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Roadmap of SUSTAINABLE CACAO DEVELOPMENT in Davao de Oro for 2025-2030, Vision to 2050

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1. BACKGROUND

1.1. Rationale of developing the roadmap

- **Cacao is one of priority commodity crops of Davao de Oro province, Davao region, and the Philippines**: as highlighted at least in the province Commodity Enhancement Plan (2021-2023)[1], Industry Clustering Strategy of Davao Region (2020-2030), High Value Crops Development Program, and the National Greening Program (until 2028).
- **Need for a blueprint to guide sustainable development of cacao industry in the province**. The roadmap will compile and synergize all development initiatives on cacao, associated coordination and collaboration across agencies and industry players, and resource allocation and policy support. It will also set targets and indicators of monitoring and evaluation, to help the province achieve sustainable cacao development.
- **Part of realization of the mandate and commitment of the province's authorities**. For example, PAGRO has a mandate and commitment for sustainable and climate-resilient agriculture and food security, strengthened partnership among stakeholders, and reduced impacts on the environment. The province's Governor has an order to develop integrated farming practices to help achieve agricultural and environmental sustainability. The Provincial Development and Physical Framework Plan 2019-2034 of Davao de Oro which is formalized through Provincial Development Council Resolution 29, series of 2018 seeks to create economic opportunities for its population while preserving the environment's integrity.
- **Support the update of existing plans**. In the current Commodity Enhancement Plan (2021-2023), cacao is among the top five priority commodities of the Davao de Oro province. The roadmap can provide inputs to the updated version of the Plan (2024-2026 or beyond). The Provincial Planning and Development Office is updating the Provincial Development Plan with a possibility to incorporate cacao-related strategies and interventions.

1.2. Definition and significance of sustainable farming and development

- **Sustainable farming practices** reconcile economic profitability, soil and environmental health, and social and economic equity.
- Sustainable farming practices help ensure **sustainable production** which reduces unfavorable impacts on environment while maintaining production level, quality, and safety standards. Sustainable production also uses natural resources efficiently, minimizes waste, and reduces consumption of unrenewable energy.

[1] The extension by the local government is in process.

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- **Sustainable development** helps ensure the present and future generations meet their needs. Sustainable development balances diverse, and often competing, needs with a full awareness of the limitation of and the need to safeguard environmental, social, and economic resources in society.

1.3. Cacao production and potential development in Davao de Oro province

1.3.1. Brief description of the province

- *Geographical and administrative setting*: Davao de Oro province (total land area about 466,693 ha) is in the northeast side of the Davao Region, Southern Mindanao. It has 11 municipalities (with a total of 237 barangays) grouped into two legislative districts: District I comprises Compostela, Maragusan, Monkayo, Montevista, and New Bataan; District II comprises Laak, Mabini, Maco, Mawab, Nabunturan, and Pantukan. Nabunturan is the province's capital located 90 km from Davao city.
- *Demography and ethnic groups*: total population in 2020 was 767,547 people (47.7% female, 62.9% working age between 15-54 years old, median age 24.4 years old). Mansaka is the main ethnic group, with migrants mostly from Cebu, Samar, Bohol, and other provinces in the Visayas region.
- *Land covers, forest protection, and watersheds*: the province has 153,097 ha (32.8%) of Alienable and Disposable (A&D) lands and 313,296 ha (67.2%) of forest lands. Compostela and Mawab municipalities have the smallest areas of forest lands (Appendix 1). The 388,166 ha of the province's Production Land Use (PLU) consists of cropland (50%), production forest (49%), and fishing and pasture area (1%)[2]. Protected areas are in Mabini, Nabunturan, Maco, Maragusan, Pantukan, Monkayo and Compostela municipalities[3]. The province hosts four Key Biodiversity Areas namely, in Monkayo, Mabini, Compostela, and Maragusan[4]. Additional protection areas based on slope and elevation overlap with these KBAs. There are four watersheds: Upper Agusan, Andap, Hijo, and Kingking-Matiao. Upper Agusan is the largest in terms of area (118,780 ha). There are other declared watershed areas under co-management agreements between the DENR and the Upland Development Program and the concerned provincial and municipal governments. The land

[2] The province, through the Regional Development Council (RDC), plans to decrease the total production area into 345,334 ha (42,832 ha decrease) to reallocate into protection forest. On the other hand, production forest is targeted to increase from 192,799 ha to 197,367 ha (4,568 ha increase), and around 55% of it for agroforestry, and the rest for rehabilitation area through the establishment of forest plantation.

