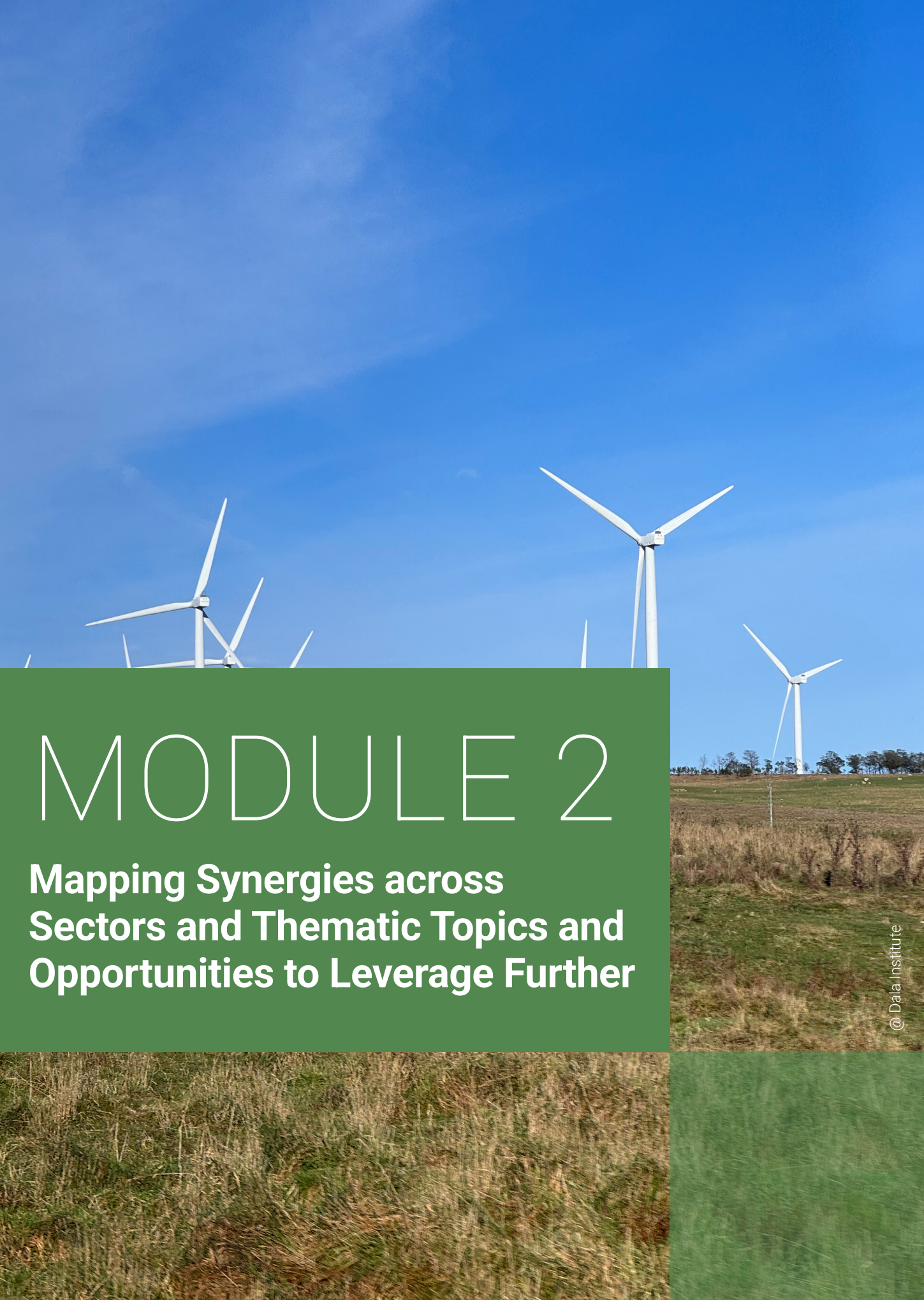


The background of the slide is a photograph of several white wind turbines in a grassy field under a clear blue sky. The turbines are positioned at different distances, with one prominently in the center-right. The foreground shows a field of tall, dry grass. A dark green horizontal band is overlaid on the middle of the image, containing the title text.

MODULE 2

**Mapping Synergies across
Sectors and Thematic Topics and
Opportunities to Leverage Further**

As outlined in Module 1, Indonesia has developed an energy planning framework through the National Energy Plan (RUEN) at the national level and the Regional Energy Plan (RUED) at the provincial level. However, significant gaps remain in how these energy plans are integrated with broader development planning frameworks and also how sectoral integration is coordinated for mainstreaming renewables, i.e., weak horizontal linkages for renewable energy planning and implementation at a sub-national level.

Limited Inclusivity: Gender and youth considerations are rarely mainstreamed into energy planning, despite their relevance for workforce development and empowerment. This reduces the potential workforce, weakens community ownership, and increases project risk.

These challenges are significant because they influence the extent to which energy can effectively support sectoral development priorities.

2.1 Key Challenges

Siloed Planning: RUEDs often remain confined within energy agencies and are not embedded into planning cycles for agriculture, industry, transport, or workforce development. This limits the transformative potential of energy as a cross-sectoral enabler.

Missed Synergies: Opportunities such as aligning solar irrigation with agricultural targets or integrating renewable energy into industrial zones are under-leveraged.

Budget Disconnects: Lack of coordination between RUEDs and RPJMDs means energy priorities are not reflected in budget allocations or implementation strategies. This weakens the ability of sub-national governments to mobilize resources, attract investment, and deliver energy-linked development outcomes.

2.2 Why Integration Matters?

RE acts as a cross-sectoral enabler of transformation across multiple development priorities. Integrating renewable energy with the key provincial development sectors helps reduce costs, improve productivity, strengthen resilience, and expand socio-economic opportunities. The sectors highlighted below are representing South Sulawesi's major production systems and the thematic support systems needed to enable sustainable and inclusive energy adoption. To support OPD in identifying their respective roles within the energy transition agenda, Figure 2.1 outlines the key sectors that hold potential synergies with renewable energy development in South Sulawesi. Meanwhile, Figure 2.2 shows cross-cutting thematic sectors that enable skills, governance, and system readiness for scalable, inclusive and sustainable RE integration.

Figure 2.1

Production sectors – Renewable energy as a driver of productivity and economic transformation

