electricity generation (stationary combustion), transportation (mobile combustion), wastewater treatment, solid waste, and carbon sequestration. The CPP Program worked closely with NREL and CNMI government partners to gather data necessary for the GHG inventory analysis. NREL was also enlisted to assist the CNMI in developing quantified emission reductions estimates for the priority measures listed in this PCAP.

2.2 Public and Stakeholder Engagement

The CPP Program engaged with the public and other community stakeholders through local news media, social media, and public presentations. The Governor's creation of the CPP Program through Directive 2023-008 made local headlines[7], and news coverage included details of the CPRG Program and the PCAP planning process. In December 2023, local media also covered a presentation on the CPRG program at the general membership meeting of the Saipan Chamber of Commerce.[8]

In early January, the CPP Program began hosting a Micronesia Challenge Young Champions climate intern from the Northern Marianas College to assist in CPRG community outreach and planning efforts. The intern developed graphics for flyers, participated in stakeholder meetings, and presented at community events including the Northern Marianas Humanities Council's "Chat and Chesa: Climate Change in the CNMI" in February 27, 2024 and the Bureau of Environmental and Coastal Quality's Environmental Expo on April 10, 2024.

On January 26, 2024, the Governor and Northern Marianas College (NMC) President jointly launched the CNMI Green Growth Initiative, to coordinate and advance the CNMI's sustainable development goals (SDGs), including goals for climate action and clean energy. The Governor's Directive 2024-06 established the Green Growth Initiative, designated NMC as the CNMI's Green Growth Hub, and named the CPP Special Assistant and NMC's Dean for Cooperative Research Education and Extension Services as co-chairs of the Green Growth Working Group.

On March 26-27, 2024, government, nonprofit organizations, business sector representatives, and other community members gathered for the first CNMI Green Growth workshop to begin drafting a strategic action framework that identifies cross-cutting thematic areas and priority SDGs, near-term and long-term objectives, action leads, and metrics for tracking progress.

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[7] Sablan named special assistant for newly established climate program. By Ferdie de la Torre. Saipan Tribune. October 26, 2023. Available at https://www.saipantribune.com/news/local/sablan-named-special-assistant-for-newly-established-climate-program/article_3f09164e-7304-11ee-8fe5-274a58e0c124.html.

[8] Local climate change efforts ramp up. By Chrystal Marino. Saipan Tribune. December 7, 2023. Available at https://www.saipantribune.com/news/local/local-climate-change-efforts-ramp-up/article_69dc6bd8-9428-11ee-98be-879aea37b077.html.

From late March to early April 2024, the CPP Program conducted a survey of the hotel sector to identify which hotels were operating mostly or entirely off-grid using their own diesel generators. All 13 hotel members of the Hotel Association of the Northern Mariana Islands and several non-members responded. Three hotels reported that they self-generated electricity and provided diesel consumption information that was added to the GHG inventory.

On April 11, 2024 the CPP Program conducted a hybrid virtual and in-person public presentation on the CNMI's GHG inventory for key sectors and proposed priority actions to reduce emissions and provide benefits to communities. A press release and event flyers were issued ahead of the event and covered in local news media and social media. Titled "Our Green Future," the presentation was held in the evening and delivered online and in person at the American Memorial Park Visitor Center on Saipan. The presentation was followed by discussion and a question-and-answer session. Approximately 25 people attended the public meeting, including community leaders and members of the press.

On April 15, 2024, Governor Palacios signed a Blue Planet Alliance Climate Agreement, joining the CNMI with other island communities in the Blue Planet Alliance in committing to achieving 100% renewable energy by 2045. The CPP Program worked with the Blue Planet Alliance, NMC, government partners, and other CNMI Green Growth stakeholders to coordinate the signing ceremony and a community workshop on the CNMI's transition to 100% renewable energy.

2.3 Special Considerations

This PCAP draws upon existing plans and strategies relevant to climate action, clean energy, and sustainable development in the CNMI and considers CNMI-specific factors that affected PCAP development and implementation. These include:

1) The CNMI Comprehensive Sustainable Development Plan 2021 – 2030, which adopts the United Nations Sustainable Development Goals (SDGs) as a framework, including SDGs for climate action and clean and affordable energy;
2) The CNMI Green Growth Initiative, a public-private partnership led by the Northern Marianas College and the Office of the Governor, to propel locally developed SDGs into concrete actions;
3) The CNMI's declared goal of 100% renewable energy by 2045 and Memorandum of Agreement with the Blue Planet Alliance;
4) The CNMI 2023 Strategic Energy Plan;
5) The Territory Energy Security Plan for the CNMI (September 2023 draft);
6) The CNMI Guidance Manual for Smart, Safe Growth;
7) The CNMI's Comprehensive Solid Waste Management Plan (October 2023 draft);
8) Limited availability of land suitable for renewable energy installation;
9) Limited availability of reliable data and applicability of certain tools for the CNMI to aid in emissions inventories, planning, and analyses; and
10) Workforce capacity needs to meet the CNMI's climate action and clean energy goals.

2.4 PCAP Elements

This PCAP includes the following key elements:

1) **GHG Inventory** - analyzing the CNMI's existing GHG emissions from priority sectors.

2) **Priority GHG Reduction Measures** – describing proposed priority measures and actions to reduce GHG emissions and achieve the CNMI's sustainable development goals.

3) **Benefits Analysis** – identifying potential benefits of GHG emission reduction measures.

4) **Review of Authority to Implement** – summarizing authority to implement priority GHG emission reduction measures, and milestones for obtaining authority where relevant.

This PCAP sets forth six Priority GHG Reduction Measures:

- Measure 1: Green Electric Power;
- Measure 2: Green Buildings and Infrastructure;
- Measure 3: Green Transportation;
- Measure 4: Green Materials Management and Waste Reduction;
- Measure 5: Green Spaces and Carbon Removal; and
- Measure 6: Green Workforce.

Each priority measure includes a summary description and provides specific priority actions, implementing agencies, applicable sectors, implementation schedules and milestones, and metrics for tracking progress.

3 Greenhouse Gas Inventory

A priority GHG Inventory is a critical element of this PCAP, and a requirement of the CPRG planning grant. The Climate Policy and Planning Program worked closely with CNMI government entities and the National Renewable Energy Laboratory to identify key sectors and gather available data necessary to calculate estimated GHG emissions within the CNMI's territorial boundaries.

The priority GHG Inventory for the CNMI was created using EPA's Local Greenhouse Gas Inventory Tool (LGGIT) and existing available data for key sectors. The key sectors identified by the CPP Program include Electricity Generation (Stationary Combustion), Transportation (Mobile Combustion), Solid Waste, Wastewater Treatment, and Carbon Sequestration. The gross GHG emissions estimated for these priority sectors are summarized in Table 1 and graphed in Figure 2.

The base year selected for this inventory is 2023. This is the first GHG emissions inventory developed for the CNMI, and 2023 is the year that most existing data were timely available and accessible. Moreover, emissions patterns in 2023 are expected to be more representative for the CNMI compared to the years immediately following the outbreak of the Covid-19 pandemic in 2020 when economic activities drastically declined.

CNMI's annual gross GHG emissions are estimated at 443,167 MT CO_2e, with electricity generation (224,574 MT CO_2e, or 51%) and transportation (212,788 MT CO_2e, or 48%) together accounting for 99% of emissions. Wastewater treatment accounts for 1% of total gross emissions, or 5,428 MT CO_2e, and solid waste is less than 1%, or 377 MT CO_2e.

Priority Sector	Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)	Percent of Total
Electricity Generation (stationary combustion)	224,574	51%
Transportation (mobile combustion from road vehicles, marine vessels, and aviation)	212,788	48%
Wastewater Treatment	5,428	<1%
Solid Waste	377	1%
Subtotal Gross Emissions of Priority Sectors for PCAP	**443,167**	**100%**
Forestry Carbon Sequestration	*-199,228*	*-45%*
Subtotal Net Emissions of Priority Sectors for PCAP	***243,939***	***55%***

Table 1. Estimated GHG emissions by priority sector, in metric tons of carbon dioxide equivalent (MT CO_2e). Percent of total means each sector's contribution to gross GHG emissions.
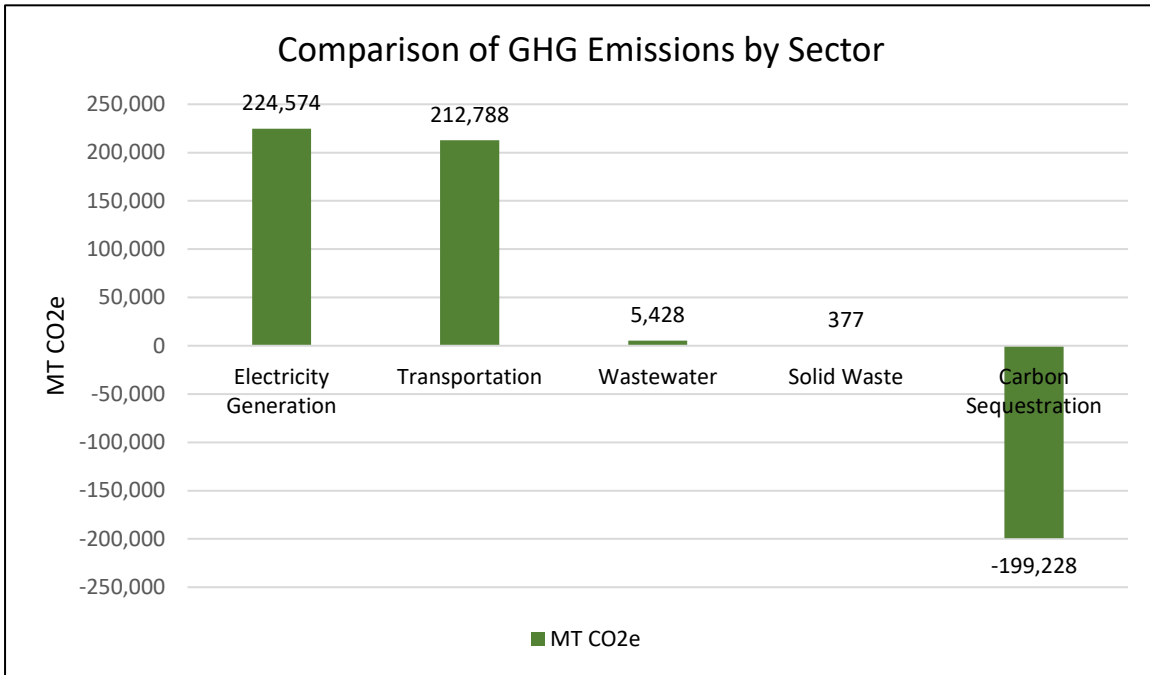
Figure 2. Comparison of GHG emissions by sector, in MT CO$_2$e.

The priority GHG inventory also considers carbon sequestration from forestry. In 2023, 60,207 acres of forested land[9] offset the CNMI's carbon emissions by nearly half, or 45% (-199,228 MT CO$_2$e). Thus, net GHG emissions for CNMI priority sectors are estimated at 243,939 MT CO$_2$e.

Emissions estimates for each priority source sector are further broken down by greenhouse gas type: carbon dioxide (CO$_2$), methane (CH$_4$), and nitrous oxide (N$_2$O). Table 2 provides a more detailed summary of the greenhouse gases produced by each priority sector.

Priority Sector	(MT CO$_2$e)			
	CO$_2$	CH$_4$	N$_2$0	Total
Electricity Generation (stationary combustion)	223,840	254	480	224,574
Transportation (mobile combustion from road vehicles, marine vessels, and aviation)	208,028	1,155	3,605	212,788
Wastewater Treatment	--	4,783	645	5,428
Solid Waste	--	377	--	377
Subtotal Gross Emissions of Priority Sectors for PCAP	431,868	6,568	4,730	443,167
Forestry Carbon Sequestration	*(199,228)*			*(199,228)*
Subtotal Net Emissions of Priority Sectors for PCAP	*232,640*	*6,658*	*4730*	*243,939*

Table 2. Detailed GHG emissions by sector and gas, in MT CO2e.

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[9] CNMI State and Private Forestry Fact Sheet. Northern Mariana Islands 2024. Available at https://apps.fs.usda.gov/nicportal/temppdf/sfs/naweb/MP_std.pdf.

For the electricity generation sector, the CNMI's largest source of emissions, the GHG inventory includes emissions from the Commonwealth Utilities Corporation, the Marpi landfill on Saipan, and three Saipan hotels that primarily generate their own electricity on-site.