[3] Mabini Protected Landscape and Seascape in Mabini, the Mainit Hot Springs Protected Landscape in Nabunturan, Mt. Tagub-Kampili Protected Landscape inn Pantukan and Maragusan, proposed Bahi Mineral Reservation in Pantukan, Lake Leonard Buffer Zone in Maco, Andap Watershed in New Bataan, Diwalwal Mineral Reservation in Monkayo and Compostela, and the Aliwagwag Protected Landscape in Compostela. Davao Region currently has 56,800 ha of protected forest areas and additional 44,456 ha has been proposed as additional protection areas (namely, areas with elevation of more than 1000 masl and slope steeper than 50% that are currently partly utilized for other land uses, mostly croplands).

[4] Bislig in Monkayo, Mabini Protected Landscape in Mabini, Mts. Atuuganon and Pasian in Compostela, and Mt. Kampalili-Puting Bato in Maragusan.

covers of Davao de Oro province in 2022 and protected areas are illustrated in Appendix 2.

- *Main crops and production*: by 2023, in terms of harvesting area, the five main crops of the province are corn (37,731 ha), coconut (36,996 ha), banana (33,198 ha), paddy rice (31,641 ha), and cacao (6,462 ha). In terms of the market value: paddy rice (~PHP 2.7 billion), corn (~PHP 998 million), abaca (~PHP 901 million), coconut (~PHP 883 million), while cacao was currently the 7th (~PHP 163 million).

1.3.2. Current contribution of cacao to the province's agriculture sector

- *Production areas and productivity*: based on the enhanced land cover map from the SFITAL project, the municipalities with the largest area of cacao cultivation in 2021 were New Bataan and Pantukan namely, ~1,805 ha in total for the two municipalities (Appendix 3). By 2021, a total of 4.95 million cacao hills planted in the province[5], and around half were bearing fruits. Two municipalities with the most bearing cacao shrubs were New Bataan and Nabunturan (Appendix 3). In terms of productivity, the highest was in Mabini (2.4 kg/tree or 0.67 ton/ha), and the lowest was in Laak (0.2 kg/tree or 0.02ton/ha). Difference in productivity level relates to, for example, management practice, tree age, soil and local weather condition, and planting densities. Most cacao cultivation in the province accommodate banana, coconut, fruit trees (rambutan, durian, lanzones, mango, etc.), and rubber.
- *Income share to agricultural sector*: no information is available regarding income generated by the whole cacao industry in the province[6].

1.3.3. Existing plans of cacao development in the province

At least there are four:

- The Philippine Cacao Industry Roadmap. Enacted in 2022 by the Department of Agriculture.
- Davao Region Industry Cluster Roadmap Updated Action Plans, 2020-2030. Enacted in 2019 by the Regional Development Council XI.
- Provincial Commodity Enhancement Plan 2021-2023. Enacted in 2021 by the Provincial Government of Davao de Oro.
- Three-Year Strategic Plan for 2022-2024. Enacted in 2022 by the Provincial Cacao Council.

[5] Source: Local Government of Davao de Oro (2021). Management Information System, cited by Provincial Agriculture Office. (2022). Cacao Industry Situationer [PowerPoint presentation].
[6] The available information from the Philippine Statistics Authority is only for dry cacao beans: in 2022, the income generated from the production of dry cacao beans in Davao de Oro province amounted to PHP 6.14 million, constituting only 0.022% of the total earnings from the crop sector in Davao de Oro.

1.3.4. Main issues of cacao production and development in the province

A. Related to farm location

- **No clear designated zones for cacao production**. Although at the national level, the Philippine Rural Development Project has helped identify the top-ranking municipalities with high potential for cacao production[7], the province has no clear designated zones for cacao production. This hampers efficient allocation of support and resource for cacao and limits the achievement of economies of scale.
- **Scattered cacao farms in some municipalities complicates consolidation**. Cacao production hotspots[8] in the province are primarily in New Bataan, Maragusan, and Nabunturan municipalities, and to some extent in Pantukan, Mabini, Maco, and Mawab. In some municipalities like Laak, Monkayo, Montevista, and Compostela, cacao farms are relatively scattered with 40-47 km distance among the farms.
- **Proximity to chemical-intensive farms of other crops** such as banana, rice, and corn might prevent cacao farms from getting a certification of product quality standard such as PhilGAP.