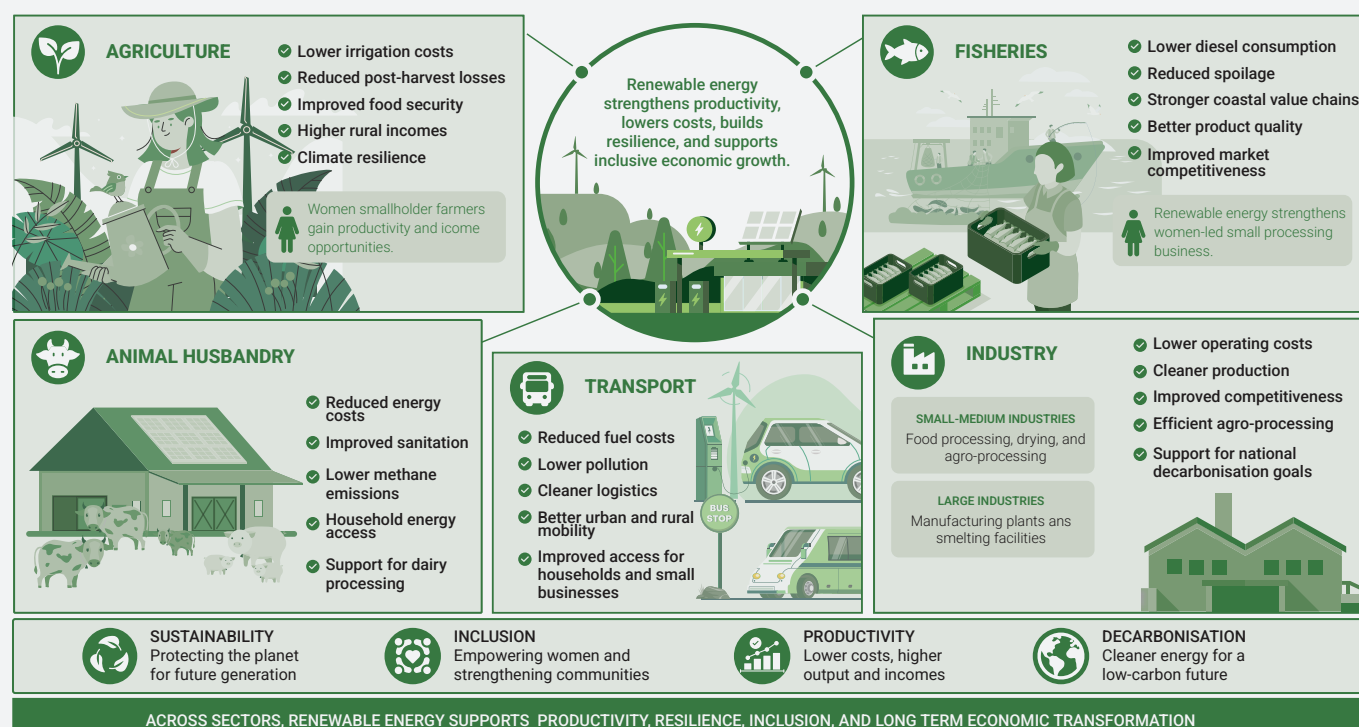


Figure 2.2
Sectors that enable scalable, inclusive and sustainable RE integration



Unlocking the socio-economic benefits requires strong and deliberate coordination across sectors and levels of government. Renewable energy intersects with production sectors—agriculture, fisheries, livestock, industry, and transport—but its full value can only be realised when supported by cross-cutting systems such as vocational training, gender-responsive programming, spatial planning, local governance, and MSME development. In Indonesia’s decentralized governance structure, sub-national (provincial, regency, subdistrict and village) governments play a critical role in planning and implementation in aligning these sectors.

Strengthening these institutional linkages ensures that renewable energy is not treated as a standalone technical solution, but as a strategic driver of productivity, inclusivity, and sustainable regional development. It is a strategic imperative for Indonesia’s decentralized governance. When energy is effectively integrated into cross-sectoral planning, local governments can strengthen policy coordination, improve the efficiency of resource utilization, and expand the economic development impacts at the local level.

To illustrate the types of cross-sectoral integration that improved coordination can unlock, the following table (Table 2.1) presents a structured overview of synergy opportunities between energy and other key development sectors. It highlights how renewable energy can be integrated across the production sectors and thematic supporting sectors to unlock productivity, sustainability, and inclusive development outcomes. Each row outlines:

- › Sectors involved and examples of activities where renewable energy can be deployed.
- › Key sectoral benefits, including cost savings, productivity gains, and environmental improvements.
- › Foreseen cross-cutting coordination mechanisms, such as joint planning or supportive policies.
- › Development impacts, such as rural income growth, job creation, and gender empowerment.
- › Stakeholders, though not yet fully detailed, indicate the need to clarify technical and thematic supporting roles and responsibilities.



Table 2.1
Opportunities for Regional Cross-Sectoral Development Synergy

Sector	Agriculture	Fisheries	Animal Husbandry	Industry	Transport
Example of RE uses / activities	› Solar-powered irrigation and agro-processing › Cold storage powered by solar › Bioenergy from agricultural waste	› Solar-powered cold storage for fish preservation › Solar-powered ice-making machines › Solar-powered aerators for aquaculture › Solar/hybrid systems for small-scale fish processing units	› Biogas digesters using livestock waste (e.g., cow/buffalo manure) › Solar-powered water pumps for livestock drinking water › Solar-powered ventilation and lighting for barns › Hybrid RE systems for small-scale dairy processing or feed production	› Rooftop solar PV for small and medium industries. › Solar-powered or hybrid RE systems for drying, milling, cooling, or heating processes. › Biomass/biogas systems using agricultural residues. › Energy efficiency and energy management improvements for SMEs. › Identification of RE potential for larger-scale captive power options in industrial zones.	› Electric two-wheelers and three-wheelers for urban logistics and deliveries. › Electric buses for BRT corridors and city transport. › -Solar-powered charging public stations. › Integration of RE into port operations (shore power, cold storage). › Hybrid solar–battery systems for small fishing or river transport vessels.
Key benefits	› Lower irrigation cost › Reduced post-harvest loss › Higher crop productivity › Stable cold-chain for perishables › Increased rural income.	› Reduced spoilage › Higher hygiene and ice reliability › Lower diesel dependency › Improved coastal value-chain competitiveness	› Lower feed/water pumping cost › Reduced methane › Cleaner barns › Stable dairy cooling › Improved livestock health	› Lower energy cost › Higher process reliability › Cleaner production › Reduced waste heat › Improved product standards	› Lower fuel cost › Cleaner air › Reliable cold-chain mobility › Safer logistics › Improved port/terminal efficiency
Technical stakeholders	› Agriculture Agency (provincial/ city/regency) › -Energy Agency (provincial) › Bappelitbangda /Bappeda (provincial/ city/regency) › Subdistrict governments › Village governments	› Marine & Fisheries Agency (provincial/ city/regency) › -Energy Agency (provincial) › Bappelitbangda /Bappeda (provincial/ city/regency) › Subdistrict governments › Village governments	› Animal Husbandry Agency (provincial/ city/regency) › -Energy Agency (provincial) › Bappelitbangda /Bappeda (provincial/ city/regency) › Subdistrict governments › Village governments	› Industry & Trade Agency (provincial/ city/regency) › -Energy Agency (provincial) › Bappelitbangda / Bappeda (provincial/ city/regency) › Subdistrict governments › Village governments	› Transportation Agency (provincial/ city/regency) › -Energy Agency (provincial) › Bappelitbangda /Bappeda (provincial/ city/regency) › Subdistrict governments › Village governments

Table 2.1 Continuation

Sector	Agriculture	Fisheries	Animal Husbandry	Industry	Transport
Foreseen cross-cutting thematic coordination (applies to all sectors)	Energy (technical coordination)				
	› Alignment between ESDM and productive sectors on RE technical standards (solar pumps, cold-chain, biogas, EV charging). › Joint O&M guidelines & troubleshooting support for small-scale RE systems. › Coordination with PLN for hybrid / mini-grid readiness where needed. › Development of monitoring systems for the utilization and performance of renewable energy technologies to support program evaluation and cross-sectoral learning.				
	Environment				
	› Integration renewable energy development with regional climate change mitigation and environmental management programs. › Utilization renewable energy to support regional greenhouse gas emissions reduction efforts.				
	Education & Workforce				
	› Integration of RE O&M and safety modules into TVET, vocational schools, and polytechnics. › Joint technician certification (PV, biogas, solar pumps, cold-chain, EV). › Co-financing via education/skills budgets, not solely energy budgets. › Sector–education alignment so skills match deployment scale and locations.				
	Gender & Inclusivity				
	› Inclusion of youth and women groups in RE O&M and productive-use training. › RE services designed to reduce labour burden and improve income control (solar dryers, cold storage, EV fleets, biogas processing). › Women-only cohorts to increase retention in technical roles. › Outreach, assessments, and oversight on the socioeconomic impacts of renewable energy programs implemented by other OPDs.				
	Local governance				
	› Village Funds & BUMDes used for service-based O&M models (solar pumps, cold storage, EV charging). › Legal alignment for village-level RE budget allocation. › Regency governments integrate RE in RPJMD/Renstra. › Clear ownership setup: village-owned RE assets, community-managed O&M.				
	MSMEs & Cooperatives				
	› Cooperative-based RE productive hubs (drying, cold-chain, dairy processing) › Government MSME upgrading schemes include RE productivity budgets › Development of renewable energy financing schemes for productive sectors through collaboration between local governments, regional banks, and financing institutions.				
	Spatial planning				
	› Sectoral-RE siting reflected in RTRW/RDTR › Prevents land-use conflicts and accelerates deployment through clear permitting. › Ensures climate-responsive land allocation linked with food supply, coastal resilience, and rural logistics.				