These emissions from electricity generation can be disaggregated by the CNMI's three main CNMI islands based on 2020 Census population data, as follows below and depicted in Figure 3:

- Saipan (92%): **206,542 MT CO$_2$e**
    - CUC: 194,404 MT CO$_2$e
    - Hotels: 12,046 MT CO$_2$e
    - Marpi Landfill: 92 MT CO$_2$e
- Tinian (4.4%): **9,864 MT CO$_2$e**
- Rota (3.6%): **8,167 MT CO$_2$e**

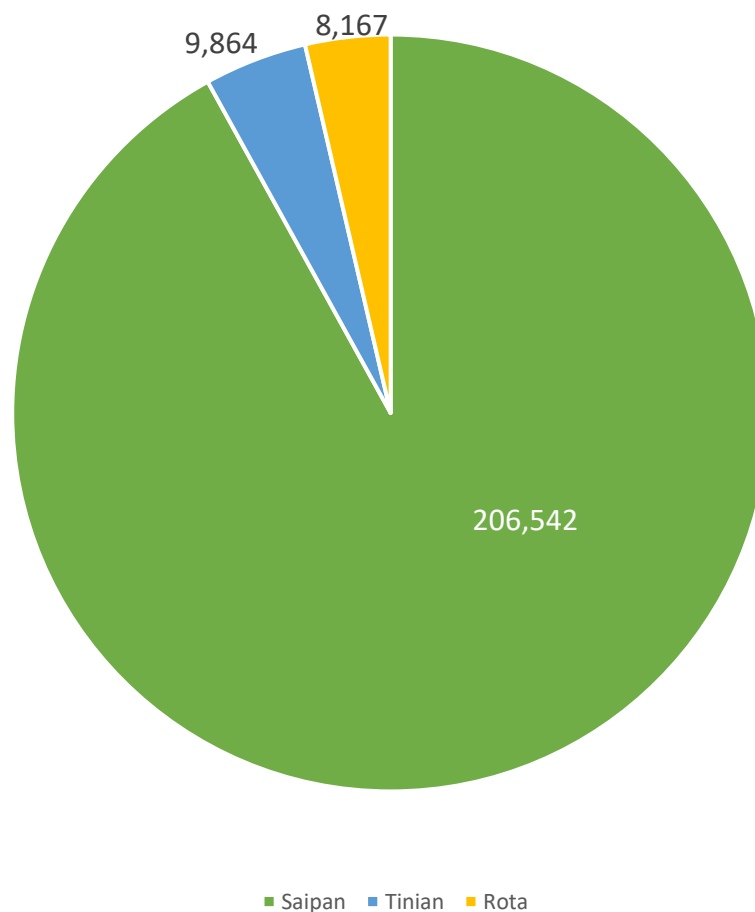## GHG Emissions (MT CO2e) from Electricity Generation by Island

Figure 3. GHG emissions from electricity generation by island, in MT CO2e.

Grid emission factors measure the amount of GHG emissions per unit of electricity generated. Combining the emissions estimates above (for CUC only) with electricity sales data from CUC, an average grid emission factor can be derived as follows:

CNMI Annual Average Grid Emission Factor (2023)

212,435 MT CO_2e / 297,413 MWh = **0.714 MT CO_2e/MWh** *(1,575 lbs. CO_2e/MWh)*

The CNMI average grid emission factor in 2023 can be disaggregated by Saipan, Tinian, and Rota as follows:

- Saipan: 1,590 lbs. CO_2e/MWh
- Tinian: 1,298 lbs. CO_2e/MWh
- Rota: 1,633 lbs. CO_2e/MWh

For comparison and benchmarking, the CNMI grid emission factor is shown below with data points from the U.S. mainland, Hawaii, Puerto Rico, U.S. Virgin Islands, Guam, and American Samoa:

Geographic Location	Annual Average Grid Emission Factors (lbs. CO_2e per MWh)
Commonwealth of the Northern Mariana Islands	1,575
United States*	828
Hawaii*	1,464
Puerto Rico*	1,600
US Virgin Islands – Total**	2,154
US Virgin Islands – STT District**	2,046
US Virgin Islands – STX District**	2,311
Guam**	1,701
American Samoa**	1,457

Table 3. CNMI grid emission factor compared with U.S. mainland, Hawaii, and other islands.

*Source: EPA eGRID 2022
**Preliminary estimate calculated by NREL for EPA CPRG PCAP GHG Emissions Inventory

The CNMI relies almost completely on imported petroleum products for electricity generation and transportation (road, marine, and aviation). In fiscal year 2023 (October 1, 2022 – September 30, 2023), based on excise tax data, CNMI fossil fuel imports included the following:

- Diesel: 28,637,575 gallons
- Gasoline: 10,323,416 gallons
- Aviation fuel: 4,738,497 gallons

For the transportation sector, the CNMI's second-largest source of emissions, emissions estimates were based on volumes of fuel imported, subtracting the diesel volumes consumed by CUC (20,595,530 gallons in 2023) and the three self-generating Saipan hotels (1,176,000 gallons annually). Diesel volumes for transportation were estimated at 7,026,816 gallons in 2023. Total gasoline volumes imported in 2023 were 10,323,416 gallons and were assumed to supply primarily the transportation sector, both road vehicles and marine vessels. Vehicle

and vessel registration data were only available for Saipan and Rota and were used in calculating estimates for gasoline and diesel consumption volumes by vehicle type and vessels. In 2023, the Department of Public Safety, Bureau of Motor Vehicles' registration data showed the following:

- Saipan: 21,797 vehicles and 377 marine vessels
- Rota: 875 vehicles and 26 vessels

Emissions for transportation fuel use on Tinian were calculated based on gross fuel volumes only.

Gasoline and diesel consumption volumes for the transportation sector can be disaggregated by island based on 2020 Census data as follows below and depicted in Figure 4:

- Saipan (92%)
    - Gasoline: 10,005,574 gallons
    - Diesel: 6,344,375 gallons
- Tinian (4%)
    - Gasoline: 471,393 gallons
    - Diesel: 354,308 gallons
- Rota (4%)
    - Gasoline: 436,569 gallons
    - Diesel: 328,133 gallons

Figure 4. Transportation fuel volumes by island, in gallons.
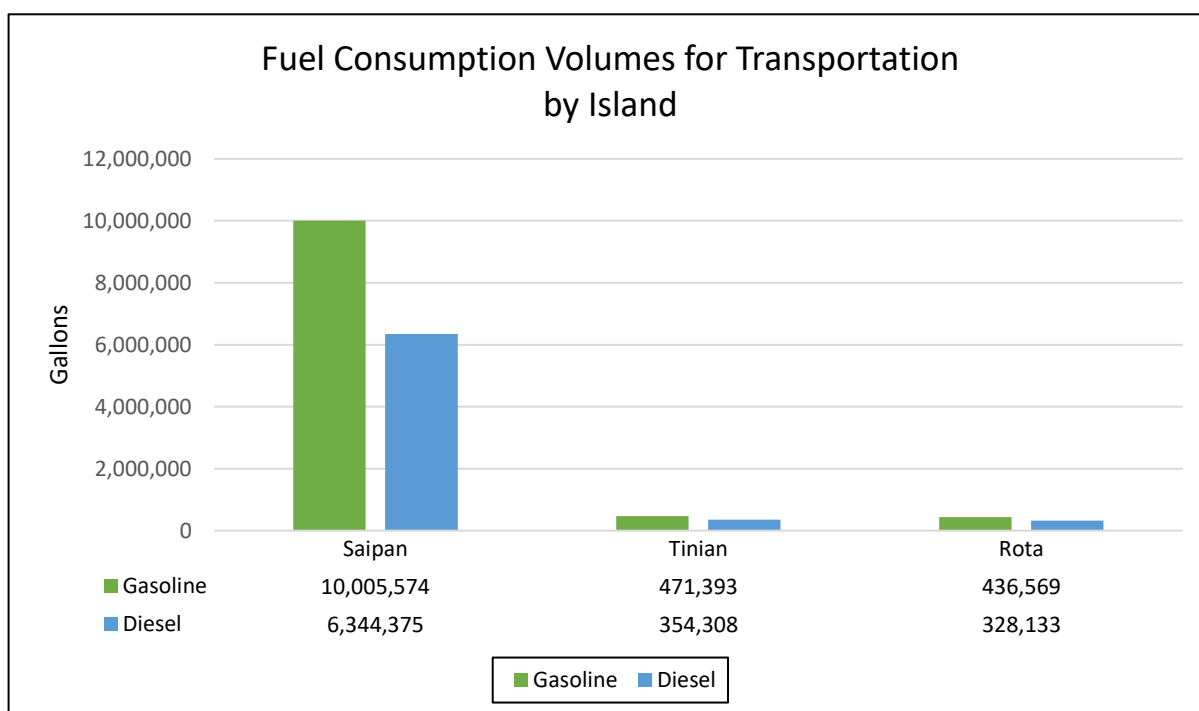
Aviation emissions were based only on overall fuel consumption estimates from import data, and were calculated at 34,877 MT CO_2e, or 16% of total emissions for the transportation sector, and 8% of gross emissions across all priority sectors. Road vehicles and marine vessels generally use the same fuels (diesel and gasoline) and emissions for both were estimated at

177,911 MT CO_2e, or 84% of total emissions for the transportation sector, and 40% of gross emissions across all priority sectors.

For the wastewater treatment sector, estimated emissions were based on data provided by CUC, which operates two wastewater treatment facilities on Saipan. Wastewater is treated in aerobic conditions at both facilities, and there is no anaerobic digestion. The wastewater treatment facilities serve an estimated 30,000 people on Saipan. The rest of Saipan's population, and all of Tinian and Rota, use septic systems: approximately 17,322 people.

Total GHG emissions from the wastewater sector can be disaggregated by gas type as follows:

- Methane (from septic systems on Saipan, Tinian, and Rota): 4,783 MT CO_2e
- Nitrous oxide (from Saipan's wastewater treatment plants): 645 MT CO_2e

For the solid waste sector, methane emissions estimates were based on data provided in the draft CNMI Comprehensive Solid Waste Management Plan[10] and by the Department of Public Works, Division of Solid Waste Management. Only the Marpi landfill on Saipan is lined and operated in compliance with the federal Resources Conservation and Recovery Act (RCRA). Rota and Tinian have non-compliant open dumpsites. There are no landfill gas collection systems anywhere in the CNMI.

Scaled solid waste data were available only for Saipan. In 2023, the Marpi landfill on Saipan received 21,265 tons of solid waste, down from the previous year's volume at 31,431 tons. For Tinian and Rota, solid waste tonnage is estimated based on population and the average per capita generation rate on Saipan. Tinian is estimated to generate 1,400 tons per year; Rota is estimated to generate 1,300 tons per year.

Estimated methane emissions data for the solid waste sector can be disaggregated by island as follows:

- Saipan: 345 MT CO_2e
- Tinian 17 MT CO_2e
- Rota: 15 MT CO_2e

Additional background notes prepared by NREL on the data and assumptions applied in developing this priority GHG inventory are included in Appendix A.

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[10] Comprehensive Integrated Solid Waste Management Plan for the Commonwealth of the Northern Mariana Islands (draft). Prepared by the Office of Planning and Development, in coordination with the Department of Public Works, Offices of the Mayors, the Bureau of Environmental and Coastal Quality, and EPA. October 2023. Available at https://opd.gov.mp/ciswmp.html.

4 GHG Reduction Measures

The priority GHG reduction measures set forth in this PCAP are based on GHG emissions information, informed by stakeholder input, and focused on achieving the most significant GHG reductions possible while considering other relevant planning goals.

The CNMI's priority GHG emission reduction measures cover six key areas:

1) Green Electric Power;
2) Green Buildings and Infrastructure;
3) Green Transportation;
4) Green Materials Management and Waste Reduction;
5) Green Spaces and Carbon Removal; and
6) Green Workforce.

Potential emission reductions in these proposed measures are not binding mandates, but rather opportunities for the CNMI to achieve its climate and clean energy goals. The CNMI's ability to achieve these goals will depend on numerous factors, including funding, available land, infrastructure development, supply chains, workforce and contractor capacity, consumer adoption, and cost and accessibility of renewable energy technology.

Measure 1: Green Electric Power

The CNMI is almost entirely dependent on diesel fuel to generate electricity, with diesel providing more than 99% of CUC's power generation.[11] The priority GHG inventory identifies the electric power generation sector as the largest source of GHG emissions, accounting for more than half (51%) of emissions across key sectors. Electricity generation from diesel is also a significant source of criteria air pollutants that impact human health.

The Commonwealth Utilities Corporation (CUC) is a semi-autonomous public corporation governed by a board of directors that is appointed by the governor and confirmed by the senate. CUC is the sole electric public utility provider for Saipan, Tinian, and Rota.[12] As of April 2023, the power generation system provides 40 MW, but is designed for up to 120 MW. Less than 1% of CUC's power supply comes from solar net metered systems.[13] Three of Saipan's major hotels rely primarily on their own diesel generators for electric power.

CUC operations have long been greatly impacted by aging infrastructure and deep financial troubles, and the climate crisis compounds these challenges. Multiple powerful typhoons over the past decade have caused significant damage to the islands' power infrastructure, and the severity of future storms is expected to increase.[14]

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[11] Territory Energy Security Plan: CNMI, 2023.
[12] Title 4, sections 8111 et seq. of the Commonwealth Code.
[13] Territory Energy Security Plan for CNMI, 2023.
[14] Ibid.

Over the next five years, to reduce emissions and improve efficiency, reliability, and resiliency in power generation, transition the CNMI away from fossil fuels, and integrate renewable energy systems more effectively, four priority actions are proposed for Measure 1: Green Electric Power.

Priority Action 1: Develop CUC's Energy Master Plan, Roadmap and Implementation Plan.

The CUC Energy Master Plan, Roadmap and Implementation Plan will set forth CUC's overall strategy to modernize its energy infrastructure, incorporate operations and maintenance capital improvement projects, and integrate renewable resources to provide clean, reliable, and affordable electricity to the people of the Commonwealth.

Implementing agency	Commonwealth Utilities Corporation
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, permitting, and NEPA compliance • Project scoping and procurement of services • Completion and publication Years 3-5 • Implementation and updating of the CUC Energy Master Plan
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; progress reports submitted; planning meetings held; stakeholders engaged; comments received on draft planning documents; publication of Energy Master Plan, Roadmap and Implementation Plan
Applicable sector(s)	Electric Power

Priority Action 2: Develop utility-scale power plants that provide cleaner, more affordable, and reliable electricity and integrate renewable energy and energy storage systems.