B. Related to management practices and productivity

- **Poor management practices have led to low productivity**. Factors such as varietal incompatibility, low quality planting materials, excessive shading in the farm, increased pest and disease risk, lack of rejuvenation practices, low pollinator populations, exacerbated by unpredictable and extreme weather conditions, have contributed to low cacao farm productivity and overall cacao production in the province. Limited access to high-quality planting materials also influences farmers to depend on the varieties of planting stocks that are readily available.
- **Inadequate soil and water conservation practices.** Many cacao farms in Davao de Oro are situated on steep slopes (more than 30% slope) that are susceptible to soil and nutrient losses and unregulated water supply. Farmers lack the necessary techniques for soil and water conservation to mitigate losses and address drought conditions effectively.
- **High input cost.** Farmers are being demotivated to consistently apply inputs due to the low productivity and aggravated by the high costs of commercial fertilizers and pesticides and low price of beans. Moreover, limited knowledge and labor resources further impede their ability to utilize less-costly farm inputs such as natural fertilizers and pesticides.
- **Emission from farm inputs.** With the current rate of input use by the cacao farmers, the estimated greenhouse gas (GHG) emission is 0.16 ton $CO2_e$9 per ha of cacao farm

[7] The potential areas were determined based on several weighted vulnerability and suitability criteria: volume of production (15%), number of farmers (10%), total production area (20%), and poverty incidence (5%). The order from highest to the lowest potential are: Compostela, Laak, Montevista, Maragusam, Mawab, Nabunturan, Maco, Pantukan, Monkayo, Mabini, and New Bataan.
[8] Hotspots are cacao areas that tend to cluster within 1x1 km grids.
[9] Based on the estimation by the World Agroforestry (ICRAF). Farmers in Davao de Oro commonly use ~52 kg/ha of ammonium phosphate (18-46-0), ~142 kg/ha of complete fertilizer (14-14-14), ~53 kg/ha of muriate of potash (0-0-60), ~94 kg/ha of sodium chloride, and ~4.5 L/ha of herbicide. GHG emission contributes to climate change which negatively affects agriculture through the

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or about 1,005 ton CO2e for the whole province from a total of 6,372 ha of cacao farms.

C. Related to human resources

- Low interest of young farmers to engage in cacao production business.
- Insufficient knowledge on agroecological practices: cacao farmers in the province have generally limited knowledge and technical skills in implementing agroecological practices namely farming practices which aim to make cacao farms more environmental-friendly and climate resilient10.
- Absence of farm record-keeping reduces the ability of cacao farmers to apply for certification of Good Agricultural Practices. In addition, lack of entrepreneurial skills restricts their decisions regarding what to sell, where to sell, and how to sell.

D. Related to market and value chains

- **Absence of centralized market information** poses challenges for both farmers and buyers in optimizing their activities[11].
- **Poor access to fermentation facilities** prevents farmers to consistently produce high quality fermented dry beans.
- **Limited value addition of cacao products from smallholder farmers**. Income of many cacao farmers is mainly from selling wet or dry beans.
- **Challenges in complying with quality standard**. The capacity of farmers, traders, and processors needs to be enhanced to comply with quality standards and cacao production and processing protocols.

E. Related to institutions

E.1 Financial institutions

- **Absence of institutions that can assist farmers in accessing capital investments** to enhance their production and post-harvest practices.
- **Poor access to insurance services**. Farms affected by climate threats such as drought and infestations are often not covered by insurance services, leaving them vulnerable to production risks.
- **Obligation for payback installment**. Farmers surely need to return loans to input suppliers even when they failed to make profits.

E.2 Agricultural extension services

- **Lack of close mentorship programs** for farmers apart from the formal trainings offered by the local government and private organizations. After trainings sessions, there is no follow up and continuous program that can help address current challenges faced by farmers.

alteration of weather patterns and pest and disease dynamics. The demand for inputs like fungicides and pesticides will increase alongside the intensification of extreme climate conditions. Reducing GHG emissions by minimizing chemical usage serves as both a mitigation and adaptation strategy to counteract climate change.

[10] Examples of agroecological practices are integrated pest and disease management, appropriate nutrient application, effective shade management, crop diversification (spatially and temporally), and soil and water conservation practices.

[11] For instance, buyers lack information about the availability and sourcing locations of beans. Some institutional buyers are discouraged from visiting villages due to unpredictable supply availability upon arrival. Similarly, farmers are uncertain of the buyers' visit schedules to their villages, leading them to sell to whoever approaches, often at varying prices.