Table 2.1 Continuation ►

Table 2.1 Continuation

Sector	Agriculture	Fisheries	Animal Husbandry	Industry	Transport
Cross-cutting development impacts (applies to all sectors, entry points for alignment with regional planning)	Energy				
	› Improved reliability and uptime of small-scale RE systems.				
	› Reduced diesel dependency and operational costs across productive sectors.				
	› Lower energy costs for production activities in productive sectors.				
	Environment				
	› Reduced cumulative and annual greenhouse gas (GHG) emissions				
	› Improved Environmental Quality Index				
	› Reduction of local air pollution.				
	Education & Workforce				
	› Increase in the number of locally certified workers in renewable energy technologies.				
	› Higher absorption of vocational education graduates into energy-related jobs or productive sectors utilizing renewable energy.				
	› Strengthened alignment between vocational education curricula and skill demands in the regional energy and productive sectors.				
	Gender & Inclusivity				
	› Increased participation of women and youth in technical training and renewable energy-based economic activities.				
	› Growth in income from enterprises managed by women's groups or vulnerable groups through the use of renewable energy technologies.				
	› Greater involvement of women in technical roles, business management, or decision-making within energy-based economic activities.				
	› Availability of data and learning on the social and economic impacts of renewable energy utilization to support more inclusive regional policy planning.				
	Local governance				
	› Increase in the number of renewable energy systems sustainably managed by villages, village-owned enterprises (BUMDes), or community groups.				
	› Establishment of clear asset ownership, operation, and maintenance mechanisms for renewable energy systems at the village or community level.				
	› Improved coordination between local governments and village governments in planning and utilizing renewable energy for productive activities.				
	MSMEs & Cooperatives				
	› Improved productivity and product quality of MSMEs through the use of renewable energy technologies.				
	› Reduced energy operational costs for MSMEs and agro-processing or fisheries processing businesses.				
	› Increased production volume or value addition for MSME products utilizing renewable energy technologies.				
	› Expanded access of MSMEs to financing schemes for renewable energy technology investments.				
	› Spatial planning				
	› Integration of renewable energy development sites into spatial plans (RTRW and RDTR) to support sectoral economic activities.				
	› Reduced land-use conflicts through clearer spatial allocation for energy infrastructure and productive activities.				
	› Improved rural logistics efficiency and distribution of production outputs through more reliable energy availability				

Table 2.1 Continuation ►

◀ Table 2.1 Continuation

Sector	Agriculture	Fisheries	Animal Husbandry	Industry	Transport
Thematic stakeholders (applies to all sectors)	Energy				
	› Energy Agency (provincial)				
	› Regional PLN				
	› Regional IPPs				
	Environment				
	› Environment Agency (provincial/city/regency)				
	Education & Workforce				
	› Education Agency (provincial/ city/regency)				
	› Workforce Agency (provincial/ city/regency)				
	› TVET/Training centres				
	› Vocational schools/SMK				
	› Polytechnics /Vocational institutions				
	› Local universities				
	Gender & Inclusivity				
	› Women's Empowerment Agency (provincial /city/regency)				
	Local governance				
	› Village and Community Development Agency (provincial/ city/regency)				
	› BUMDes				
	› Local community groups				
	MSMEs & Cooperatives				
	› Cooperatives and MSME Agency (provincial/ city/regency)				
	› Village and Community Development Agency (provincial/ city/regency)				
	› Village cooperatives				
	› Local MSMEs				
	Spatial planning				
	› Spatial planning Agency (provincial/ city/regency)				

The above table serves as a strategic framework for identifying and enhancing multi-sectoral synergies driven by renewable energy. It illustrates how energy can catalyze improvements in productivity, sustainability, and equity across sectors, while also highlighting the need for stronger institutional coordination, especially between RUED and broader development planning (RPJMD, Renstra, Renja). Further detailed synergy table is presented in **Annex A**.

Strengthening these linkages is essential to ensure that energy investments translate into tangible development outcomes that requires deliberate institutional coordination. This means involving Bappelitbangda, sectoral agencies and local stakeholders in the formulation and updating of RUEDs and development plans. It also calls for harmonising planning timelines, aligning indicators, and creating joint monitoring

mechanisms to ensure coherence between energy and development goals. In short, while the policy architecture is in place, the challenge now lies in operationalising integration so that energy planning is developmentally relevant and institutionally embedded across sectors.

2.3 Integration to Sectoral Planning

This section explains how RE integration can be embedded into sectoral planning, using the South Sulawesi Marine and Fisheries Agency (*Dinas Kelautan dan Perikanan/DKP*) as an example. It demonstrates how RE technologies, such as solar-powered cold storage, can support sectoral development objectives without introducing new or parallel planning structures.

Understanding the Sectoral Planning Framework

Local government planning follows a hierarchical structure regulated by national frameworks, particularly:

- › Ministry of Home Affairs (MoHA) Regulation No. 86/2017, which regulates regional development planning procedures;

- › MoHA Regulation No. 90/2019, which standardizes program and activity nomenclature;
- › and is operationalized through the Regional Government Information System (SIPD).

Within this system, every OPD translates regional development priorities into a layered planning structure that moves from strategic intent to operational execution.

Planning follows a cascading structure as follows:

RPJMD (Medium Regional Development Plan) → Renstra PD (Agency Strategic Plan) → Renja PD (Agency Annual Plan) → RKA (Workplan and Budget Plan) → APBD (Regional Revenue and Expenditure Budget)

Table 2.2
Indicator Structure in the Regional Planning System

Level	Document	Indicator Type	Function
Regional	RPJMD	Regional Development Indicators	Measure overall development outcomes
Strategic (OPD)	Renstra PD	IKU	Measure OPD strategic performance
Program/Activity	Renstra PD/Renja PD	IKK	Measure contribution of activities
Operational	Renja/RKA	Output Indicators	Measure direct physical/non-physical outputs

Indicators are structured in layers, each serving a distinct function:

- › **RPJMD Indicators** (Regional Development Indicators) are formulated at the regional level within the RPJMD document and are used to measure overall development outcomes at a macro and cross-sectoral level. These indicators reflect societal well-being, regional economic performance, environmental quality, and other social dimensions that constitute the objectives of medium-term regional development. RPJMD indicators are outcome- and impact-orientated and serve as the primary reference for assessing the overall performance of the regional government.
- › **IKU** (Indikator Kinerja Utama / Key Performance Indicators) are formulated at the Renstra OPD level and measure the strategic performance of the agency in contributing to regional development outcomes. IKU reflects medium-term objectives and represents the highest level of accountability within the OPD's mandate.
- › **IKK** (Indikator Kinerja Kegiatan / Activity Performance Indicators) are formulated at the program or activity

level and measure intermediate results generated through specific interventions. IKK demonstrates how programs and activities contribute to the achievement of IKU and provide a measurable link between strategic objectives and operational implementation.