This project will reduce total annual GHG emissions and modernize CUC's existing energy infrastructure by replacing obsolete diesel engines on Saipan, Tinian, and Rota and integrating utility-scale solar photovoltaic (PV) systems with battery energy storage systems (BESS). By 2030, CUC proposes to install 20MW solar PV with BESS for Saipan; 5MW solar PV with BESS for Tinian; and 3MW solar PV with BESS for Rota.

Implementing agency	Commonwealth Utilities Corporation
Implementation schedule and milestones	Years 1-2 • Identify funding • Identify sites for solar PV and BESS installation • Planning, permitting, and NEPA compliance process • Procurement process and selection of contractors Years 3-5 • Site preparation and construction • Installation and systems testing • Commissioning • Operations and maintenance
Geographic location(s)	Saipan, Tinian, Rota
Metrics for tracking progress	Amount of funding secured; sites selected and prepared; progress reports submitted; contractors awarded; planning meetings held; stakeholders engaged; permits secured; construction completed; solar PV system and BESS performance; residents served by solar power; GHG and other air pollutant emissions avoided
Applicable sector(s)	Electric Power

Priority Action 3: Install solar photovoltaic and other renewable energy systems with energy storage where appropriate and feasible on key government-owned facilities.

The Commonwealth government will install solar PV or other renewable energy systems and may include energy storage on key government-owned facilities, including offices of the executive, legislative, and judicial branches of government, public educational institutions, public libraries, healthcare facilities, airports and seaports, public housing and shelter facilities, public parks and recreational facilities, emergency management facilities and fire stations, solid waste management facilities, and municipal offices and facilities. Several government entities, including the Bureau of Environmental Quality, Northern Marianas College, Public School System, Northern Marianas Technical Institute, and Tinian Mayor's Office have new buildings that are or will soon be in construction, and will pursue solar PV or other renewable energy systems for those new facilities.

Implementing agencies	Office of the Governor, Office of Grants Management; Bureau of Environmental and Coastal Quality; Department of Lands and Natural Resources; Department of Corrections; Department of Public Safety; Public Defenders Office; Office of the Attorney General; Office of the Public Auditor; Department of Fire and Emergency Medical Services; Homeland Security and Emergency Management; Department of Community and Cultural Affairs; Department of Finance; Department of Labor; Department of Public Works; Council on Developmental Disabilities; Substance Abuse and Recovery Program; Carolinian Affairs Office; Indigenous Affairs Office; Women's

	Affairs Office; Veterans Affairs Office; Legislature; Judiciary; Saipan Mayor's Office; Rota Mayor's Office; Northern Islands Mayor's Office; Tinian Mayor's Office; Public School System; Northern Marianas Housing Corporation; Marianas Visitors Authority; Northern Marianas Technical Institute; Northern Marianas College; CNMI Scholarship Office; Commonwealth Office of Transit Authority; Northern Marianas Housing Corporation; Commonwealth Healthcare Corporation; Commonwealth Ports Authority; Joeten-Kiyu Public Library; Rota Public Library; Tinian Public Library
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, site assessments, and permitting • Procurement process and selection of contractors Years 3-5 • Installation and systems testing • Commissioning • Operations and maintenance
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; site assessments completed; progress reports submitted; contractors awarded; permits secured; solar PV system and energy storage performance; energy savings realized; GHG and other air pollutant emissions avoided
Applicable sector(s)	Electric Power

Priority Action 4: Provide incentives for solar photovoltaic and other renewable energy systems for commercial facilities and residents.

The Office of the Governor, Office of Grants Management aims to deliver solar PV systems with battery storage to 50% or more of CUC residential customers by 2030. The Department of Public Works, Division of Energy will also facilitate the transition to clean energy for both residents and commercial facilities through technical assistance programs and rebates or vouchers to offset the cost of renewable energy systems.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works, Division of Energy
Implementation schedule and milestones	Years 1-3 • Identify funding • Develop eligibility requirements, application, and selection process • Public education and outreach • Planning, site assessments, and permitting • Procurement process and selection of contractors • Implementation

	Years 4-5
	• Implementation continues
	• Public education and outreach continue
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; contractors awarded; technical assistance counseling sessions conducted; progress reports submitted; site assessments completed; solar PV or other renewable energy systems installed; system performance; rebates issued; consumer evaluations; GHG and other air pollutant emissions avoided
Applicable sector(s)	Electric Power

GHG Emission Reduction Estimates

The CNMI's 2023 Strategic Energy Plan and the Commonwealth Utilities Corporation have set a goal of transitioning to 50% clean energy by 2030, which translates to a reduction of 112,287 MT CO_2e in annual emissions from 2023 levels for electric power generation. The CNMI's commitment to the Blue Planet Alliance Climate Agreement sets a goal of 100% clean energy by 2045, which would avoid annual emissions of 224,574 MT CO_2e from electric power generation based on 2023 data.

Integration of utility-scale renewable energy. Assuming no load growth and in terms of annual kWh of CUC-generated electricity, reaching the 50% renewable energy goal by 2030 would displace approximately 106,218 MT CO_2e, or half of CUC's share of GHG emissions for electricity. Reaching the 100% renewable energy goal for CUC-generated electricity would displace 212,435 MT CO_2e, or CUC's full share of GHG emissions for electricity.

Using NREL's PVWatts tool, a 20MW ground-mounted solar PV array on Saipan is estimated to generate 34,000 MWh per year, or approximately 11% of the total CUC electricity generation in 2023. A 5MW ground-mounted solar PV array on Tinian would generate approximately 8,440 MWh per year, or approximately 3% of total CUC electricity generation in 2023. A 3MW ground-mounted solar PV array on Rota would generate an estimated 5,066 MWh per year, or about 2% of total CUC electricity generation in 2023.

Using the CNMI average grid emission factor developed from the GHG inventory, (0.714 MT CO_2e/MWh), this amount of solar power generation for Saipan, Tinian, and Rota would avoid approximately 33,919 MT CO_2e per year. Incorporating battery storage could increase emission reduction potential.

Installation of solar PV systems on residential, government, and commercial facilities. Based on CUC power generation data, in 2023 residential customers consumed approximately 24.9%[15] of electricity generated in the CNMI, or 74,055 MWh of CUC electricity. Government

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[15] Territory Energy Security Plan: CNMI, 2023.

(including municipal uses) consumed approximately 22.9%[16] of electricity, or 68,108 MWh. Commercial customers consumed 37.8%[17] of CUC-generated electricity, or 112,422 MWh.

Installing solar PV systems at the homes of 50% CUC's residential customers corresponds to approximately 37,028 MWh, and an avoidance of 26,438 MT CO_2e per year. Installing solar PV systems at 50% of government-owned facilities corresponds to approximately 34,054 MWh, and an avoidance of 24,315 MT CO_2e per year. Installing solar PV systems at 50% of CUC's commercial customers' facilities corresponds to approximately 56,211 MWh, and an avoidance of 40,135 MT CO_2e per year. Installing solar PV systems to reduce diesel consumption and at least 50% of carbon emissions from Saipan's three self-generating hotels would avoid 6,023 MT CO_2e per year. Battery storage could increase emission reduction potential.

Benefits Analysis

In addition to reducing GHG emissions annually and over the lifetime of the clean energy projects, the four priority actions for Measure 1: Green Electric Power are expected to improve air quality for the health benefit of CNMI communities by reducing co-pollutants emitted by CUC's diesel power generators. NREL assisted in this portion of the PCAP benefits analysis by estimating emissions of non-GHG air pollutants based on available fuel[18] and technology data[19] provided by CUC for turbines on Saipan, Tinian, and Rota. CUC power plants for all three islands run on ultra-low sulfur diesel (ULSD).

	MW	Unit Type	Fuel Use (gallons ULSD)	Tons/Year Pollutant Emissions (uncontrolled)					
				NO_x	CO	SO_2	PM10	PM2.5	VOC/TOC
Saipan	34.5	Diesel/fuel oil turbine	1,623,579	100.01	.38	.17	1.36	1.36	.05
Tinian	3	Diesel/fuel oil turbine	92,815	5.72	.02	.01	.08	.08	0
Rota	2	Diesel/fuel oil turbine	65,386	4.03	.02	.01	.05	.05	0
TOTAL			1,781,780	109.76	.42	.3	1.49	1.49	.05

Table 4. Co-pollutants emitted by CUC generators, in tons per year.

Fossil-fueled power plants produce a variety of air pollutants that are damaging to human health. The pollutants that are of greatest concern are particulate matter and ozone. Particulate matter can penetrate the lungs and bloodstream, and are associated with cardiovascular and respiratory problems, lung cancer, and stroke. Ozone is associated with

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[16] Ibid.

[17] Ibid.

[18] In conducting this part of the benefits analysis, NREL relied on June 2023 fuel data provided by CUC for the Territory Energy Security Plan.

[19] CUC's power generator technology data for Saipan, Tinian, and Rota were provided to NREL in January 2024.

both short-term and long-term respiratory issues and can lead to chronic obstructive pulmonary disease.[20]

The CUC pollutant emissions summarized in Table 4 include criteria air pollutants (CAPs, i.e., those with National Ambient Air Quality Standards) as well as volatile organic compounds (VOCs) which are precursors to the atmospheric formation of ozone, a criteria air pollutant. CAPs estimated include oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter (PM) with particle sizes less than 10 micrometers (PM_{10}) and less than 2.5 micrometers ($PM_{2.5}$).

Based on 2023 data, CUC power plants annually emit 109.76 tons of NO_x, .42 tons of CO, .3 tons of SO_2, 1.49 tons of PM_{10} and $PM_{2.5}$ each, and .05 tons of volatile organic compounds, precursors to ozone. Transitioning the CNMI to renewable sources of energy and away from diesel consumption for electricity will reduce these harmful pollutant emissions. NREL's background notes and analysis of co-pollutants from the CNMI's electric power generation sector are provided in Appendix B.

Other benefits anticipated from these four priority actions for Measure 1: Green Electric Power include lower energy costs for households, businesses, and the government; creation of new training programs and high-quality jobs in solar PV installation, repair, and maintenance; and enhanced public awareness and engagement in clean energy and climate pollution reduction strategies.

Implementing Authority

The Commonwealth Utilities Corporation has statutory authority to oversee the planning, construction, operation, and regulation of electric services in the CNMI, including the interconnection of renewable energy systems with the grid. CUC additionally is mandated by law to promulgate and implement a net metering program[21] and to prioritize interconnection with net metering for the commonwealth's public health and educational institutions.[22] CUC's Renewable Energy Division is tasked with ensuring that 50% of the CNMI's electricity is generated from renewable sources by 2030.[23]

The Office of Grants Management is established by law under the Office of the Governor and has purview over all federal grants and other federal funding sources to the Executive Branch, excluding the Judiciary and independent offices established by the CNMI Constitution.[24] The Office of Grants Management is the CNMI's administering authority over the EPA's Solar for All program to provide solar PV systems to residents[25] and additionally

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[20] An Overview of Policies Influencing Air Pollution from the Electricity Sector in Central Asia. Prepared by J. Erik Ness, Garvin Heath, and Vikram Ravi. NREL. January 2022. Available at https://www.nrel.gov/international/south-and-central-asia-air-quality-study.html.
[21] The net metering program is currently suspended and undergoing review based on CUC concerns over grid stability and financial impacts.
[22] Title 4, section 8122 of the Commonwealth Code.
[23] Territory Energy Security Plan: CNMI, 2023..
[24] Title 1, section 2891 of the Commonwealth Code.
[25] As of April 15, 2024, the Solar for All funding award for CNMI is pending.

manages solar PV installations for government facilities under the Office of Insular Affairs' Energizing Insular Communities program.

The Department of Public Works (DPW) is part of the Executive Branch of government and has statutory authority to construct and maintain all public works.[26] DPW's Division of Energy oversees energy planning, programs, and projects aligned with its mission to "help reduce the importation of petroleum products into the Commonwealth through energy efficiency and utilization of local renewable energy sources."[27]

Both DPW and CUC lead the CNMI's Strategic Energy Task Force (SETF), established by Executive Order 2021-16 as amended. The SETF is responsible for the development and update of a strategic energy plan to reduce the Commonwealth's dependence on imported fossil fuels and establish a sustainable energy future for the CNMI.

Measure 2: Green Buildings and Infrastructure

Buildings account for approximately 40% of energy use,[28] 75% of electricity use, and 35% of carbon emissions nationwide.[29] To reduce energy demand and associated emissions and foster the development of buildings and infrastructure that are resource-efficient, resilient, safe, and accessible, the CNMI has updated and expanded its building codes and produced an array of plans, guidance, and incentives.

In terms of codes, the CNMI has adopted both the International Building Code (IBC)[30] and the CNMI Tropical Energy Code.[31] In alignment with these codes and to promote energy and water efficiency as well as disaster resiliency in the housing sector, the Northern Marianas Housing Corporation has promulgated green building standards specifically for housing development projects in its disaster recovery program.[32]

In terms of planning documents and tools, the CNMI Comprehensive Sustainable Development Plan (CSDP) outlines goals, objectives, and priority actions for a sustainable built environment, including "complete streets" that encourage safe walking, bicycling, and public transportation, incentives for green buildings, and Smart, Safe Growth principles in

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[26] Title 1, section 2403 of the Commonwealth Code.

[27] CNMI Energy Division, DPW website available at http://cnmienergy.gov.mp.

[28] Frequently Asked Questions (FAQs): How much energy is consumed in U.S. buildings? U.S. Energy Information Administration, November 2023. Available at https://www.eia.gov/tools/faqs/faq.php?id=86&t=1.

[29] NREL researchers reveal how buildings across the United States could – and do – use energy. NREL. September 14, 2023. Available at https://www.nrel.gov/news/features/2023/nrel-researchers-reveal-how-buildings-across-the-united-states-do-and-could-use-energy.html#:~:text=Buildings%20are%20responsible%20for%2040,of%20the%20nation's%20carbon%20emissions.