- **Farmers lack knowledge and technical support to adhere to Good Agricultural Practices** such as information on compliance requirements, certification benefits, traceability, and assistance with the application process.

E.3 Cooperatives and farmer associations

- **Lack of farmer clustering** makes each farmer needs to manage their own post-harvest process[12]. Even though other farmers adhere to recommended post-harvest processes, their beans are still bought at similarly low prices. The buyers consolidate the beans, regardless of whether they are properly fermented or not.
- **Lack of coordination among farmers** prevents them from jointly investing in a communal processing facility. Furthermore, buyers hesitate to visit villages due to unreliable supply and given the poor farm-to-market roads.

E.4 Research Institutions

- **Limited research publications** on techniques for enhancing productivity in general and resilience to pests and diseases that are adaptive to effects of climate change.
- **Lack of collaboration and coordination** among research institutions, public and private sector, and farmer's cooperatives.

2. SCOPE AND APPROACH FOR DEVELOPING THE ROADMAP

2.1. Sectoral and temporal scope

- All relevant stakeholders in the province to include private sector and multi-sectoral government institutions (e.g., forestry, agriculture, infrastructure, etc.), farmers' associations and cooperatives, non-government research and development organizations, etc. are involved in developing this roadmap.
- This roadmap will outline the strategies and interventions for cacao development in the Province of Davao de Oro for 2025-2030, with a vision to 2050.

2.2. Principles and conceptual framework

- The roadmap is developed with three main principles: inclusive, integrative, and informed. The roadmap is ***inclusive*** because it involves and accommodate inputs from all relevant stakeholders in the provinces; ***integrative*** because it considers various existing plans to include spatial plans, and sectoral plans to avoid siloed processes; and ***informed*** because the roadmap uses reliable sources of data, and all

[12] With relatively small landholdings, farmers often neglect the recommended post-harvest processing steps to ensure high bean quality (e.g., bean extraction, fermentation, drying, sorting, and bagging). They store and accumulate the extracted beans in bags before selling the beans to traders with no have regular schedule of purchasing from farmers. As a result, the beans are often sold at lower prices.

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relevant stakeholders are well informed throughout the development and completion process.

- The roadmap development applies a **landscape approach**: cacao production areas and industry in the province need to consider other land uses e.g. production of other main crops, forest cover and connectivity to help ensure the maintenance of ecosystem services and biodiversity, and protection areas for safeguarding natural resources.

2.3. Methodological framework and assessment tool

- The development of the roadmap is carried out in four stages: ***participatory data collection*** (about cacao farmers and production in the province, key issues, available information to include spatial information for landscape assessment, and policy regulations and support), ***participatory planning and assessment*** (identify vision and objective setting, strategies and interventions for development, and projection of impacts of the strategies and interventions), ***prioritization and financing*** (prioritization of the strategies and interventions based on urgency and capacity for implementation and associated timeline, estimation of investment costs, and exploration of possible sources of financing), and ***launching and implementation*** (integration into current policy framework of the province, launching to alert broaden audience and to start implementation).
- Unique features of the roadmap include the use of **spatially explicit and computer-based simulation tool and trade-off analysis**[13] for scenarios of cacao development in the province. The tool provides ex-ante projections of socio-economic and environmental impacts of each scenario which can help local stakeholders to better understand future risks and opportunities for decision making.
- The four stages are implemented through preparation phase and four planning workshops with all relevant local stakeholders in the province.

[13] The tool used for the projection and trade-off analysis is R-FALLOW (Forest Agroforest Low Value, Landscape or Wasteland?) simulation model developed by the World Agroforestry (ICRAF). The model can handle input maps and available online: https://rfallow.agroforestri.id/. The user's manual of the model is available at https://cacaomustahan.com/r-fallow-users-manual/.

3. VISION, STRATEGIES, AND INTERVENTIONS

3.1. Vision

- The National Cacao Roadmap (2021-2025) has a vision "A globally competitive and sustainable Philippine Cacao and Chocolate Industry built on a strong Philippine Brand of quality cacao."
- The vision for agricultural sector of Davao de Oro province as stated in the Commodity Enhancement Plan "A dynamic organization committed to achieve maximum production and sustainable agriculture for Davao de Oro Province through appropriate farming technologies supported by leaders anchored on the principle of environment friendly and rational utilization of resources."
- Based on the perspectives of local stakeholders in the planning workshops, the **proposed vision of cacao industry in the Davao de Oro province** is "globally competitive cacao industry founded on environmental and landscape sustainability, empowered cacao growers and entrepreneurs, profitable business ventures, and transparent and inclusive governance."