- › **Output indicators** are defined at the sub-activity level (Renja/RKA) and measure the direct, tangible results of implementation—whether physical (e.g., infrastructure installed) or non-physical (e.g., beneficiaries trained, services delivered). Outputs represent the most immediate level of performance measurement and form the basis for budgeting and reporting within SIPD.

In addition to IKU and IKK, at the program level there are (sometimes) IKP (Indikator Kinerja Program / Program Performance Indicator), which measure program achievements. IKK are positioned below the program level and support the achievement of IKP.

RE can be integrated through the indicators above, even though program, activity, and sub-activity names remain fixed according to the existing nomenclature under Minister of Home Affairs Regulation No. 90/2019 (Permendagri 90/2019).

Positioning Renewable Energy within the Planning Framework

Renewable energy should be positioned primarily as an **enabling input or implementation approach or output**, rather than as a standalone development objectives/outcome, except in the case of technical energy agencies (e.g. Dinas ESDM). In most non-energy agencies, renewable energy functions as:

- › A productivity-enhancing tool,
- › A cost-reduction mechanism,
- › A service reliability solution,
- › Or a resilience-enhancing infrastructure.

Therefore:

- › At the **IKU level**, renewable energy usually does not appear explicitly (except for technical agencies, i.e., ESDM).
- › At the **IKK level**, RE-related intermediate outcomes can be measured.
- › At the **Output level**, RE becomes visible in installed systems, trained beneficiaries, or operational facilities.

Mainstreaming RE requires a clear casual logic where operational improvement (output) will affect intermediate indicator change (IKK) and later the strategic performance improvement (IKU)

Case in Fisheries Sector

In the fisheries sector, common development challenges include high post-harvest losses, high operational costs (fuel, electricity), and limited value addition. Relevant intervention may include solar-powered cold storage installation. Which then expected to reduce losses, reduce fuel costs, or increase storage time. In this case, RE is not the objective, but an enabling instrument to achieve sectoral outcomes. In this case, indicators may be presented below:

- › RPJMD Target Indicator – Contribution of agriculture and fishery sectors to GRDP
- › IKU - Increase fisheries productivity and income
- › IKK - Percentage reduction in post-harvest losses (%)
- › Output - Number of solar-powered cold storage units installed

2.3.1 Integrating Renewable Energy into Renstra OPD

Step 1: Strategic Alignment with Existing IKU

Before defining activities, outputs, or budget allocations, OPDs must first test whether a renewable energy (RE) intervention is strategically aligned with their existing IKU (Indikator Kinerja Utama) in the Renstra.

RE technology contributes to the agency's performance targets and strategic sectoral objectives. The table below highlights the existing Key Performance Indicators (*Indikator Kinerja Utama/IKU*) in DKP Renstra and illustrates how RE technology, particularly solar cold storage, could support the achievement of these IKUs.

Table 2.3
IKUs and relevant RE contributions

Existing Renstra IKUs	How Solar Cold Storage Contributes
Increase fisheries production and productivity	Cold storage reduces post-harvest losses, enabling shorter fishing trips
Improve income for the fishing community	Higher product quality, access to premium markets, and value addition
Strengthening fishing community organizations	Collective ownership of cold storage builds cooperation
Develop processing and value addition	Solar-powered processing enables local value chains
Improve coastal community welfare	Reliable energy access for productive activities
Sustainable fisheries management	Better preservation reduces pressure to overfish

At this stage, no activities, sub-activities, or outputs are defined. The purpose is solely to confirm that RE-enabled interventions are relevant to and supportive of existing IKUs and are therefore legitimate within the OPD's strategic mandate.

Step 2: Translating Strategic IKU into Intermediate Results (IKK)

Once strategic alignment is established (agency responsibility, see Step 1), RE-related impacts can be captured at the IKK level (division/department responsibility), which reflects intermediate outcomes at the program or activity level.

While IKU reflect the OPD's medium-term strategic accountability, IKK captures intermediate outcomes generated through specific interventions. Therefore, IKKs are more flexible and can explicitly reflect changes enabled by RE interventions.

The DKP, in consultation with Bappelitbangda and Dinas ESDM, may explore additional or revised indicators at the IKK level. IKKs must clearly derive from existing IKUs and demonstrate how sectoral outcomes are being achieved.

For example, cold storage reduces post-harvest losses, thereby increasing fisheries production. A possible IKK could therefore be the "percentage reduction in post-harvest losses.". This indicator directly supports the IKU on increased fisheries production and productivity.

Table 2.4

Examples of potential new or modified IKKs

Existing <i>Renstra</i> IKUs	New/Modified IKKs to Add
Increase fisheries production and productivity	Reduction in post-harvest losses (% or tons) Increase in fish product quality (% premium grade)
Improve income for the fishing community	Average income increases for fishermen using cold storage (%) Reduction in energy costs for fisheries enterprises (%)
Strengthening fishing community organizations	Number of renewable energy-based productive business units Number of women engaged in fish processing enterprises
Develop processing and value addition	Number of solar-powered processing units operational Utilization rate of cold storage facilities (%) Energy cost savings compared to diesel-powered cold storage (%)
Improve coastal community welfare	Number of fishing communities with reliable electricity access Reduction in energy costs for fisheries enterprises (%) Vulnerable groups (women and youth) utilizing renewable energy (%)
Sustainable fisheries management	Integration of cold chain with sustainable fishing practices

IKK can only be proposed while the *Renstra* documents are still being drafted or revised, as once they are ratified, these indicators become formally locked.

2.3.2 Integration into Annual Renja Activities

While IKUs and IKKs focus on outcomes, the Renja translates these outcomes into concrete annual actions. At this stage, renewable energy-supported interventions, such as solar-powered cold storage, can be proposed at the sub-activity level through output-level indicators.

Step 1: From IKK to Sub-Activity Design

If the IKK reflects an intermediate change (e.g., reduction in post-harvest losses), Renja must specify sub-activities that generate outputs enabling that change.

If the IKK is: Percentage reduction in post-harvest losses (%)

The corresponding sub-activities may include:

- › Training fishermen groups to operate and maintain solar-powered cold storage
- › Installing rooftop solar PV systems at landing sites
- › Establishing cooperatives responsible for managing RE facilities
- › Supporting women-led fish processing enterprises with reliable energy access

Nevertheless, given that sub-activities are rigidly defined within the regional government nomenclature under Minister of Home Affairs Regulation No. 90/2019 (Permendagri No. 90/2019), related initiatives can still be integrated as outputs within relevant sub-activities in accordance with the existing nomenclature.

Step 2: Defining output indicators

Each sub-activity must include measurable output indicators. These represent the direct deliverables of implementation.

Outputs are not sectoral outcomes. They are the tangible results that enable intermediate performance improvements.

Table 2.5

Relevant output indicators for solar-powered cold storage

Proposed Sub-Activity	Relevant Outputs	Relevant Sub-Activities Based on Government Nomenclature (Ministerial Decree No. 900/2025)
Install rooftop solar PV systems at fish landing sites.	› Number of solar-powered processing units in operation › Number of solar-powered ice machines › Total installed PV capacity in fisheries facilities (kWp)	Provision of capture fisheries business facilities (3.25.03.1.01.0010)
Train fisher groups to operate and maintain solar-powered cold storage facilities.	› Number of fishers/women trained in facility operation › Number of fisher groups capable of operating and maintaining solar-powered cold storage facilities	› Capacity development for coastal and small island communities (3.25.02.1.03.0001) › Strengthening and development of coastal and small island community institutions (3.25.02.1.03.0002)
Establish cooperatives responsible for managing renewable energy facilities.	› Number of cooperatives/fisheries business groups operationally managing RE facilities	› Provision of mentoring, improved access to knowledge, technology, and information, as well as the organization of education and training (3.25.02.1.03.0004)
Support women-led fish processing enterprises through access to reliable energy.	› Number of women-led fish processing enterprises utilizing renewable energy facilities	



2.3.3 Linking Renja to Budgeting (RKA and APBD)

Renja OPD is the formal entry point into the regional budgeting cycle. In practice, the process flows as follows:

Renstra (5-year strategy) → Renja (annual plan) → RKA (Budget Work Plan and Budget) →
→ APBD (approved regional budget)

Step 1: Ensure Nomenclature Alignment

Before budgeting, confirm that the RE intervention is embedded within an existing program, activities, and subactivities under MoHA Regulation No. 90/2019 (with detailed listings in Ministerial Decree No. 900/2025). This means that the intervention falls within the government affairs under the authority of the relevant OPD.