[30] Title 2, section 7142 of the Commonwealth Code and Title 155, Part 600 of the NMI Administrative Code – Building and Energy Codes.

[31] Title 155, Part 600 of the NMI Administrative Code – Building and Energy Codes.

[32] Northern Mariana Islands CDBG-DR Program: Green Building and Construction Policies, Procedures and Standards for Design and Development of Single-Family and Multi-Family Housing. Northern Marianas Housing Corporation, Community Development Block Grant – Disaster Recovery Program. Available at https://cnmi-cdbgdr.com/wp-content/uploads/2022/11/CDBG-DR-Single-Family-and-Multifamily-Rehabilitation-and-New-Construction-Standards-11.22.2022.pdf.

public facilities and capital improvement projects.[33] The CNMI Guidance Manual for Smart, Safe Growth provides strategies to help government regulators, planners, and developers improve resiliency of the built environment.[34] The Bureau of Environmental and Coastal Quality's Division of Coastal Resources Management (DCRM) offers guidance for nature-based solutions[35] and permit fee reductions[36] for development projects that implement best management practices (BMPs) for buildings, including BMPs in energy efficiency, climate adaptation, stormwater management, and waste reduction.

Over the next five years, to reduce energy demand, lower energy costs, and improve efficiency, resiliency, and safety in the built environment, three priority actions are proposed for Measure 2: Green Buildings and Infrastructure.

Priority Action 1: Implement weatherization, energy efficiency, and water efficiency measures in government facilities.

The Commonwealth government will implement weatherization and efficiency projects at key public facilities, including efficient lighting, water conservation features such as low-flow fixtures and rainwater harvesting systems, elastomeric coating on rooftops, efficient appliances, equipment, doors and windows, and efficient HVAC systems. These key public facilities may include buildings of the legislature, judiciary, and executive branch; mayor's offices and municipalities; healthcare facilities; ports; public housing and shelters; public educational facilities; and public libraries.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works, Division of Energy; Legislature; Judiciary; Commonwealth Healthcare Corporation; Joeten-Kiyu Public Library; Commonwealth Ports Authority; Rota Mayor's Office; Saipan Mayor's Office; Tinian Mayor's Office; Northern Islands Mayor's Office; Marianas Visitors Authority; Office of the Attorney General; Office of the Public Auditor; Public School System; Northern Marianas Technical Institute; Northern Marianas College; Northern Marianas Housing Corporation

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[33] CNMI Comprehensive Sustainable Development Plan 2021 – 2030. Prepared by the Office of Planning and Development, October 2021. Available at https://opd.gov.mp/assets/2021-2030_cnmi_csdp.pdf.

[34] Guidance Manual for Smart, Safe Growth: Commonwealth of the Northern Mariana Islands. Prepared by Nimbus Environmental Services for the Federal Emergency Management Agency and Environmental Protection Agency. November 2018. Available at https://opd.gov.mp/library/etc/sw-plan-docs/a6-cnmi-smart-safe-growth-guidance-manual.pdf.

[35] Living Shorelines and Nature-Based Solutions: A Guide for the Commonwealth of the Northern Mariana Islands. Prepared by Mary Fem Urena. Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. 2022. Available at https://dcrm.gov.mp/wp-content/uploads/crm/Living-Shorelines-and-Nature-Based-Solutions-Guidebook-Accessible-Aug2022.pdf.

[36] Title 15, Part 200 of the NMI Administrative Code - Coastal Resources Management Regulations, Permit Process.

Implementation schedule and milestones	Years 1-2
	• Identify funding
	• Planning, site assessments, and permitting
	• Procurement process and selection of contractors
	• Implementation
	Years 3-5
	• Implementation continues
	• Operations and maintenance
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; contractors awarded; site assessments completed; permits secured; progress reports submitted; weatherization and efficiency projects implemented; lighting systems replaced; water conservation fixtures installed; appliances and equipment replaced; doors and windows repaired or replaced; HVAC systems replaced; energy savings realized; gallons of water conserved; GHG emissions and other air pollutants avoided
Applicable sector(s)	Electric Power; Buildings

Priority Action 2: Provide incentives for weatherization and other efficiency initiatives for commercial facilities and residential buildings.

The Office of the Governor, Office of Grants Management and Department of Public Works, Division of Energy will aid CNMI residents and businesses in reducing energy consumption and improving efficiencies in their buildings by providing outreach, technical assistance programs, and rebates or vouchers to offset the costs of building weatherization and replacements of inefficient appliances, lighting, water fixtures, or other building features. The Saipan Mayor's Office will implement a light bulb and flapper valve replacement program for island residents.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works, Division of Energy; Saipan Mayor's Office
Implementation schedule and milestones	Years 1-3
	• Identify funding
	• Develop eligibility requirements, application, and selection process
	• Public education and outreach
	• Planning, site assessments, and permitting
	• Procurement process and selection of contractors
	• Implementation
	Years 4-5
	• Implementation continues
	• Public education and outreach continues
Geographic location(s)	CNMI-wide

Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; contractors awarded; technical assistance counseling sessions conducted; progress reports submitted; site assessments completed; weatherization and efficiency measures installed; buildings impacted; rebates issued; light bulbs distributed; consumer evaluations; energy savings realized; GHG and other air pollutant avoided
Applicable sector(s)	Electric Power; Buildings

Priority Action 3: Implement green building standards and the CNMI's tropical energy code, nature-based solutions, and other best practices for green building and green infrastructure in new construction and renovation projects.

Over the next five years, multiple major construction and renovation projects will be underway in the CNMI. Some are funded at least partially by federal disaster recovery, hazard mitigation, and/or economic development grants. These projects include public facilities that were damaged by Super Typhoon Yutu in October 2018 and now present opportunities for greener and more resilient construction or renovation, such as the Northern Marianas College, Northern Marianas Technical Institute, Oleai Sports Complex, Hopwood Middle School, Marianas High School, Da'ok Academy, the Tinian municipal building, and the Department of Finance's Economic Resiliency Center. In the housing sector as well, the Northern Marianas Housing Corporation aims to build or rehabilitate 350 resilient and safe housing units for low-income families and 100 homes for moderate-middle income families and implement green building standards in these projects. The Northern Islands Mayor's Office proposes to build green, resilient safe rooms for residents in the Northern Islands to seek shelter in the event of natural disasters or other emergencies. The Saipan Mayor's Office proposes to develop conceptual designs for affordable and resilient residential green buildings that would be made available for residents who do not have the means to hire an architectural firm for their home construction projects.

Implementing agencies	Office of the Governor, Office of Grants Management; Northern Marianas College; Tinian Mayor's Office; Northern Marianas Housing Corporation; Department of Public Works; Saipan Mayor's Office; Bureau of Environmental and Coastal Quality; Northern Marianas Technical Institute; Office of Planning and Development; Public School System; Department of Finance; Northern Islands Mayor's Office; Marianas Visitors Authority
Implementation schedule and milestones	Years 1-2 • Identify funding • Project assessment and selection of opportunities to incorporate green building standards or nature-based solutions • Planning, site assessments, and permitting • Procurement process and contractor selection

	Years 3-5
	• Project implementation
	• Project monitoring and evaluation
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; contractors awarded; technical assistance counseling sessions conducted; progress reports submitted; site assessments completed; construction or renovation projects in code compliance; green building features installed; nature-based solutions implemented; green buildings designed; green buildings developed; consumer evaluations; energy savings realized; gallons of water saved; GHG and other air pollutant avoided
Applicable sector(s)	Electric Power; Buildings; Water

Emissions Reduction Estimates

Energy efficiency measures in buildings can reduce overall energy consumption by 20 - 30%.[37] Various measures will have different impacts on consumption. Based on CUC's 2023 electricity generation data, and assuming that buildings in the CNMI account for 75% of electricity consumption, improving energy efficiency by 20 – 30% in existing buildings across sectors can avoid 31,853 – 47,779 MT CO_2e in GHG emissions.

Benefits Analysis

In addition to reductions in GHG emissions, the benefits anticipated from these three priority actions for Measure 2: Green Buildings and Infrastructure include reductions in energy demand on the grid and corresponding reductions in co-pollutant emissions and energy costs. Implementation of efficiency measures, green building standards and the tropical energy code in new construction and renovation projects will provide additionally improve indoor air quality and comfort, promote efficiency in water use, increase resiliency against extreme weather and heat, lower energy costs, and create high-quality jobs and construction projects.

Review of Authority to Implement

The Department of Public Works has statutory authority and responsibility for the construction and maintenance of public works throughout the CNMI.[38] DPW's Division of Energy leads the CNMI's energy efficiency programs, low-income weatherization assistance programs, energy conservation outreach and education, and energy efficient appliance

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[37] Rules of Thumb: Energy Efficiency in Buildings. EPA State and Local Climate and Energy Program. 2017. Available at https://19january2017snapshot.epa.gov/sites/production/files/2016-03/documents/table_rules_of_thumb.pdf.
[38] Title 1, section 2403 of the Commonwealth Code.

rebate program.[39] DPW's Building Safety Division has enforcement authority over the CNMI's building codes including the tropical energy code, as well as a mandate to educate the public about these codes and methods of energy and water conservation in buildings.[40]

The Northern Marianas Housing Corporation is a public corporation established by law for the purpose of meeting the need for decent, safe and sanitary housing in the CNMI, and providing employment opportunities through the construction, reconstruction, or improvement of housing.[41] NMHC focuses on providing housing services to persons of low and moderate income, the elderly, and persons with disabilities, and administers federally funded housing programs including the Community Development Block Grant – Disaster Recovery Program.

The Mayors' Offices of Saipan, Tinian, Rota, and the Northern Islands have broad statutory authority over local matters and community development projects within their respective island municipalities.[42]

The Office of Grants Management under the Office of the Governor has statutory authority to oversee all federal grants and other federal funding sources to the Executive Branch.[43]

Measure 3: Green Transportation

Transportation is the CNMI's second largest source of GHG emissions, accounting for 47% of all emissions. This sector is also a significant source of criteria air pollution that impacts human health. The road vehicles, marine vessels, and aircraft that comprise the CNMI's transportation sector are predominantly powered by fossil fuels. There is a nascent public transit bus system on Saipan, with 21 vehicles that run on gasoline. Passenger travel, commerce, and the delivery of goods and services between the islands of the Northern Marianas are constrained by the high costs and limited options of transportation and shipping. There is currently no interisland public ferry system.

To facilitate the expansion and accessibility of clean transportation for CNMI residents by land, air, and sea, six priority actions are proposed for Measure 3: Green Transportation.

Priority Action 1: Conduct a feasibility study to evaluate clean public transportation propulsion options for the CNMI.

The feasibility study will evaluate the suitability of various options for public transportation, to include but not be limited to battery electric motors and green hydrogen fuel cells.

Implementing agencies	Office of the Governor, Office of Grants Management; Commonwealth Office of Transit Authority

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[39] CNMI Energy Division, DPW website available at http://cnmienergy.gov.mp.
[40] Title 2, section 7121 et seq. of the Commonwealth Code.
[41] Title 2, section 4411 et seq. of the Commonwealth Code.
[42] Title 1, section 5101 et seq. of the Commonwealth Code.
[43] Title 1, section 2891 of the Commonwealth Code.

Implementation schedule and milestones	Year 1
	• Identify funding
	• Develop scope
	• Procurement process and selection of contractor
	• Stakeholder engagement and project implementation
	Year 2
	• Public presentations and comment period on draft study
	• Publication and distribution of final report
Geographic location(s)	Saipan, Tinian, Rota
Metrics for tracking progress	Amount of funding secured; project scope developed; contractor selected; stakeholders engaged; progress reports submitted; public presentations delivered; presentation attendees; comments received; final report with recommendations completed
Applicable sector(s)	Transportation

Priority Action 2: Develop a low/no emissions interisland ferry system that provides passenger and cargo transportation services within the Northern Mariana Islands.

The Commonwealth Office of Transit Authority, Department of Public Works, and Commonwealth Ports Authority will collaborate on a project to rehabilitate and upgrade the CNMI's seaports and establish a low/no emissions interisland ferry system to support passenger and cargo transportation services within the CNMI. This project is expected to facilitate accessibility to healthcare and other public services within the islands, interisland commerce and trade, tourism, and emergency response, while avoiding GHG emissions and fuel costs that would have been generated with conventional ferry vessels powered by fossil fuels. The Northern Islands Mayor's Office will also pursue low/no emissions vessel options to provide clean transportation services to and from the Northern Islands.

Implementing agencies	Office of the Governor, Office of Grants Management; Commonwealth Office of Transit Authority; Department of Public Works; Commonwealth Ports Authority; Northern Islands Mayor's Office
Implementation schedule and milestones	Year 1
	• Identify funding
	• Feasibility studies and planning
	• Stakeholder and public engagement
	• Selection of options

	Years 2-5
	• Identify funding • Planning, site assessments, permitting • Procurement process and awards • Implementation • Testing and commissioning • Operations and maintenance
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; feasibility studies completed; stakeholder and public meetings conducted; comments received; options selected; plans completed; permits obtained; contractors awarded; vessels procured and commissioned; progress reports submitted; ferry system performance evaluations completed; passenger rides; cargo transported
Applicable sector(s)	Transportation

Priority Action 3: Implement green complete streets initiatives to promote public transit, bicycle, and pedestrian modes and the use of nature-based solutions and green infrastructure in street design and construction.