3.2. Strategies

- The National Cacao Industry Roadmap (2021-2025) identifies six development directions which are needed to be considered in the implementation of the roadmap namely, (1) **Expansion of production areas** in areas suitable for cacao growing based on the climate and soil suitability map, (2) Increase in **fermented bean productivity level**, (3) Moving up of the cacao **industry value chain**, (4) Strengthening of **market presence through branding**, (5) Focus on **fine flavor beans market**, and (6) Apply the principle of **clustering, localization and market demands**.
- The main strategy to achieve prosperity or economic development of all sectors as outlined in the Province's Commodity Enhancement Plan is to ensure sustainable and vibrant local economy through (1) Improving **market accessibility**, (2) Improving **agricultural productivity** such that improving farms and rural enterprises, (3) providing opportunities for **private sector investment** in agri-industrial production, and (4) Improving **value chain**.
- The proposed strategies for the current roadmap aim to ensure that rural landscape of Davao de Oro province could generate economic benefits from cacao and other commodity crops, while maintaining ecosystem services to include biodiversity and safeguarding natural resources to include forest areas. The strategies also aim to address multiple issues related to the cacao industry in the province described earlier. Based on the strategies outlined in the existing plans and inputs from local stakeholders gathered through the planning workshop, there are **five proposed strategies**:

(1) Sustainable land use allocation for cacao production

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This strategy is to ensure that the selection of cacao production areas in the province considers e.g. land suitability and risk to climate threats and synergizes with other land uses related to other commodity crops and forest protection, as outlined in the existing development plans for Davao De Oro. This strategy also emphasizes the need to rejuvenate old and unproductive cacao farms through co-investment schemes involving the private and public sector.

(2) Improve access of the cacao farming community to livelihood capitals

This strategy will increase the capacity of the cacao farming community in cacao production and post-production. It can be achieved through improving e.g. facilitation for cacao farmers to receive effective extension service and access to information regarding e.g. cacao production and post-production with increasing participation of women and youth (*human capital*), access to crop insurance (*social capital*), access to farm inputs to include quality planting materials, processing facilities and market (*physical capital*), natural resources to include source of water for irrigation (*natural capital*), and co-investment or financing support to establish and maintain cacao farms and production facilities (*financial capital*).

(3) Increase productivity and income diversification of cacao farms

This strategy aims to help ensure that cacao farmers are not severely affected by increasing production costs due to e.g. lack of supply or inflation, market uncertainty e.g. fluctuating cacao price influenced by global supply and demand, and uncertainty in climate condition exacerbated by climate change. To achieve such a resilience, it is important to promote cacao agroforestry and agroecological practices for more environmental-friendly and climate resilient cacao farms. This strategy also emphasizes the need of increasing the awareness, interest, and capacity of cacao farming community to adopt 'safe' agricultural practices or to meet product quality standard such as PhilGAP.

(4) Sustainable improvement of supply and market value chain

This includes the need to improve governance, connectivity, fairness, and transparency of supply and market value chain. As part of building transparency, the cacao sector of the province should gradually be transformed into a more digitalized sector. In addition, increasing interest of cacao farming community to produce quality cacao beans is also part of sustainable developing supply and market value chain. Increasing such an interest will need providing incentives such as higher market price or better access to current market.

(5) Incentivize ecosystem services generated at farm- and landscape scale

Ecosystem services include water provision, carbon storage, and biodiversity. Incentives for such services, either from public or private sector, will encourage farmers and local communities to protect environment through better

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management of crops, livestock, forests, and conservation of endangered flora or fauna species and their habitats.

It is worth to underline that, effective implementation of all these strategies and associated interventions (Section 3.3 below) will require close **coordination and negotiation among relevant sectors and stakeholders in the province to include the Cacao Industry Council** and strong **policy support**.

3.3. Interventions

The proposed interventions below have integrated those outlined in the Philippine Cacao Industry Roadmap, Davao Region Industry Cluster Roadmap, Provincial Commodity Enhancement Plan, and inputs from the SFITAL's planning workshops. In addition, the interventions address multiple issues regarding cacao production and development in the province described earlier in Section 1.