Within the **sub-activity level**, solar-powered cold storage is introduced as a technical approach to delivering post-harvest infrastructure. Other solutions may include solar ice makers or solar-powered processing units. The use of renewable energy in this context is not positioned as a development goal in itself but as a method to improve reliability, reduce costs, and enhance the sustainability of fisheries services.

Table 2.6

RE with program, activity, and subactivity level

Program/ Activity/ Sub-Activity	Program Performance Indicators / Activity Performance Indicators / Outputs
Marine, Coastal, and Small Islands Management Program (3.25.02)	› Expansion of sustainably managed marine conservation areas › Volume of community-based salt production
Empowerment of Coastal and Small Island Communities (3.25.02.1.03)	› Average increase in the income of fishers using cold storage (%) › Reduction in energy costs for fisheries businesses (%) › Number of renewable energy-based productive business units
Capacity Development for Coastal and Small Island Communities (3.25.02.1.03.0001)	› Number of fishers/women trained in facility operation › Number of fisher groups capable of operating and maintaining solar-powered cold storage facilities
Provision of mentoring, improved access to knowledge, technology, and information, and the organization of education and training (3.25.02.1.03.0004)	› Number of cooperatives/fisheries business groups operationally managing renewable energy facilities › Number of women-led fish processing enterprises utilizing renewable energy facilities
Capture Fisheries Management Program (3.25.03)	› Value of capture fisheries production (IDR thousand) › Capture fisheries production (tons) › Coverage of facilitation for fisher groups › Percentage of fisher group production (%) › Percentage of fishing ports equipped with facilities and infrastructure that meet operational standards (%)
Fish Capture Management in Marine Areas up to 12 Nautical Miles (3.25.03.1.01)	› Reduction in post-harvest losses (% or tons) › Improvement in fish product quality (% premium quality)
Provision of Capture Fisheries Business Facilities (3.25.03.1.01.0010)	› Number of solar-powered processing units in operation › Number of solar-powered ice machines › Total installed PV capacity in fisheries facilities (kWp)

Step 2: Define Cost Structure

In preparing the RKA, renewable energy development is not limited to Dinas ESDM. Various types of regional expenditures can be utilized by sectoral OPDs to support the use of RE in productive activities and regional development.

Table 2.7

Types of expenditures and examples RE activities

Type of Expenditure	Description	Examples of Activities
Goods and Services Expenditure	Used for non-infrastructure activities such as training, studies, outreach, cross-sector coordination, or the development of monitoring systems. This type of expenditure can be utilized by various OPDs to support renewable energy (RE) utilization without directly procuring energy infrastructure.	Training on the operation and maintenance (O&M) of renewable energy systems for fisher groups, farmers, or MSMEs (Dinas ESDM, Dinas Perikanan, Dinas Pertanian, Dinas Koperasi & UMKM). Preparation of feasibility studies or plans for RE use in productive sectors (Bappeda, Dinas ESDM, Dinas Perindustrian). Outreach on RE technologies for coastal communities, villages, and businesses (Dinas ESDM, Diskominfo, Dinas PMD). Development of monitoring systems and data collection on the socio-economic impacts of RE utilization (Bappeda, Dinas ESDM, Dinsos, DP3A). Preparation of technical guidelines for the operation and maintenance of small-scale RE systems (Dinas ESDM). Development of renewable energy potential maps and their integration into regional planning (Bappeda, Dinas ESDM).
Capital Expenditure	Used for the procurement or construction of assets that provide benefits for more than one year. This expenditure can support the procurement of RE technologies or infrastructure for productive activities. Maintenance and operational considerations should be taken into account.	Installation of solar-powered water pumps for agricultural irrigation (Dinas Pertanian, Dinas ESDM). Provision of cold storage facilities or solar-powered ice machines for the fisheries sector (Dinas Perikanan, Dinas ESDM). Installation of rooftop solar PV systems at public facilities such as markets, fish landing sites, or MSME centers (Dinas ESDM, Dinas Perdagangan, Dinas Perikanan). Development of communal biogas systems in livestock farming areas (Dinas Peternakan, Dinas ESDM). Provision of electric vehicle charging stations to support mobility and logistics for small businesses (Dinas Perhubungan, Dinas ESDM).
Grant Expenditure	Used to provide support in the form of money, goods, or services to community groups, cooperatives, village-owned enterprises (BUMDes), or other institutions. Grant schemes are often used so that equipment or infrastructure utilized by communities does not become a regional government asset, allowing maintenance to be managed by the beneficiaries.	Grants of solar dryers to groups processing agricultural or fisheries products (Dinas Pertanian, Dinas Perikanan). Grants of renewable energy systems to cooperatives or BUMDes to support local economic activities (Dinas Koperasi & UMKM, Dinas PMD). Grants of energy facilities for food processing businesses managed by women's groups (DP3A, Dinas Koperasi & UMKM). Grants of energy systems for village public service facilities (Dinas ESDM, Dinas PMD).

Table 2.7 Continuation ►

◀ Table 2.7 Continuation

Type of Expenditure	Description	Examples of Activities
Social Assistance Expenditure	Used to support individuals or community groups in need. In the context of renewable energy, social assistance can be used to expand energy access for vulnerable communities or remote areas.	Assistance for household solar energy systems for low-income communities (Dinsos, Dinas ESDM). Assistance for energy equipment to support economic activities of poor or vulnerable community groups (Dinsos, Dinas Koperasi & UMKM).
Transfer Expenditure / Financial Assistance	Used to provide financial assistance to village governments or other regional governments. This scheme can support renewable energy development through village development programs or local economic activities.	Financial assistance to villages for the development of village renewable energy systems (Bappeda, Village Community Empowerment Office, Energy Office). Financial support for villages or BUMDes to develop energy facilities for productive activities (Village Community Empowerment Office, Bappeda). Initial financing support for the development of renewable energy-based business centers at the village level (Village Community Empowerment Office, Cooperatives & MSMEs Office).



References

Ministry of Home Affairs. (2017). *Minister of Home Affairs Regulation No. 86 of 2017 concerning procedures for regional development planning, evaluation of regional development plans, and amendment of regional development plans.*

Ministry of Home Affairs. (2019). *Minister of Home Affairs Regulation No. 90 of 2019 concerning the classification, codification, and nomenclature of regional development and financial planning.*

Ministry of Home Affairs. (2025). *Ministerial Decree No. 900 of 2025 concerning detailed classifications, codifications, and nomenclature of regional development and financial planning.*

ANNEX A

Table A.1.