The Department of Public Works and Commonwealth Office of Transit Authority cooperate on highway investment and transportation system planning, and will include complete streets principles, nature-based solutions, and intermodal connectivity in designing and implementing transportation system improvement projects. The Northern Marianas College is spearheading a project to revitalize its campus and the adjacent neighborhood in the Dandan corridor on Saipan to eliminate urban heat islands, reduce driving, and create a greener, more attractive, walkable and bikeable college town environment. The Tinian Mayor's Office is pursuing a project to install sidewalks, bicycle lanes, and pedestrian crosswalks on Tinian.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works; Commonwealth Office of Transit Authority; Northern Marianas College; Tinian Mayor's Office
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, site assessments, and permitting • Procurement and contractor selection • Public and stakeholder engagement • Architectural and engineering (A&E) design Years 3-5 • Construction • Public outreach and education • Landscaping and beautification • Maintenance

Geographic location(s)	Saipan, Rota, Tinian
Metrics for tracking progress	Amount of funding secured; site assessments and plans completed; permits obtained; contractors awarded; public and stakeholder meetings held; meeting attendees; comments received; A&E design completed; progress reports submitted; public education and outreach materials disseminated; trees planted; sidewalks, bicycle lanes, and crosswalks installed; beautification projects completed
Applicable sector(s)	Transportation

Priority Action 4: Increase the share of low/no emissions vehicles, equipment, and vessels in the government fleet, and install charging infrastructure.

The Commonwealth government will transition its fleet vehicles, equipment, and vessels to low/no emissions options and install charging infrastructure. These include the Department of Community and Cultural Affairs, which oversees a wide range of social services, including the nutrition assistance program, youth services, low-income home energy assistance, and meal service for elderly and homebound residents. The Bureau of Environmental and Coastal Quality will pursue electrification of its fleet and installation of charging stations at its new building to be constructed. The Northern Marianas College will also pursue electric fleet vehicles and charging stations at its campus that is now under construction. Several entities will pursue electric vehicles and charging stations tied to solar PV systems to expand services and outreach programs, including public libraries (EV book-mobiles); the Commonwealth Healthcare Corporation (EV mobile clinics); and the Public School System (EV vans and buses for pupil transportation). Law enforcement and first responder agencies such as the Department of Public Safety, Department of Corrections, Commonwealth Ports Authority, and Department of Fire and Emergency Medical Services will transition to hybrid electric and electric vehicles and charging stations. CPA will also pursue EV charging stations tied to solar PV systems in port parking lots. Government entities with vehicles and heavy equipment, including the Department of Public Works and Mayor's Offices will transition to electric or hybrid electric options and install charging stations.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Community and Cultural Affairs; Bureau of Environmental and Coastal Quality; Department of Public Safety; Department of Corrections; Department of Fire and Emergency Medical Services; Judiciary; Commonwealth Ports Authority; Department of Public Works; Saipan Mayor's Office; Rota Mayor's Office; Tinian Mayor's Office; Northern Islands Mayor's Office; Northern Marianas College; Northern Marianas Technical Institute; Public School System; Commonwealth Healthcare Corporation; Public Libraries

Implementation schedule and milestones	Years 1-2 • Identify funding • Identify suitable vehicle, vessel, and equipment options • Charging station planning and design • Procurement process and selection Years 3-5 • Project implementation • Commissioning of vehicles, vessels, and equipment • Charging station installation • Public education and outreach • Asset maintenance
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; low/no emissions options selected; vehicles, vessels, and equipment procured; charging stations installed; public education and outreach materials produced and disseminated; asset maintenance program developed
Applicable sector(s)	Transportation

Priority Action 5: Design and construct park and ride facilities in key villages to promote the use and accessibility of public transit in the CNMI.

The Commonwealth Office of Transit Authority aims to develop park-and-ride facilities tailored to the unique transportation needs of Saipan. These facilities will offer commuters convenient parking solutions in strategic locations across the island, enabling them to easily access public transportation hubs such as bus terminals and ferry docks. This project will alleviate traffic congestion, enhance mobility, and reduce emissions from motor vehicles.

Implementing agencies	Commonwealth Office of Transit Authority
Implementation schedule and milestones	Years 1-2 • Identify funding • Procurement process and selection of contractors • Feasibility studies and planning • Site assessment and selection • Land acquisition • A&E design • Permitting Years 3-5 • Site preparation • Construction • Integration with transit system • Public education and outreach • Maintenance
Geographic location(s)	CNMI-wide

Metrics for tracking progress	Amount of funding secured; contractors awarded; feasibility studies and plans completed; site assessments completed; sites selected; land acquired; A&E design completed; permits secured; sites prepared; progress reports submitted; park and ride facilities constructed; public education and outreach materials produced and disseminated; facility usage reports; facility maintenance program established
Applicable sector(s)	Transportation

Priority Action 6: Provide incentives to increase the share of low/no emissions vehicles, equipment, and vessels in the private sector.

The Office of the Governor, Office of Grants Management and Department of Public Works, Division of Energy aims to assist CNMI residents, businesses, and nonprofit organizations in converting to low/no emission vehicles, equipment, and vessels by providing outreach, technical assistance programs, and rebates or vouchers to offset the costs of procurement.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works, Division of Energy
Implementation schedule and milestones	Years 1-2 • Identify funding • Develop eligibility requirements, application, and selection process • Develop technical assistance program • Public education and outreach • Implementation of incentives Years 4-5 • Implementation continues • Public education and outreach continue
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; planning meetings held; stakeholders engaged; technical assistance counseling sessions conducted; progress reports submitted; rebates or vouchers issued; vehicles, vessels, and equipment purchased; consumer evaluations; GHG and other air pollutant emissions avoided
Applicable sector(s)	Transportation

Emissions Reduction Estimates

A 25% reduction in 2023 transportation emissions as a result of electrifying vehicles, vessels, and equipment in the government and private sector and expanding the use of public transit, walking, and bicycling would result in avoiding approximately 45,000 MT CO_2e. Compared to conventional vehicles powered by gasoline or diesel, electric vehicles emit much lower

carbon pollution even when the source of energy comes from fossil fuels.[44,45] As electricity generation decarbonizes, GHG emissions associated with electric vehicles drop further. CNMI government entities that transition their vehicles to electric and tie their charging infrastructure to solar PV systems would significantly reduce emissions associated with their respective fleets.

Benefits Analysis

Electrifying the transportation sector can improve air quality by reducing emissions of harmful air pollutants from the combustion of gasoline and diesel fuel in motor engines, including nitrogen oxides, nitrogen dioxide, carbon monoxide, volatile organic compounds, particulate matter, benzene, aldehydes, hydrocarbons, and metals.[46] On the other hand, if fossil fuels are the primary source of electricity, then a disbenefit of converting to electric vehicles and vessels can be an increase in emissions from the electricity sector.[47]

Review of Authority to Implement

The Commonwealth Office of Transit Authority (COTA) is established by law under the Office of the Governor and administered by the Special Assistant for Public Transportation.[48] COTA has statutory authority to establish a public transportation system for the Commonwealth, apply for and secure federal grants to support public transportation, procure public transportation vehicles, equipment, and supplies, and develop and implement public transportation policies and programs consistent with CNMI and federal laws.[49]

The Department of Works has statutory authority over the construction and maintenance of roads throughout the CNMI. DPW also operates a fleet of vehicles and heavy equipment and is responsible for their maintenance and repair.[50]

DPW's Division of Energy leads the CNMI's energy efficiency and renewable energy programs, including programs to promote greener transportation options in the CNMI.[51]

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[44] Electric vehicle myths. EPA. April 9, 2024. Available at https://www.epa.gov/greenvehicles/electric-vehicle-myths.

[45] Electric vehicles reduce carbon pollution in all U.S. states. By Karin Kirk. Yale Climate Connections. September 14, 2023. Available at https://yaleclimateconnections.org/2023/09/electric-vehicles-reduce-carbon-pollution-in-all-u-s-states/#:~:text=In%20the%20U.S.%20as%20a,larger%20in%20the%20coming%20years.

[46] Sources of Air Pollution: Gasoline and Diesel Engines. Prepared by Daniel S. Greenbaum. International Agency for Research on Cancer, Scientific Publication 161: Air Pollution and Cancer, Chapter 5. October 2013. Available at https://www.iarc.who.int/fr/news-events/iarc-scientific-publication-no-161-air-pollution-and-cancer-as-an-e-book-2/.

[47] An Overview of Policies Influencing Air Pollution from the Electricity Sector in Central Asia, 2022.

[48] Title 1, section 20161 of the Commonwealth Code.

[49] Title 1, section 20162 of the Commonwealth Code.

[50] Title 1, section 2403 of the Commonwealth Code.

[51] CNMI Energy Division, DPW website available at http://cnmienergy.gov.mp.

The Office of Grants Management under the Office of the Governor has statutory authority to oversee all federal grants and other federal funding sources to the Executive Branch.[52]

Measure 4: Green Materials Management and Waste Reduction

Although wastewater treatment accounts for just 1% of total emissions, and solid waste emissions less than 1%, GHG reduction measures for the water, wastewater, and solid waste sectors are included in this PCAP in consideration of other compelling factors and planning goals.

Water and wastewater. Water is a limited and precious resource in the CNMI, and both water and wastewater treatment in the CNMI consume significant amounts of electricity. Water and wastewater facilities additionally have multiple diesel generators on standby for operation in the event of power outages. The CNMI's water and wastewater treatment facilities are operated by the Commonwealth Utilities Corporation. The primary source of drinking water in the CNMI is groundwater, and water quality is impaired by saltwater intrusion due to over-pumping from the aquifers as well as PFAS[53] contamination. Moreover, non-revenue water from system leaks and theft is a major cost for CUC and its ratepayers, with estimated losses as high as 60-70%. Since 2008, CUC has been under federal stipulated orders for water and wastewater violations of the federal Safe Drinking Water and Clean Water Acts.

Solid waste. Land is also a limited and precious resource in the CNMI, and solid waste management is an acute challenge, impacting water quality, land availability for other uses, and public health. The CNMI's solid waste management facilities, vehicles, and heavy equipment in the CNMI are powered entirely by fossil fuels. The Marpi landfill and parts of the transfer station facility on Saipan are not connected to the grid and run daily on diesel generators. There are only open dumpsites on Tinian, Rota, and the Northern Islands. Nearly half of the CNMI's waste stream, or 40 - 45%, is organic waste that may be diverted from the landfills and composted.[54] The CNMI has set a goal of diverting 50% of its recyclable waste stream from the landfill by 2030.[55]

To reduce emissions and improve efficiencies in the CNMI's water, wastewater, and solid waste management operations, six priority actions are proposed for Measure 4: Green Materials Management and Waste Reduction.

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[52] Title 1, section 2891 of the Commonwealth Code.
[53] Per- and Polyfluorinated Substances. PFAS contamination of Saipan's water supply is attributed to extensive use of aqueous film-forming firefighting foams containing PFAS at the Saipan International Airport's Aircraft and Rescue Firefighting Facility, a firefighting training center for the Pacific region.
[54] CNMI Comprehensive Solid Waste Management Plan (draft), October 2023.
[55] CNMI Comprehensive Sustainable Development Plan, October 2021.

Priority Action 1: Install solar photovoltaic or other renewable energy systems and energy storage where appropriate and feasible at water, wastewater, and solid waste management facilities.

The Commonwealth government proposes to install solar PV or other renewable energy systems to offset energy consumption and reduce GHG emissions from CUC's water and wastewater treatment facilities. Solar PV or other renewable energy systems are also proposed for the solid waste management facilities of Saipan, Tinian, and Rota. For Saipan's Marpi landfill, which currently operates leachate pumps on diesel generators for approximately 12 hours a day, six days a week, the Department of Public Works proposes to install a solar PV array or other renewable energy system with battery storage of sufficient capacity to expand to 24/7 operations, electrify its fleet and install charging infrastructure, and open a new landfill cell with an additional leachate pumping system. A feasibility study for DPW's project is in progress.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works; Commonwealth Utilities Corporation; Tinian Mayor's Office; Rota Mayor's Office
Implementation schedule and milestones	Years 1-2 • Identify funding • Project scoping and procurement • Feasibility studies • Planning, permitting, and NEPA compliance Years 3-5 • Site preparation and construction • Installation and testing • Commissioning • Operations and maintenance
Geographic location(s)	Saipan, Tinian, Rota
Metrics for tracking progress	Amount of funding secured; project scope developed; contractors selected; solar PV or other renewable energy systems installed; energy savings realized; electric fleet vehicles and equipment procured; charging stations installed; progress reports submitted; operations and maintenance programs established; GHG emissions avoided
Applicable sector(s)	Electric Power; Water; Wastewater; Solid Waste

Priority Action 2: Implement the CUC SMART Grid program.

CUC's SMART Grid program will enhance the power and water distribution systems on Saipan, Tinian, and Rota by improving efficiencies and reducing losses. CUC will incorporate the Supervisory Control and Data Acquisition (SCADA) system and advanced metering technology to improve customer response time to outages and allow customers to have access to their electrical and water usage to promote conservation and ultimately reduce GHG emissions.

Implementing agency	Commonwealth Utilities Corporation
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, permitting, and NEPA compliance • Project scoping and procurement Years 3-5 • Implementation and construction • Operations and maintenance
Geographic location(s)	Saipan, Tinian, and Rota
Metrics for tracking progress	Amount of funding secured; planning completed; permits obtained; project scope developed; equipment and supplies procured; non-revenue water reduced; energy and water savings realized; customer experience evaluations; operations and maintenance programs established; GHG emissions reduced
Applicable sector(s)	Electric Power; Water

Priority Action 3: Implement a waste-to-energy anaerobic digestion project at CUC's wastewater treatment facilities.