Strategy 1: Sustainable land use allocation for cacao production

There are four interventions:

(1) Designate main **cacao production areas** and identify possible **areas for expansion of cacao farms** to include areas for rejuvenation. The proposed areas should consider land suitability and risk to climate threats, cacao consolidation points, and synergize with land use plans of other commodity crops and forest uses, either for production or protection.
(2) Develop **recommended models of cacao farms and suitable crop components** to reconcile economic and ecological benefits that can be derived from the farms.
(3) Produce an **integrated land use map** at municipality or province scale which clearly illustrates the possible areas for new cacao farms and areas for rejuvenation.
(4) As part of the effort in producing the integrated map, assess **economic and ecological impacts of several land use scenarios** at municipality or province scale and conduct trade-off analysis to help understand associated risk and benefits for decision making.

Strategy 2: Improve access of the cacao farming community to livelihood capitals

There are seven interventions:

(1) Improve **extension service, access to centralized information, and mentorship program** for cacao farming community, including women and youth, regarding e.g. cacao production and post-production, market opportunities, available training programs, and climate information.
(2) Assist cacao farming community to better access **crop insurance**, especially those living in the areas prone to climate hazards.
(3) Improve **access to farm inputs** to include quality planting materials (multiple cacao varieties, grafted seedlings, etc.), by e.g. strengthening collaboration with private enterprises.

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(4) Revive the function and improve access of cacao farming community to **processing facilities** such as consolidation, drying, fermentation equipment, etc.
(5) Improve **water management system and contribute to forest protection** programs to help safeguard natural to include water resources.
(6) Develop **co-investment scheme and improve access to financing support** to help cacao farming community establish and maintain cacao farms and production facilities.
(7) Facilitate **transformation of farmers' groups into cooperatives** and encourage cacao farmers to join the cooperatives for a possibility to improve access to the livelihood capitals.

Strategy 3: Increase productivity and income diversification of cacao farms

There are eight interventions:

(1) Promote **cacao agroforestry and agroecological practices** through extension services, high school, college or university curriculum, training manuals, demonstration farms, and develop associated training program (e.g., farmer field schools (FFS) and package of technology (POT)).
(2) Strengthen capacity development program for cacao farming community to increase adoption of **good agricultural practices**.
(3) Strengthen collaboration with e.g. private enterprises or research and development institutions for **quality planting materials** including multiple cacao varieties or those more resilient to climate threats such as drought-tolerant varieties.
(4) Develop and implement plans, to include co-investment plan, to **rejuvenate old and unproductive cacao farms** and ensure long-term maintenance of rejuvenated or new cacao farms.
(5) In collaboration with the private sector, Cacao Industry Councils, and cooperatives, provide more **consolidation points in strategic locations** to improve access of cacao farming community to those points.
(6) Improve the knowledge and technical capacity of cacao farming community in **bean classification and grading**.
(7) Improve **financial literacy** of cacao farming community to include women and youth.
(8) Improve access to **new technology, facilities and infrastructure** which can help increase productivity, facilitate post-harvest handling, and **add values to cacao products**.

Strategy 4: Sustainable improvement of supply and market value chain

There are five interventions:

(1) Strengthen collaboration between public and private sector to include the Cacao Industry Council to develop and implement a **reliable traceability system** with

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associated training programs for cacao farming community and improve the ability of farmers in **farm-record keeping**.

(2) Improve **entrepreneur skills** of cacao farming community including women and youth to increase their ability in finding new market opportunities.

(3) Improve **governance, connectivity, fairness, and transparency** of supply and market value chain by strengthening collaboration between public and private sector to include Cacao Industry Council.

(4) Gradually develop **digital platforms** which can also increase the interest from youth to cacao agribusiness.

(5) Provide **market incentives** such as higher market price or better access to current market for 'safe' or higher quality cacao beans.

Strategy 5: Incentivize ecosystem services generated at farm- and landscape scale

There are three interventions:

(1) **Reward mechanism** for farmers adopting cacao agroforestry and agroecological practices which contribute to generating ecosystem services such as carbon storage and biodiversity at farm or larger scale.

(2) Strengthen collaboration with research institutions for possible **quantification of ecosystem services** such as water provision, carbon storage, and capacity of the landscape to conserve biodiversity.

(3) Identify opportunities for e.g. **carbon or biodiversity credit** both from potential investors within and outside the county.