Opportunities for Cross-Sectoral Development Synergy

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Agriculture					
Energy	› Solar-powered irrigation and agro-processing › Cold storage powered by solar › Bioenergy from agricultural waste	› Joint planning between Agriculture Agency (TPH Bun) and Energy Agency (Dinas ESDM) › Supportive tariffs and incentives for productive energy use › Integration of agricultural programs with RUED	› Reduced irrigation cost › Increased agriculture productivity › Reduced post-harvest losses › Energy cost savings	› Higher rural incomes › Improved food security › Empowerment of smallholder farmers	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Local/Regional PLN › Bappelitbangda South Sulawesi › Bappeda at the regency level
Education and workforce	› Skills training for solar irrigation and agro-energy applications › Curriculum integration of renewable energy and agricultural vocational school/ university programs › Certification for RE system operation and maintenance (O&M)	› Coordination between vocational schools/ vocational institutions, universities, Agriculture Agency, Energy Agency, and TVET/training centres › Alignment of training modules with local RE deployment needs in Agriculture (irrigation, storage, agro-processing) › Joint planning to match skills supply with community demand for RE O&M	› Improved technical competence for operating solar pumps and agro-energy systems, allowing workforce readiness and new employment opportunities › Increased youth and women participation in RE-based agricultural activities › Local availability of trained technicians reduces downtime and maintenance cost	› Reduced skills mismatch in rural areas › New employment pathways for green rural jobs › Enhanced sustainability of RE systems due to trained local operators	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Bappelitbangda South Sulawesi › Bappeda at the city/regency level › Provincial Education Agency › City/Regency Education Agency › Provincial Workforce Agency › City/Regency Education Agency › Subdistrict government › TVET/Training centres › Vocational schools/SMK › Polytechnics /Vocational institutions › Local universities

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Agriculture					
Gender and inclusivity	› Renewable-energy powered tools that reduce women's labour burden (pumping, drying, processing) › Inclusion of women's farmer groups in the planning and utilisation of solar irrigation and agro-processing systems	› Integration of gender tagging in RE-based agricultural programs › Collaboration between Women's Empowerment Agency and Agriculture Agency to identify women's needs for RE technologies › Involvement of women's farmers groups in O&M roles or as system users (e.g. agro-processing)	› Reduced manual labour for women farmers › Increased access to technology for women-led agricultural activities › Enhanced decision-making roles for women in RE-based agricultural production	› Women's economic empowerment › Greater participation of women in productive agriculture › More inclusive RE adoption at the village level	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Bappelitbangda South Sulawesi › Bappeda at the city/regency level › Provincial Women's Empowerment Agency › City/Regency Women's Empowerment Agency › Subdistrict government › Village government › Women's farmers group (village level)
Local & village development	› Village-owned RE services through BUMDes (e.g., renting solar pumps, fee-for-service irrigation) › Participatory energy needs assessments to match RE technologies with farming cycles › Local monitoring and maintenance systems	› Collaboration between village governments and technical agencies (Agriculture + Energy) › Integration of RE productive-use initiatives into Village Development Plans (RPJMDes/RKPDDes) › Use of Village Funds (Dana Desa) or BUMDes capital for O&M	› Stronger local ownership of RE systems › Sustainable financing models for RE-based agriculture › Improved village community participation in planning and maintenance	› Strengthen local governance › More resilient and self-sustaining agricultural communities › Community income generation from RE service	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Bappelitbangda South Sulawesi › Bappeda at the city/regency level › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › BUMDes › Farmers groups

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
MSMEs	› Solar-powered agro-processing (dryers, milling, storage) › Development of green MSME models (value-added processing using RE)	› Coordination between Cooperatives and MSME Agency, Agricultural Agency and Energy Agency to support adoption of RE technologies › Development of green financing schemes for agro-MSMEs › Integration into cooperatives for collective access to RE assets	› Lower operating costs for rural MSMEs › Improved quality and competitiveness of agro-products › Cleaner and more efficient production processes	› Stronger rural MSME value chains › Improved market access for processed agricultural goods › Emergence of new green business models	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Bappelitbangda South Sulawesi › Bappeda at the city/regency level › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › City/Regency Industry/Trade Agency › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › Village Cooperatives › Agricultural MSMEs (subdistrict and village)
Spatial	› Integrating RE irrigation and agro-processing zones into regional spatial plans › Siting criteria for solar irrigation, solar dryers, and bioenergy facilities › Mapping of RE potential overlaid with agricultural production zones	› Alignment between Spatial Planning Agency, Agriculture Agency, and Energy Agency for RE site selection › Integration of RE-productive use areas into RTRW, RDTR, and RPJMD planning › Coordination for streamlined permitting and land-use designation	› Reduced land-use conflict between agriculture, settlement, and RE facilities › Streamlined approval process for RE systems in agricultural areas	› Better land management › Accelerated deployment of solar and bioenergy technologies › Conflict-sensitive agricultural development	› Dinas ESDM South Sulawesi › Dinas TPH Bun South Sulawesi › Dinas TPH Bun at the regency level › Bappelitbangda South Sulawesi › Bappeda at the city/regency level › Provincial Spatial Planning Agency › City/Regency Spatial Planning Agency › Subdistrict government › Village government

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Fisheries					
Energy	› Solar-powered cold storage for fish preservation › Solar-powered ice-making machines › Solar-powered aerators for aquaculture › Solar/hybrid systems for small-scale fish processing units	› Joint planning between Marine and Fisheries Agency and Energy Agency › Development of technical standards for cold storage and aquaculture systems › Coordination with PLN where grid connection or hybrid systems are required › Alignment between RUED and fisheries and coastal development priorities	› Reduced post-harvest losses and improved fish freshness › Lower dependence on diesel for cooling and processing › Lower operational costs for small fishers and processors	› Increased income for fisher households › Stronger and more resilient fisheries value chains › Improved food quality and reduced waste	› Provincial Energy Agency › Provincial Marine and Fisheries Agency › City/Regency Marine and Fisheries Agency › Provincial Bappelitbangda › City/Regency Bappeda › Local/Regional PLN
Education and workforce	› Technical training for operating and maintaining solar-powered cold storage and ice machines, as well as other solar/hybrid systems › RE safety and practical training for youth and fisher groups › Integration of RE topics into fisheries vocational curricula	› Collaboration between Marine and Fisheries Agency, Energy Agency, Education Agency, Workforce Agency, vocational schools/institutions, TVET/training centres, and universities › Certification schemes for RE-powered cold chain and aquaculture systems › Partnerships with RE suppliers for hands-on training	› Improved technical capacity in coastal communities › Reduced downtime due to local availability of trained O&M personnel › Increased youth employment in green fisheries-related jobs	› Local job creation › Better long-term maintenance of RE systems › Strengthened human capital in coastal areas	› Provincial Energy Agency › Provincial Marine and Fisheries Agency › City/Regency Marine and Fisheries Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Education Agency › City/Regency Education Agency › Provincial Workforce Agency › City/Regency Education Agency › TVET/Training centres › Vocational schools/SMK › Polytechnics /Vocational institutions › Local universities

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Gender and inclusivity	› Solar-powered dryers for women-led fish processing groups › Training for women on RE-powered processing technologies › Inclusive participation mechanisms in planning and training activities	› Coordination between Women's Empowerment Agency and Marine and Fisheries Agency › Identification of women-led fisheries MSMEs that can benefit from RE technologies › Gender tagging in RE and fisheries programs	› Reduced physical labour for women in processing › Higher product quality and better market access › Greater engagement of women in productive fisheries activities	› Women's economic empowerment › More inclusive coastal and fisheries development › Improved household livelihoods	› Provincial Energy Agency › Provincial Marine and Fisheries Agency › City/Regency Marine and Fisheries Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Women's Empowerment Agency › City/Regency Women's Empowerment Agency › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › Subdistrict government › Village government › Women-led fish processing groups
Local & village development	› BUMDes-managed RE-based fishing and processing facilities as a community service › Village-level committees for monitoring and maintaining RE systems › Use of Village Funds to support RE O&M	› Collaboration between Village Government, Subdistrict Government, Village and Community Development Agency, Marine and Fisheries Agency and Energy Agency for village-level planning and budgeting mechanism for RE based activities › Integration of RE fisheries needs into RPJMDes and RKPDes	› Stronger local ownership and higher sustainability › Better alignment between RE adoption and village needs › Community-driven O&M structures for RE-based fisheries facilities	› Strengthen local governance › More resilient and self-sustaining coastal and fisheries communities › Local reinvestment of revenue generated through BUMDes-operated services	› Provincial Energy Agency › Provincial Marine and Fisheries Agency › City/Regency Marine and Fisheries Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › BUMDes › Fisher groups