Anaerobic digesters can produce renewable energy from wastewater, prevent the release of methane, and reduce air and water pollution. The digested waste can also be applied to crops as fertilizer. CUC proposes to capture and utilize the gases produced from anaerobic digestion to energize the wastewater treatment plant facilities and thereby reduce CUC's dependence on fossil fuels.

Implementing agency	Commonwealth Utilities Corporation
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning and project scoping • Procurement process and contractor selection for feasibility study, design, and implementation • Permitting and NEPA compliance Years 3-5 • Implementation and construction phase at CUC's wastewater treatment plants in Sadog Tasi and Agingan, Saipan
Geographic location(s)	Saipan
Metrics for tracking progress	Amount of funding secured; planning and project scoping completed; contractors awarded; progress reports completed; construction and installation completed; methane captured and converted to energy; fertilizer produced and distributed among local farmers; energy savings realized; GHG emissions reduced
Applicable sector(s)	Wastewater; Electric Power; Agriculture

Priority Action 4: Implement advanced disposal fee programs, improved collection services, and other initiatives to promote waste diversion of recyclable or compostable materials.

The Bureau of Environmental and Coastal Quality's Division of Environmental Quality (DEQ) aims to implement an advanced disposal fee (ADF) program through regulation and public outreach to encourage recycling and reduce the disposal of recyclable materials at CNMI landfills. DEQ proposes to begin with cardboard, which comprises approximately one-third of the CNMI's waste stream, and to establish a redemption permitting program that authorizes redemption centers to receive, collect, and process cardboard.

The Tinian Mayor's Office proposes to spearhead a universal collection program on Tinian that includes a zero-waste study and comprehensive waste audit; implementation of island-wide recycling to promote waste diversion; deployment of electric waste collection vehicles; construction of an outdoor sorting and processing facility to maximize recycling and composting; and a public awareness campaign to educate residents about proper waste management and the importance of waste reduction.

Implementing agencies	Bureau of Environmental and Coastal Quality, Division of Environmental Quality; Department of Public Works; Tinian Mayor's Office; Office of Planning and Development
Implementation schedule and milestones	Years 1-2 • Identify funding source • Adoption of regulations/standard operating procedures • Hiring and training of personnel Years 3-5 • Program implementation • Public outreach and education • Program evaluation
Geographic location(s)	Saipan, Tinian, Rota
Metrics for tracking progress	Amount of funding secured; regulations/procedures adopted; community participation rates in recycling programs; vendor permits issued or contracts awarded; waste diversion rates; tonnage of recyclables and compostables processed annually; electric collection vehicles procured; community satisfaction surveys; GHG emissions reduced
Applicable sector(s)	Solid Waste; Transportation

Priority Action 5: Implement initiatives to reduce organic waste and promote composting.

The Office of the Governor, Office of Grants Management, Department of Lands and Natural Resources, Department of Public Works, and the Mayors' Offices propose initiatives to

support the processing and composting of organic waste in the CNMI, the distribution of mulch materials to local farmers and gardeners, and public education and outreach campaigns to promote composting. The Public School System and Department of Corrections propose pilot programs to reduce food waste and promote composting and gardening at their respective facilities.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Lands and Natural Resources; Department of Public Works; Saipan Mayor's Office; Rota Mayor's Office; Tinian Mayor's Office; Northern Islands Mayor's Office; Public School System; Department of Corrections
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, project scoping, and program design • Procurement process and selection of contractors/vendors • Public education and outreach • Program implementation Years 3-5 • Continue implementation • Continue public education and outreach • Program evaluation
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; tonnage of organic waste diverted and composted; mulch materials distributed; public education materials produced and disseminated
Applicable sector(s)	Solid Waste; Agriculture

Priority Action 6: Implement green digital solutions to reduce waste and GHG emissions and improve efficiencies in government processes.

The Commonwealth government aims to enhance and expand its green digital infrastructure to improve energy efficiency, streamline e-government, upgrade technologies, and reduce paper waste. The Department of Finance and the Judiciary propose to develop secure, green data centers powered by renewable energy systems with storage. The Judiciary also proposes to replace internal network equipment and lines for improved efficiency and security, upgrade courtroom technology, and extend technology licenses to support e-recording, e-filing, and e-court systems. The Commonwealth Ports Authority aims to develop a green network operations center utilizing energy efficient hardware and software systems.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Finance; Judiciary; Commonwealth Ports Authority
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning and permitting • Procurement process and contractor/vendor selection

	Years 3-5 • Implementation and construction • Technology installation • Operations and maintenance
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; energy savings realized; paper waste reduced; GHG emissions reduced
Applicable sector(s)	Electric Power; Buildings; Solid Waste

Emissions Reduction Estimates

Assuming that on-site diesel generators at the Marpi landfill on Saipan have a similar operating emissions factor to the CUC grid average (0.714 MT CO_2e/MWh), a solar PV system to operate the landfill at current capacity will avoid an estimated 92 MT CO_2e in annual GHG emissions. DPW's proposal to install a larger solar PV system (estimated size: 300kW) with battery storage in anticipation of expanded operations is estimated to avoid 357 MT CO_2e annually that would otherwise be emitted from diesel generators.

Using EPA's Waste Reduction Model (WARM) to estimate GHG emissions and reductions, diverting 150 tons of mixed paper from the landfill annually will avoid 216 MT CO_2e in GHG emissions. For every ton of food waste diverted from the landfill, 1.39 MT CO_2e in GHG emissions will be avoided. Every ton of green waste diverted, such as yard trimmings and tree branches, will avoid 0.21 - 0.39 MT CO_2e.

Benefits Analysis

In addition to reducing GHG emissions, the six priority actions in Measure 4: Green Materials Management and Waste Reduction will improve efficiencies in government processes, enhance transparency in billing and improve the customer experience at CUC, increase public awareness and engagement in recycling, composting, and other waste diversion measures, and extend the life of the landfill.

Review of Authority to Implement

The Commonwealth Utilities Corporation oversees water and wastewater treatment operations in the CNMI.[56]

The Department of Public Works is responsible for constructing, operating, and maintaining public works[57] in the CNMI, including solid waste management facilities.[58]

The Bureau of Environmental and Coastal Quality's Division of Environmental Quality is authorized by law to develop advanced disposal fees for specific materials deemed viable for

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[56] Title 4, section 8122 of the Commonwealth Code.
[57] Title 1, section 2403 of the Commonwealth Code.
[58] Title 155, Part 001 – 200 of the NMI Administrative Code – Solid Waste Collection and Disposal Regulations.

diversion.[59] DEQ's Solid Waste Management Branch implements recycling and solid waste management permitting programs.

The Judiciary, Department of Finance, and Commonwealth Ports Authority are each responsible for their respective operations and information technology systems.

The Department of Lands and Natural Resources has statutory authority to protect and enhance the natural resources of the CNMI, and to promote, develop, and administer agricultural programs.[60]

The Office of Grants Management has statutory purview over all federal grants and other federal funding sources to the Executive Branch.[61]

Measure 5: Green Spaces and Carbon Removal

Carbon sequestration from forestry management plays a significant role in mitigating GHG emissions in the CNMI, with this PCAP's GHG inventory indicating that CNMI forests offset 199,228 MT CO_2e, nearly half (46%) of total gross emissions in 2023.

To amplify carbon removal through the CNMI's forests and other natural spaces, five priority actions are proposed.

Priority Action 1: Support and expand forestry programs to propagate and plant native, food, and medicinal species throughout the CNMI.

The Department of Lands and Natural Resources' Forestry Section supports forest restoration projects throughout the CNMI and maintains native plant nurseries to propagate seedlings and shrubs for site restoration and mitigation projects. The Forestry Section was recently awarded federal grant funding to rehabilitate nurseries on Saipan and Rota that were damaged by typhoons in 2018. Other government entities are pursuing forestry enhancement projects as well. The Northern Marianas College is leading a regenerative agroforestry program that teaches residents how to grow food forests that foster nutrition security, restore soil health and biodiversity, and remove greenhouse gases. The Saipan Mayor's Office proposes to establish community gardens and implement replanting projects throughout the island. The Northern Islands Mayor's Office proposes to develop a nursery for native and medicinal plants. The Rota Mayor's Office is implementing a 1,000 Fruit Trees Initiative and a program to promote backyard gardening. The Department of Corrections proposes to engage incarcerated individuals in propagating and planting trees and cultivating food gardens.

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[59] Title 2, section 3532 of the Commonwealth Code.
[60] Title 1, section 2653 of the Commonwealth Code.
[61] Title 1, section 2891 of the Commonwealth Code.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Lands and Natural Resources; Northern Islands Mayor's Office; Rota Mayor's Office; Tinian Mayor's Office; Northern Marianas College; Department of Corrections
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning and site assessment • Partner and community engagement • Needs assessment • Procurement of seedlings, tools, equipment, and supplies • Nursery development and program implementation Years 3-5 • Continue nursery development and program implementation • Volunteer and partner recruitment • Public education and outreach • Program evaluation
Geographic location(s)	Saipan, Rota, Tinian, Northern Islands
Metrics for tracking progress	Amount of funding secured; plans and site assessments completed; partners engaged; community members engaged; seedlings cultivated and outplanted; seedling survival rates; public education and outreach materials; progress reports submitted; GHG emissions reduced
Applicable sector(s)	Carbon Sequestration

Priority Action 2: Develop and expand programs to restore, enhance, and monitor mangroves, wetlands, seagrass beds, watersheds, and coral reef ecosystems.

In addition to forests, other terrestrial and marine resources provide carbon sequestration services among numerous other benefits that increase the CNMI's climate resiliency. These resources include mangroves, wetlands, watersheds, coral reef ecosystems, and seagrass beds. Various entities of the Commonwealth government aim to restore, enhance, and monitor these resources. The Department of Lands and Natural Resources proposes to undertake a blue carbon assessment and restoration project for *Enhalus* seagrass and coral reefs on Saipan and Rota.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Lands and Natural Resources; Bureau of Environmental and Coastal Quality

Implementation schedule and milestones	Years 1-2 • Identify funding • Recruit and hire personnel for restoration projects • Site assessments and resource surveys • Mapping and identification of restoration target areas • Implement restoration Years 3-5 • Continue implementation • Monitoring and assessment
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; personnel hired; site assessments completed; resource survey results; maps identifying target areas for restoration; number of transplants; transplant survival rates; progress reports submitted; monitoring and assessment results; GHG emissions reduced
Applicable sector(s)	Carbon Sequestration

Priority Action 3: Revegetate and restore degraded public lands.

The Department of Public Lands (DPL) proposes to revegetate and restore degraded public lands, including abandoned quarries, brownfields, and eroding shorelines. DPL has been awarded partial funding from the Office of Insular Affairs for native plant revegetation and restoration of abandoned quarries. Abandoned quarries are found on Saipan, Tinian, and Rota; some are also brownfields.

Implementing agencies	Department of Public Lands
Implementation schedule and milestones	Years 1-2 • Identify funding • Planning, project scoping and assessment • Stakeholder and public engagement • Procurement process and selection of contractors/vendors • Site selection • Project implementation Years 3-5 • Continue implementation • Continue public education and outreach • Monitoring and assessment
Geographic location(s)	Saipan, Tinian, and Rota

Metrics for tracking progress	Amount of funding secured; personnel hired; plans and site assessments completed; stakeholder and public meetings held; meeting participants; comments received; sites selected for restoration; area covered; seedlings planted; seedling survival; mitigation measures implemented; progress reports submitted; monitoring and assessment results; GHG emissions reduced
Applicable sector(s)	Carbon Sequestration

Priority Action 4: Develop and implement measures to prevent and suppress wildland fires and protect carbon sinks.

The Department of Fire and Emergency Medical Services tracks, fights, and works to prevent wildland fires in the CNMI. In 2023, DFEMS recorded 18 wildland fires on Saipan, 3 on Rota, and 3 on Tinian, which burned a total of approximately 16 hectares. Between April 2013 and 2022, 1,068 hectares burned on Saipan alone.[62] Fires threaten native forests, erode soils, and contribute to sedimentation of coral reefs. Many wildland fires occur in areas of the islands that are difficult to access, and DFEMS lacks emergency response vehicles and firefighting apparatus that can navigate rough terrain. DFEMS seeks to expand its capacity to prevent and suppress wildfires throughout the CNMI through the acquisition of suitable hybrid electric firefighting and emergency response vehicles and equipment, the implementation of a community forest restoration and firebreak project, and a public education and outreach campaign.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Fire and Emergency Medical Services
Implementation schedule and milestones	Years 1-2 • Identify funding • Project planning and scoping • Procurement process and vendor selection • Personnel training • Public education and outreach • Partner engagement and collaboration • Project implementation Years 3-5 • Continue implementation • Continue training • Continue partner engagement, public education and outreach • Program evaluation
Geographic location(s)	Saipan, Tinian, Rota, Northern Islands

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[62] Spatial and temporal patterns of fire on Saipan, CNMI. Ilan E. Bubb and Zachary B. Williams. Pacific Science, vol. 76, no.1:1-15. 2022.

Metrics for tracking progress	Amount of funding secured; vehicles and equipment acquired; personnel trained; number of fires suppressed; acres burned; DFEMS response times; public education and outreach materials produced and disseminated; progress reports submitted; program evaluation reports
Applicable sector(s)	Carbon Séquestration; Transportation

Benefits Analysis

In addition to carbon removal, the restoration and protection of the CNMI's carbon sinks will provide other benefits, including high-quality jobs in natural resource management, improved habitat for wildlife, enhanced climate resiliency, reduced urban heat islands, reduced fire risk, and a more attractive environment for residents and visitors.