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APPENDICES

Appendix 1. Area coverage per land classification in Davao de Oro province

Municipality	Land area (ha)	Area coverage per land classification (ha)			
		A & D	Forestlands	% Share of A & D	% Share of forestland
Compostela	18,750	11,872	6,878	63.32	36.68
Laak	94,706	20,819	73,887	21.98	78.02
Mabini	41,225	7,892	33,333	19.14	80.86
Maco	24,440	8,105	16,335	33.16	66.84
Maragusan	39,429	11,766	27,663	29.84	70.16
Mawab	16,952	9,997	6,955	58.97	41.03
Monkayo	69,289	24,513	44,776	35.38	64.62
Montevista	26,500	11,325	15,175	42.74	57.26
Nabunturan	24,529	11,851	12,678	48.43	51.57
New Bataan	68,860	20,079	48,781	29.16	70.84
Pantukan	42,013	14,878	27,135	35.41	64.59
Total	466,693	153,097	313,596	32.80	67.20

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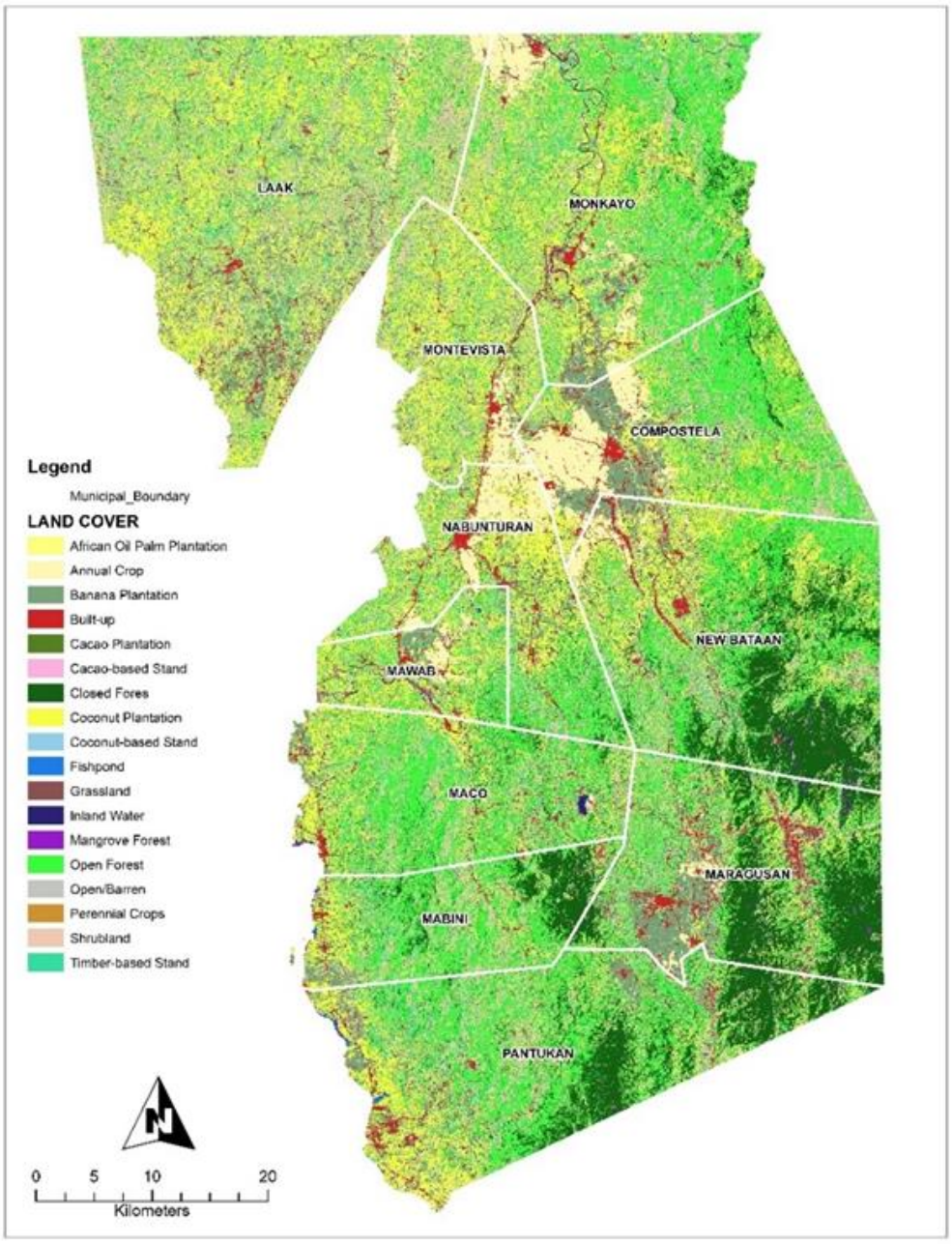
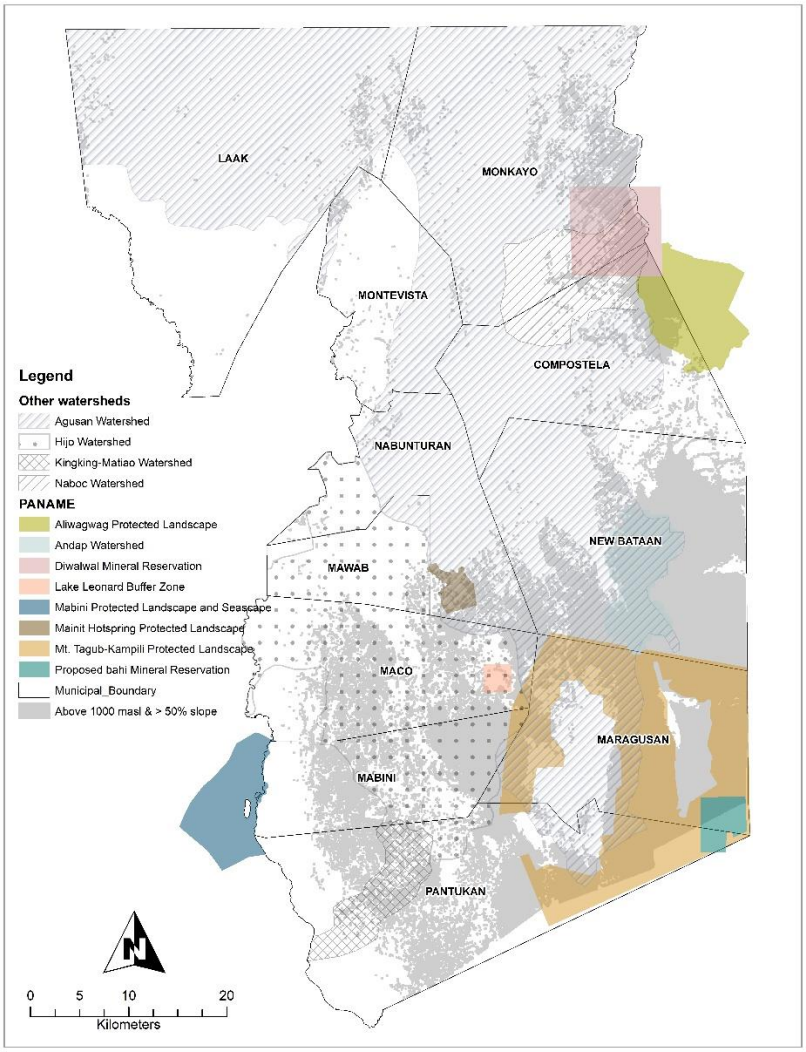
Appendix 2. Land covers of Davao de Oro province in 2022 and protected areas

Land covers of Davao de Oro province in 2022



Protected areas in Davao de Oro province



Appendix 3. Cacao production profile of Davao de Oro province

Municipality	No. of farmers	No. planted (hills)	Bearing trees (hills)	Total area (ha)*	Potential area (ha)	Production (MT)*
Laak	1,542	768,006	281,666	764.94	2,038	12.93
Maragusan	No data	750,800	283,000	750.80	1,430	318.40
New Bataan	1,708	619,890	568,950	904.72	---	84.56
Nabunturan	680	480,000	395,500	854.00	805	42.00
Maco	No data	477,500	204,506	756.00	2,300	147.24
Pantukan	342	457,975	191,975	901.95	420	215.97
Montevista	No data	391,150	96,735	621.00	255	11.79
Monkayo	1,269	358,500	220,000	704.00	468	23.51
Compostela	835	241,030	137,650	335.66	101	19.10
Mawab	300	210,961	101,900	510.26	135	12.74
Mabini	758	197,140	106,645	382.40	116	255.18
Total	--	4,952,952	2,588,527		8,068	1,143

Source: MAO of Nabunturan (2021), *Data source is DTI (2021)

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