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
MSMEs	› Solar-powered ice-making machines for micro and small seafood businesses › RE-based fish drying, smoking, and processing technologies › Energy efficiency upgrades for coastal processing MSMEs › RE-powered mini cold chain units for small processors	› Coordination between Cooperatives and MSME Agency, Marine and Fisheries Agency, and Energy Agency to support MSME adoption of RE technology › Integration of RE technologies into MSME support, cooperatives, and coastal enterprise programs › Development of accessible green financing mechanisms for small fish processors › Cooperative-based models for shared RE assets (dryers, ice-making, cold storage)	› Lower operational and production costs › Increased product quality and consistency › Improved competitiveness in local and regional markets › Reduced reliance on diesel for processing and cooling	› Strengthened coastal MSME value chains › Expanded market access and improved food safety compliance › Emergence of green business models in fisheries processing	› Provincial Energy Agency › Provincial Marine and Fisheries Agency › City/Regency Marine and Fisheries Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › Village cooperatives › Small seafood-processing MSMEs (subdistrict and village) › Microfinance and green financing institutions

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Animal Husbandry					
Energy	› Biogas digesters using livestock waste (e.g., cow/buffalo manure) › Solar-powered water pumps for livestock drinking water › Solar-powered ventilation and lighting for barns › Hybrid RE systems for small-scale dairy processing or feed production	› Joint planning between Animal Husbandry Agency, Energy Agency, and Environmental Agency › Integration of biogas and solar adoption into RUED, livestock development plans, and waste management programs › Technical guidelines for household-level biogas and small-scale RE systems	› Reduced energy costs on farms › Improved waste management and reduced methane emissions › Better animal health through improved ventilation and lighting	› Lower production costs for farmers › Improved livestock productivity › Reduced environmental impacts from animal waste	› Provincial Energy Agency › Provincial Animal Husbandry Agency › City/Regency Animal Husbandry Agency › Provincial Environmental Agency › City/Regency Environmental Agency › Provincial Bappelitbangda › City/Regency Bappeda
Education and workforce	› Training on biogas construction, operation, and maintenance › Skills development for solar-powered livestock systems (pumps, lighting, ventilation) › Integration of RE-for-livestock modules in vocational schools/institutions	› Collaboration between Animal Husbandry Agency, Energy Agency, Education Agency, Workforce Agency, vocational schools/institutions, TVET/training centres, and universities › Certification schemes for biogas technicians or RE maintenance providers › On-farm demonstration training in collaboration with farming groups	› Increased capacity for farmers to maintain RE systems independently › Youth employment opportunities in biogas and solar O&M › Reduced reliance on external technicians	› Local technical self-sufficiency › Strengthened human capital in livestock communities › Improved sustainability of RE systems	› Provincial Energy Agency › Provincial Animal Husbandry Agency › City/Regency Animal Husbandry Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Education Agency › City/Regency Education Agency › Provincial Workforce Agency › City/Regency Education Agency › TVET/Training centres › Vocational schools/SMK › Polytechnics /Vocational institutions › Local universities

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Gender and inclusivity	› Biogas digesters that reduce women's labour burden (no firewood collection, cleaner cooking) › Solar-powered tools for women-led dairy processing (mixers, grinders) › Inclusion of women in biogas and RE operation training	› Coordination between Women's Empowerment Agency and Animal Husbandry Agency › Gender-responsive planning in livestock development programs › Identification of women-led dairy or livestock-related MSMEs suitable for RE adoption	› Reduced household labour burden for women › Improved health outcomes (reduced indoor smoke) › Access to more efficient processing tools	› Women's economic empowerment in dairy and livestock value chains › Improved wellbeing and time savings › Inclusive participation in livestock-related livelihoods	› Provincial Energy Agency › Provincial Animal Husbandry Agency › City/Regency Animal Husbandry Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Women's Empowerment Agency › City/Regency Women's Empowerment Agency › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › Subdistrict government › Village government › Women livestock farmer groups
Local & village development	› Village-supported biogas adoption through Dana Desa › BUMDes operation of communal biogas or RE-powered feed mills › Village-level farmer group committees for O&M › Participatory livestock-waste-to-energy assessments	› Collaboration between Village Government, Subdistrict Government, Village and Community Development Agency, Animal Husbandry Agency and Energy Agency for village-level planning and budgeting mechanism for RE based activities › Integration into village development plans (RPJMDes and RKPDes)	› Community-owned RE solutions › Sustainable livestock waste management › Improved village services through BUMDes-operated systems	› Increased village resilience › Community-driven RE adoption › Environmental improvements from reduced waste pollution	› Provincial Energy Agency › Provincial Animal Husbandry Agency › City/Regency Animal Husbandry Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › BUMDes › Livestock farmer groups

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
MSMEs	› RE-powered dairy processing (cooling, mixing, pasteurising) › Biogas for small-scale livestock product processing (milk, yogurt, cheese, animal feed) › Energy-efficient equipment for livestock MSMEs › Cooperative-led RE adoption for livestock value chains	› Coordination between Cooperatives and MSME Agency, Animal Husbandry Agency, and Energy Agency to support MSME adoption of RE technology › Development of green financing for livestock MSMEs › Cooperative-based models for shared processing equipment	› Lower production costs for dairy/livestock MSMEs › Increased product quality and hygiene › Improved competitiveness	› Stronger livestock value chains › Expanded market opportunities › Growth of rural, RE-powered MSMEs	› Provincial Energy Agency › Provincial Animal Husbandry Agency › City/Regency Animal Husbandry Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › Provincial Village and Community Development Agency › City/Regency Village and Community Development Agency › Subdistrict government › Village government › Village cooperatives › Dairy/livestock product MSMEs

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Industry					
Energy	› Rooftop solar PV for small and medium industries (food processing, seaweed, cocoa, coffee, metalworks). › Solar-powered or hybrid RE systems for drying, milling, cooling, or heating processes. › Biomass/biogas systems using agricultural residues (rice husks, coconut shells, cassava waste). › Energy efficiency and energy management improvements for SMEs. › Identification of RE potential for larger-scale captive power options in industrial zones	› Coordination between Energy Agency, Industry Agency, and PLN for technical compliance, rooftop solar processes, and industrial energy management. › Alignment with provincial industrial development priorities (RPIP) for promoting RE uptake in small-medium industries. › Provincial government in coordination with national government and PLN to support early data sharing, mapping, or recommendations on RE potential to inform national industrial planning (RIPIN) for captive RE in industrial zones.	› Reduced operational costs for SMEs. › More stable and efficient processing operations. › Cleaner production and improved product quality. › Better alignment with national RE and industrial decarbonisation initiatives.	› Strengthened competitiveness of local industries. › Increased value-added through improved processing efficiency. › Enhanced attractiveness for investment in clean-processing supply chains.	› Provincial Energy Agency › Provincial Industrial and Trade Agency › City/Regency Industrial and Trade Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › PLN