Review of Authority to Implement

The Department of Lands and Natural Resources is responsible for the protection and enhancement of the terrestrial and marine resources of the CNMI. DLNR's mandate includes the conservation of forests, landscaping and beautification projects, and the conservation of agricultural and aquatic resources.[63]

The Department of Public Lands is responsible for the administration, use, leasing, development, and disposition of the Commonwealth's public lands.[64]

The Department of Fire and Emergency Medical Services is responsible for providing effective fire prevention, fire protection, fire suppression, and wildland firefighting, and preventing and reducing the risk of fire through public education and enforcement programs.[65]

The Mayors' Offices of Saipan, Tinian, Rota, and the Northern Islands have broad authority over local matters and community improvement projects within their respective island municipalities.[66]

Measure 6: Green Workforce

The CNMI's transition to a sustainable, clean energy and climate resilient future requires a skilled, diverse, and ready workforce. CNMI residents must have the educational and training opportunities to develop their skills and knowledge to participate meaningfully in the clean energy economy.

The need for coordinated workforce development and local capacity building was raised in numerous stakeholder engagement meetings throughout the CNMI. The Public School System, Northern Marianas Technical Institute, Northern Marianas College, the Department

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[63] Title 1, section 2653 of the Commonwealth Code.
[64] Title 1, section 2803 of the Commonwealth Code.
[65] Title 1, section 28004 of the Commonwealth Code.
[66] Title 1, section 5101 et seq. of the Commonwealth Code.

of Labor, and other partners have committed to collaborate in developing education and training programs that prepare CNMI residents to take on jobs in the clean energy economy and contribute to climate solutions. These programs may take many forms, including online and in-person training, on-the-job training, boot camps, certification courses, internships, pre-apprenticeships, registered apprenticeships, and professional development.

To build and sustain the CNMI's green workforce, four priority actions are proposed.

Priority Action 1: Develop, promote, and implement workforce training programs to support Measure 1: Green Electric Power.

These workforce training programs may cover areas that include but are not limited to installation, repair, and maintenance of solar PV and other renewable energy systems, and design and sizing of solar PV systems for different applications.

Implementing agencies	Office of the Governor, Office of Grants Management; Northern Marianas College; Northern Marianas Technical Institute; Public School System; Department of Labor; Department of Public Works, Division of Energy
Implementation schedule and milestones	Years 1-2 • Identify funding • Partner engagement and strategic planning • Needs assessment • Program and course development • Recruitment, hiring, and training of trainers • Procurement of equipment, tools, and supplies • Community outreach and student recruitment • Implement training program Years 3-5 • Continue implementation of training program • Track student progress and job placement • Program evaluation
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; partners engaged; needs assessment completed; progress reports submitted; program and courses developed; trainers recruited and trained; students recruited and trained; student retention and program completion rates; job placement rates; program evaluation reports submitted
Applicable sector(s)	Electric Power

Priority Action 2: Develop, promote, and implement workforce training programs to support Measure 2: Green Buildings and Infrastructure.

These workforce training programs may cover areas that include but are not limited to conducting energy audits, designing and implementing weatherization projects,

implementing building code and tropical energy code standards, obtaining LEED certification, and strategies and best practices in green building, green infrastructure, green complete streets, and nature-based solutions.

Implementing agencies	Office of the Governor, Office of Grants Management; Department of Public Works; Office of Planning and Development; Northern Marianas Technical Institute; Northern Marianas College; Public School System; Northern Marianas Housing Corporation; Department of Labor
Implementation schedule and milestones	Years 1-2 • Identify funding • Partner engagement and strategic planning • Needs assessment • Program and course development • Recruitment, hiring, and training of trainers • Procurement of equipment, tools, and supplies • Community outreach and student recruitment • Launch training programs Years 3-5 • Continue implementation of training programs • Track student progress and job placement • Program evaluation
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; partners engaged; needs assessment completed; progress reports submitted; program and courses developed; trainers recruited and trained; students recruited and trained; student retention and program completion rates; job placement rates; program evaluation reports submitted; buildings in code compliance; building code inspectors trained and certified; nature-based solutions installed; green infrastructure projects installed; LEED certified professionals
Applicable sector(s)	Electric Power; Buildings; Transportation

Priority Action 3: Develop, promote, and implement workforce training programs that support Measure 3: Green Transportation.

These workforce training programs may cover areas that include but are not limited to repair and maintenance of electric and hybrid electric vehicles, vessels, and equipment, and the installation, repair, and maintenance of charging infrastructure.

Implementing agencies	Office of the Governor, Office of Grants Management; Northern Marianas Technical Institute; Northern Marianas College; Public School System; Department of Public Works; Department of Labor

Implementation schedule and milestones	Years 1-2
	• Identify funding
	• Partner engagement and strategic planning
	• Needs assessment
	• Program and course development
	• Recruitment, hiring, and training of trainers
	• Procurement of equipment, tools, and supplies
	• Community outreach and student recruitment
	• Launch training program
	Years 3-5
	• Continue implementation of training program
	• Track student progress and job placement
	• Program evaluation
Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; partners engaged; needs assessment completed; progress reports submitted; program and courses developed; trainers recruited and trained; students recruited and trained; student retention and program completion rates; job placement rates; program evaluation reports submitted
Applicable sector(s)	Transportation; Electric power generation

Priority Action 4: Develop and construct a climate and health resiliency training center.

The Northern Marianas College is the CNMI's Green Growth Hub and aims to serve as the region's hub for climate and health resiliency. NMC will leverage and expand its programs in natural resources management, pre-engineering, food and nutrition sciences, agricultural sciences, nursing and health sciences and other areas to develop a climate and health resiliency training center. The center will equip island residents with the knowledge and skills to contribute to the clean energy transition and a healthier, more sustainable, and climate resilient economy. NMC has secured funding to support A&E design and is seeking funding for construction of a facility that will demonstrate green building standards, renewable energy systems, and nature-based solutions.

Implementing agencies	Northern Marianas College
Implementation schedule and milestones	Years 1-2
	• Identify funding
	• Procurement process and contractor selection
	• A&E design, planning, site assessment, and permitting
	• Public and stakeholder engagement
	• Program development
	Years 3-5
	• Site preparation and construction
	• Recruitment and hiring
	• Program implementation

Geographic location(s)	CNMI-wide
Metrics for tracking progress	Amount of funding secured; contractors awarded; public and stakeholder meetings held; meeting participants; comments received; A&E design completed; plans completed; progress reports submitted; site prepared; permits obtained; facility constructed; green building features and nature-based solutions installed; courses and programs developed; personnel hired; students recruited; program evaluation reports completed
Applicable sector(s)	Electric Power; Buildings; Transportation; Carbon Sequestration; Solid Waste

Benefits Analysis

A strong workforce development program is essential to achieving the CNMI's clean energy and climate action goals and delivering benefits to communities. These benefits include high-quality, stable jobs for residents, faster deployment of clean energy technology, a ready workforce for repairs and maintenance of assets, increased public awareness, and effective implementation of clean energy and climate action initiatives.

Review of Authority to Implement

The Northern Marianas College (NMC) has a constitutional mandate to provide postsecondary and adult education in the Commonwealth[67] and oversees higher education, adult continuing education, adult vocational and technical education, professional training programs, and occupational and technical training centers.[68]

The Public School System (PSS) is constitutionally mandated to oversee free public elementary and secondary education in the CNMI.[69] PSS' Career and Technical Education Program[70] supplements the core curriculum with supervised work-based learning through which students earn credit, gain work experience, and explore career pathways.[71]

The Northern Marianas Technical Institute (NMTech) is a public corporation established by law to provide trades, careers, and technical training programs in the CNMI and collaborate with NMC and PSS to complement their programs and services.[72]

The CNMI Department of Labor develops and oversees workforce services, promotes job opportunities, and supports employment training, skill development programs, and apprenticeship opportunities.

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[67] Article XV, section 2 of the CNMI Constitution.
[68] Title 3, section 1305 of the Commonwealth Code.
[69] Article XV, section 1 of the CNMI Constitution.
[70] Title 3, section 1901 of the Commonwealth Code.
[71] CNMI Public School System, Office of Curriculum and Instruction: Career and Technical Education Program. Available at http://cnmipssoci.org/career-and-technical-ed.
[72] Title 3, sections 12101 et seq. of the Commonwealth Code.

5 Future Considerations

This PCAP focuses on GHG emission estimates for key sectors based on available data, and near-term, high-impact GHG emission reduction measures for those sectors. The emissions calculations provided in this PCAP's GHG inventory do not represent all major sources or sinks, and some generalizations and assumptions had to be made for areas where specific data were unavailable. The Comprehensive Climate Action Plan and comprehensive GHG inventory are the next deliverables due in the CPRG program and should cover all major sectors with more complete data.

For the electricity generation sector, the CCAP and comprehensive GHG inventory may disaggregate emissions by customer class or major activities, and consider whether other entities outside of the hotel industry rely primarily on their own on-site fossil fuel generators. It may also be worthwhile to consider the emissions produced by standby generators, given their prevalence in the public and private sectors and the frequency of power outages in the CNMI.

For the transportation sector, more complete road vehicle and marine vessel registration data for all of the islands, as well as actual fuel consumption and mileage data, would help to produce more accurate estimates of emissions for the CCAP and comprehensive GHG inventory. Similarly, more accurate estimates of aviation emissions may be made with data related to aircraft types, flights, and fuel consumption, distinguishing interisland from international flights.

For carbon sequestration, further study is needed to more precisely characterize and quantify the carbon sequestration services of the CNMI's forests and other natural carbon sinks, and to take into account impacts such as land use changes, invasive species, and wildland fires.

Other emission sources and sectors that the CNMI may consider in the CCAP and comprehensive GHG inventory include agriculture, military activities, industrial activities such as asphalt and cement batching, and incinerators.

Appendix A

Appendix to Commonwealth of the Northern Mariana Islands Priority Greenhouse Gas (GHG) Emissions Inventory for EPA CPRG Priority Climate Action Plan (PCAP)

Prepared by Michael Young, CAP – National Renewable Energy Laboratory (NREL)

4/10/2024

This document accompanies the greenhouse gas (GHG) emissions estimates calculated for Commonwealth of the Northern Mariana Islands (CNMI) in the Local GHG Inventory Tool: Community Module ("CPRG PCAP GHG Inventory – CNMI.xlsx"), and provides notes on sources of data, assumptions made in calculations, and additional narratives on the results of these preliminary emissions calculations.

Summary of Priority GHG Emissions Inventory

Priority sectors identified by CNMI include Electricity Generation, Transportation, Solid Waste, Wastewater Treatment, and Carbon Removal through Forest Management, which align with CNMI's priority actions for emissions reduction. The GHG emissions estimated for these priority sectors are:

Emissions Source Category	Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)	Percent of Total
Stationary Combustion (from Electricity Generation)	224,574	51%
Mobile Combustion[73] (from road vehicles, marine vessels, and aviation[74])	212,788	48%
Solid Waste	377	<1%
Wastewater Treatment	5,428	1%
Subtotal Gross Emissions of Priority Sectors for PCAP	443,167	100%
Forestry Carbon Sequestration	*-199,228*	*-45%*
Subtotal Net Emissions of Priority Sectors for PCAP	*243,939*	*55%*

Commentary on PCAP GHG Emissions Inventory Results

Stationary Combustion

The Stationary Combustion category of this PCAP GHG inventory represents emissions resulting from Commonwealth Utilities Corporation (CUC) electricity generation along with the Marpi Landfill and three Saipan hotels that primarily generate their own electricity on-site. These emissions from electricity generation can be disaggregated by the three main CNMI islands as follows:

- Saipan (92%): **206,542 MT CO_2e**
  - CUC: 194,404 MT CO_2e
  - Hotels[75]: 12,046 MT CO_2e

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[73] Saipan and Rota vehicles and marine vessels are represented based on BMV registration data. Tinian is represented by gross fuel volumes assumed for transportation, since complete BMV registration data was not available.

[74] Aviation is categorized as "Other" in the EPA Community Greenhouse Gas Inventory Tool, due the fact that generalized data (i.e., fuel import volumes only) was entered under "Additional Emission Sources". For the purpose of displaying the inventory results more clearly, aviation emissions are included in the Mobile Combustion category above.

[75] After a survey of CNMI hotels/resorts, three hotels on Saipan indicated that they rely primarily on their own generators for electricity generation. These hotels are Pacific Islands Club, Hyatt Regency, and Aqua Resort.

- o   Marpi Landfill: 92 MT CO_2e
- Tinian (4.4%): **9,864 MT CO_2e**
- Rota (3.6%): **8,167 MT CO_2e**

Combining the emissions estimates above (for CUC only) with electricity sales data from CUC, a grid average emissions factor can be derived as follows:

- CNMI Annual Average Grid Emissions Factor (2023)
  - o   212,435 MT CO_2e / 297,413 MWh = **0.714 MT CO_2e/MWh** *(1,575 lbs. CO_2e/MWh)*

Disaggregated by island, the CUC average grid emissions factors for Saipan, Tinian, and Rota in 2023 are as follows:

- Saipan: 1,590 lbs. CO_2e/MWh
- Tinian: 1,298 lbs. CO_2e/MWh
- Rota: 1,633 lbs. CO_2e/MWh

For comparison and benchmarking, the CNMI emissions factor is shown below with other comparable data points:

Geographic Location	Annual Average Grid Emissions Factor (lbs. CO_2e per MWh)
Commonwealth of the Northern Mariana Islands	1,575
United States*	828
Hawaii*	1,464
Puerto Rico*	1,600
US Virgin Islands – Total**	2,154
US Virgin Islands – STT District**	2,046
US Virgin Islands – STX District**	2,311
Guam**	1,701
American Samoa**	1,457

Source: EPA eGRID 2022
**Preliminary estimate calculated by NREL for EPA CPRG PCAP GHG Emissions Inventory*

Mobile Combustion

In this PCAP GHG Inventory for CNMI, emissions from mobile combustion involve several assumptions and estimations of data. Source-level emissions estimates are limited to land-based vehicles and marine vessels on Saipan and Rota only (road vehicle and marine vessel registration data for Tinian were not available). Emissions from aviation for all of CNMI, as well as road vehicles and marine vessels on Tinian, are only included at this time based on overall fuel consumption estimates.

Quantifying emissions from on-road and off-road vehicle transportation ideally requires data representing the fuel consumption and vehicle miles traveled (VMT) for each type of vehicle operating within the geographic area of a community GHG inventory. However, this level of detail is typically difficult to obtain and assumptions are needed to fill in the blanks. In the case of this GHG inventory for CNMI, the estimates for these transportation emissions were based on vehicle registration data (from the CNMI Department of Public Safety) and fuel consumption volumes (inferred from CNMI Customs data). The following assumptions were then made to support the quantification of GHG emissions estimates:

- Saipan and Rota
  - o   Registered Motor Vehicle and Marine Vessel data were reorganized/mapped to the motor vehicle types in the EPA Local GHG Inventory Tool
  - o   Gasoline and Diesel fuel use values were prorated to each vehicle category
    - ▪   Other manual adjustments were made to fuel use in particular vehicle categories to help refine the data (i.e., setting diesel use for motorcycles to zero and reallocating diesel use to other categories)

- o VMT values for each vehicle category were estimated by multiplying the assumed fuel use for a particular category by the EPA-default fuel economy (miles per gallon) for that vehicle type.

These assumptions may result in overcounting the VMT, which would cause methane (CH_4) and nitrous oxide (N_2O) emissions estimates to be abnormally high. However, carbon dioxide (CO_2) emissions – the primary greenhouse gas – are influenced only by the volume of fuel combusted. Therefore, the overall GHG emissions for the Mobile Combustion category are most sensitive to the fuel consumption data (i.e., gallons of gasoline, gallons of diesel).

<u>Notes on Sources of Activity Data and Assumptions</u>

Stationary Combustion emissions (for electricity generation) have been determined based on the following:

- Activity Data
  - o Fuel consumed by Commonwealth Utilities Corporation (CUC) for power generation was provided in the form of monthly activity reports from calendar year 2023.
    - Gallons of Ultra-Low Sulfur Diesel
      - Saipan: 18,847,445 gal
      - Tinian: 956,268 gal
      - Rota: 791,817 gal
  - o Fuel consumed by three Saipan hotels that self-generate electricity was provided as a monthly average. This was multiplied by 12 to estimate annual fuel consumption.
    - Pacific Islands Club: 36,000 gallons of Diesel fuel * 12 months = 432,000 gal
    - Hyatt Regency: 46,000 gallons of Diesel fuel * 12 months = 552,000 gal
    - Aqua Resort: 16,000 gallons of Diesel fuel * 12 months = 192,000 gal
  - o Fuel consumed by the Marpi Landfill (Saipan) for on-site electricity generation was provided as an annual estimate of 9,000 gallons of diesel per year.
- Data Sources
  - o CUC
    - CUC Monthly Reports for Saipan, Tinian, and Rota 2023 provided to Tina Sablan via email (April 2024). These reports generally included the following details:
      - Fuel consumption
      - kWh generated
      - Peak demand (MW)
  - o Hotels
    - Survey of the Hotel Association of the NMI (issued by Tina Sablan in March 2024) indicated that three hotels primarily rely on electricity generated on their own site (with CUC as back-up). These hotels provided data on monthly average fuel consumption for power generation.
  - o Marpi Landfill
    - Email via Tina Sablan from CNMI DPW Solid Waste Management Division (4/9/2024).
- Other notes/considerations
  - o GHG emissions calculated from this activity data may not represent all electricity consumption in the territory. Other generators are known to exist, but these are likely to be used primarily as back-up power sources. Between the CUC data and hotel survey responses, it is assumed that a significant portion of emissions from electricity generation are captured in this GHG Inventory.
  - o With only monthly data available for fuel consumption by Hotels, multiplying this data by 12 assumes static (i.e., "flat") load profiles on an annual basis. This assumption is based on another NREL report[76] that states, *"CNMI has a tropical marine climate that is warm and humid with little seasonal temperature variation. The typical dry season occurs between December-June and the rainy season is between July-October. Yearly average temperatures*

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[76] https://www.nrel.gov/docs/fy11osti/50906.pdf

range between 72°F and 84°F ... Due to the temperate climate, there is minimal seasonal load variation."

Mobile Combustion emissions have been determined based on the following:

- Activity Data
  - Fuel consumed for road transportation was estimated using the following process:

Table 4: Data Sources and Methodology for Transportation Fuel Use Assumptions

Step	Description of Data	2022-2023 Average Values	Source
A	Total Diesel Imports	28,798,346 gallons	CNMI Customs (*"Updated Liquid Fuel Tax Assessments (gasoline, diesel, aviation).xlsx"* via email from Tina Sablan 3/27/2024)
B	Total Gasoline Imports	10,913,536 gallons	
C	2023 CUC Fuel Consumption for Power Generation (Ultra Low Sulfur Diesel)	20,595,530 gallons	CUC Power Generation Monthly Reports Jan-Dec 2023 (via email from Tina Sablan 4/2/2024)
D	Approximate volume of diesel fuel consumption for primary power generation at Saipan hotels (Hyatt Regency, Pacific Islands Club, and Aqua Resort)	1,176,000 gallons	Survey of Hotel Association of the NMI, results shared by Tina Sablan via email on 3/26/2024
E	Assumed diesel consumption for transportation (calculated)	7,026,817 gallons	Calculated: *E = A-C-D*

- Lines B and E in the table above are assumed to be the volumes of Gasoline and Diesel consumed for transportation for the purposes of this GHG Inventory.
- These fuel consumption volumes were then broken out by island based on 2020 Census population data:
  - Saipan (92% of population)
    - Gasoline: 10,005,574 gallons
    - Diesel: 6,344,375 gallons = 7,520,375 − 1,176,000 (Line D above)
  - Tinian (4% of population)
    - Gasoline: 471,393 gallons
    - Diesel: 354,308 gallons
  - Rota (4% of population)
    - Gasoline: 436,569 gallons
    - Diesel: 328,133 gallons
- Vehicle and vessel registration data was only available for Saipan and Rota, so the emissions for transportation fuel use on Tinian were calculated based on gross fuel volumes only.
  - For Saipan and Rota, vehicle and vessel registration data were used to break down the gasoline and diesel consumption volumes by vehicle type.
    - CNMI Department of Public Safety Registered Motor Vehicles (2023)
      - Saipan = 21,791
      - Rota = 875

- CNMI Department of Public Safety Registered Marine Vessels (2023)
  - Saipan = 377
  - Rota = 26
- These vehicles and vessels were then grouped according to the vehicle types provided by the EPA calculation tool.
- Each vehicle type category was assigned fuel consumption values for gasoline and diesel, based on prorated portions of the assumed fuel type for each vehicle type.
- Finally, the assumed volumes of gasoline and diesel fuel for each vehicle type were used with EPA average fuel efficiencies (by vehicle type) to determine an assumed VMT.

- Data sources:
  - Fuel consumption:
    - See Table 1 above for data sources and methodology for estimating transportation fuel use volumes.
  - Vehicle registration:
    - CNMI Department of Public Safety 2023 Annual Report of Vehicle Registration
- Other notes/considerations:
  - Several assumptions were made to quantify an estimate of GHG emissions from road transportation in CNMI. More accurate estimates of emissions from road transportation could be achieved with actual fuel sales data and vehicle mileage data (i.e., odometer readings).

Solid Waste emissions have been determined based on the following:

- Activity Data
  - Landfill characteristics, such as the presence (or lack) of landfill gas collection systems
    - Landfills with no LFG collection system were evaluated using the California Air Resources Board's Landfill Emissions Tool using data on annual waste deposited in each landfill.
    - There are no landfills with comprehensive LFG collection systems in CNMI.
- Data sources:
  - Comprehensive Integrated Solid Waste Management Plan for the Commonwealth of the Northern Mariana Islands (CNMI CISWMP)
  - FY21, 22, and 23 Product Summary Report from the CNMI DPW Solid Waste Management Division

Wastewater Treatment emissions have been determined based on the following:

- Activity Data
  - Wastewater treatment plant characteristics, such as the type of treatment applied (aerobic/anaerobic), availability of data on digester gas production, population of citizens served by septic systems, etc.
    - See "Wastewater-Control" tab of *"CPRG PCAP GHG Inventory – CNMI.xlsx"* for more detail.
  - Based on this information, data was entered for the following:
    - Population served by facilities with nitrification/denitrification = 0
    - Population served by facilities without nitrification/denitrification = 30,000
    - Population served by aerobic treatment facilities = 30,000
    - Population served by septic systems = 17,322
- Data sources:

       ○ Wastewater treatment plant data was provided via emails from Tina Sablan (March 14, 2024).

Urban Forestry Carbon Sequestration has been estimated based on the following:

- Activity Data
  - Total acres of forest land in CNMI = 60,207 acres
  - The EPA Community GHG Inventory Tool estimates the carbon sequestration from forestry based on percent of urban area with tree cover, so CNMI data was entered as follows:
    - Total Urban Area = 60,207 acres (~244 km^2)
    - % of Urban Area with Tree Cover = 100%
- Data sources:
  - CNMI State and Private Forestry Fact Sheet 2023

Appendix B

Analysis of Co-Pollutants Produced by Commonwealth Utilities Corporation Generators

Notes Prepared by the National Renewable Energy Laboratory

	AP-42 Chapter 3.3 <600 hp, diesel ind. Engine		AP-42 Chapter 3.4 > 600 hp, diesel ind. Engine		AP-42 Chapter 3.1 diesel turbine		South Coast AQMD LPG turbine/engine	AP-42 Chapter 3.1 natural gas turbine	
	PTE	controlled	PTE	controlled	PTE	controlled		PTE	controlled
	lb/MMBtu		lb/MMBtu		lb/MMBtu		lb/1000 gal	lb/MMBtu	
NOx	4.41		3.2	1.9	0.88	0.24	139	0.32	0.13
CO	0.95		0.85		0.0033	0.076	129	0.082	0.03
SO2	0.29		0.002		0.001515		0.35	0.0034	
PM*	0.31		0.062		0.012		5	0.0066	
PM10	--		0.050						
PM2.5	--		0.048						
VOC/TOC	0.36		0.082		0.00041		83	0.0021	
	N/A		lb/1000 gal		lb/1000 gal		lb/1000 gal	lb/1000 gal	
NOx			0	0	0	0	139	0.00	0.00
CO			0		0.00	0.00	129	0.00	0.00
SO2			0.00		0.00		0.35	0.00	
PM*			0.00		0.00		5	0.00	
PM10			0.00		0.00		0	0.00	
PM2.5			0.00		0.00		0	0.00	
VOC/TOC			0.00		0.00		83	0.00	

Notes:

Emissions were estimated using the equation: *emission factor * activity factor = mass emission*

An emission factor expresses mass emissions of a given air pollutant per unit "activity" for which electricity generation is often heat input of a given fuel (e.g., MMBTU). The activity factor is the amount of activity (e.g., MMBTU combusted) in that year. Multiplying the two achieves an estimate of mass emissions of a given pollutant in a given year. NREL sourced emission factors for this analysis from EPA's standard emission factor handbook, AP-42. These factors are specific to a technology-fuel combination, and if there was not a perfect match for the technology-fuel combination that was provided by CUC, NREL used engineering judgment to select the closest approximate match within the AP-42 handbook. Sometimes other approximations or simplifications were required; some technology-fuel combinations were not emission factors differentiated by PM10 versus PM2.5 so NREL assumed they were equal. CUC provided diesel/fuel oil use for Saipan, Tinian, and Rota used in turbines at each site.

Potential alternate EF for propane/LPG engine or turbine, diesel (micro?) turbine
https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/combustion-emission-factors-2021.pdf
https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/default-combustion-emission-factors.pdf?sfvrsn=12
      https://www.epa.gov/natural-gas-star-program/engine-exhaust

      turbines have lower emissions than engines for same fuel - natural gas may be needed to represent propane turbines

      emission factors for propane are on same scale as diesel engine - higher than turbine. Close to scale for engines, too high for turbines

3%	of VOC are crankcase/slip emissions
0.0015	% ULSD sulfur content (maximum)

*PM=PM10=PM2.5 for several sets of emission factors

600	Hp	0.44742	MW
	All engines are larger than 600 hp = 0.45 MW		
1	MW =	3.412	MMBtu/hr

	Unit Details			Fuel Use		Tons/Year pollutant emissions (uncontrolled)						
						NOx	CO	SO2	PM*	PM10	PM2.5	VOC/TOC
-	MW			turbine								
Saipan	34.5	diesel/fuel oil	turbine	1,623,579	gallons ULSD	100.01	0.38	0.17	1.36	1.36	1.36	0.05
Tinian	3	diesel/fuel oil	turbine	92,815	gallons ULSD	5.72	0.02	0.01	0.08	0.08	0.08	0.00
Rota	2	diesel/fuel oil	turbine	65,386	gallons ULSD	4.03	0.02	0.01	0.05	0.05	0.05	0.00
					Total	109.76	0.41	0.19	1.50	1.50	1.50	0.05

Fuel calculation assumptions = "most recent fuel" worksheet

Emission factors and emission assumptions = "emissions" worksheet