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Spatial	› Integrating rooftop solar potential and small-scale RE siting into detailed spatial planning (RDTR) for light and medium industrial areas. › Identifying suitable sites for small RE-supported processing hubs (drying/processing centres). › Sharing inputs on RE resource potential for planning captive RE in larger industrial zones.	› Joint planning between Spatial Planning Agency, Energy Agency, Industry Agency and Bappelitbangda/ Bappeda. › Alignment of RDTR and RTRW for accommodating small–medium industrial RE facilities (solar rooftops, biomass storage, small hybrid systems). › Facilitating micro-zoning for RE-supported small industrial clusters.	› Reduced land-use overlap for processing centres and biomass facilities. › Smoother site preparation and licensing for RE-supported SME clusters. › Improved coordination between renewable energy and industrial spatial needs.	› More organised small–medium industrial clusters. › Stronger integration between RE and industrial development.	› Provincial Energy Agency › Provincial Industrial and Trade Agency › City/Regency Industrial and Trade Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Spatial Planning Agency › City/Regency Spatial Planning Agency
Education and workforce	› Technical training for solar PV and RE-powered industrial machinery. › Training on energy-efficient industrial processes. › Certification for industrial technicians and energy managers. › Development of RE-related modules in technical and industrial vocational schools/ polytechnics	› Collaboration between Workforce Agency, Energy Agency, Industrial dan Trade Agency, TVET/training centres, and industries for training delivery › Joint curriculum development with Education Agency, vocational schools, polytechnics and universities › Partnership with RE suppliers for hands-on learning	› Strengthened technical skills for industrial workers. › Reduced downtime due to better maintenance. › Better safety and operational standards.	› More competitive industrial labour force. › Increased availability of green jobs. › Higher productivity in SME industrial facilities.	› Provincial Energy Agency › Provincial Industrial and Trade Agency › City/Regency Industrial and Trade Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Education Agency › City/Regency Education Agency › Provincial Workforce Agency › City/Regency Workforce Agency › TVET/Training centres › Vocational schools/SMK › Polytechnics /Vocational institutions › Local universities › RE suppliers

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Gender and Inclusivity	› Inclusion of women workers and women-led MSMEs in RE-related training. › Introduction of cleaner RE-powered processing technologies that reduce health risks. › Support for women-led processing groups to access RE equipment.	› Coordination between Women's Empowerment Agency, Industrial and Trade Agency, and Cooperatives and MSME Agency to map women-led processing businesses that can benefit from RE. › Gender-responsive monitoring of RE-supported industrial interventions.	› Expanded access for women to technical and processing roles. › Improved occupational health. › More equitable access to RE-supported productivity improvements.	› Increased economic empowerment of women in industrial value chains. › More inclusive industrial upgrading. › Stronger household resilience.	› Provincial Energy Agency › Provincial Industrial and Trade Agency › City/Regency Industrial and Trade Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Women's Empowerment Agency › City/Regency Women's Empowerment Agency › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency
MSMEs	› Solar-powered drying, milling, cooling, and processing for small industries. › RE-based production upgrades for food, seaweed, and agro-industrial MSMEs. › Cooperative-based shared RE systems for processing centres. › Access to energy-efficient industrial equipment.	› Joint support from Cooperatives and MSME Agency, Industrial and Trade Agency, and Energy Agency. › Development of MSME-friendly green financing. › Collaboration with cooperatives for shared RE-based assets.	› Reduced production and energy costs. › Higher product quality and compliance with standards. › Enhanced competitiveness and resilience.	› Stronger local processing industries. › Increased value-added production. › Growth of green MSMEs.	› Provincial Energy Agency › Provincial Industrial and Trade Agency › City/Regency Industrial and Trade Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Renewable energy in Transportation					
Energy	› Electric two-wheelers and three-wheelers for urban logistics and deliveries. › Electric buses for BRT corridors and city transport. › Solar-powered charging stations at public facilities, terminals, and government buildings. › Integration of renewable energy into port operations (shore power, cold storage). › Hybrid solar–battery systems for small fishing or river transport vessels.	› Collaboration between Transport Agency and Energy Agency on EV charging standards and renewable-powered transport infrastructure. › Alignment with PLN for grid readiness and charging infrastructure. › Coordination with provincial and district transport plans (RPJMD, Sistranas, SistraDa). › Engagement with vehicle distributors and EV programme partners.	› Reduced fuel dependency and transport operational costs. › Lower emissions in urban areas. › Improved reliability for logistics operators using EVs. › Higher energy efficiency for public transportation.	› Cleaner and healthier urban environments. › Strengthened green mobility transitions. › More efficient logistics for small businesses and SMEs.	› Provincial Energy Agency › Provincial Transport Agency › City/Regency Transport Agency › Provincial Bappelitbangda › City/Regency Bappeda › PLN
Spatial	› Identification of priority locations for EV charging stations through RDTR. › Allocation of space for solar-powered charging facilities in public areas. › Integration of EV mobility corridors into urban spatial plans. › Zoning support for small renewable-powered transport hubs.	› Joint planning and work between Spatial Planning Agency, Transport Agency, Energy Agency, and Bappeda. › Alignment of RDTR and RTRW with electric transport needs. › Review of transport nodes (terminals, ports) for RE integration opportunities.	› Improved readiness for EV charging infrastructure. › Reduced land-use conflicts for transport energy facilities. › Stronger alignment between mobility planning and energy priorities.	› More organised urban transport ecosystem. › Better quality of public spaces and mobility networks. › Increased investor confidence for EV infrastructure projects.	› Provincial Energy Agency › Provincial Transport Agency › City/Regency Transport Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Spatial Planning › City/Regency Spatial Planning

Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Education and workforce	› Technical training for automotive and EV maintenance technicians. › Skills development on battery safety, charging systems, and electric motor diagnostics. › Training for public transport operators on RE-integrated mobility. › Curriculum insertion for EV technology in vocational schools and polytechnics.	› Collaboration between Workforce Agency, Education Agency, Energy Agency, Transport Agency, TVET/Training centres, vocational schools, polytechnics and universities for EV-related modules. › Partnerships with EV distributors and RE suppliers for practical training. › Coordination with Transport Agency for operator certification and safety standards.	› Availability of local EV technicians. › Increased safety and quality of EV operations. › Lower maintenance downtime for EV fleets.	› Creation of new green jobs. › Stronger industrial base for EV adoption. › Enhanced technical capacity for transport electrification.	› Provincial Energy Agency › Provincial Transport Agency › City/Regency Transport Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Workforce Agency › City/Regency Workforce Agency › Provincial Education Agency › City/Regency Education Agency › TVET/Training centres › Vocational schools/SMK › Polytechnics /Vocational institutions › Local universities › Transport operators › EV distributors
MSMEs	› Use of electric motorbikes for food delivery, courier services, and micro-logistics. › RE-powered charging stations tailored for SME delivery fleets. › Energy-efficient cold chain transport using solar-assisted refrigeration units. › Credit/financing schemes for EV adoption by small businesses.	› Joint programmes by Cooperatives and MSME Agency, Transport Agency, and Energy Agency to promote EVs for SMEs. › Coordination with banks and microfinance institutions for EV financing. › Partnership with cooperatives for group-based EV ownership or leasing.	› Lower fuel costs for SMEs. › Improved delivery efficiency for small producers. › Enhanced competitiveness for small businesses using clean mobility.	› Growth of green MSME logistics sectors. › Increased productivity for last-mile delivery businesses. › Greater adoption of clean technologies by small enterprises.	› Provincial Energy Agency › Provincial Transport Agency › City/Regency Transport Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency

◀ Table A.1 Continuation

Cross-cutting thematic sector	Example of activities	Foreseen coordination	Key benefits	Development impact	Stakeholders to be involved
Gender and Inclusivity	› Inclusion of women delivery drivers or small business owners in EV adoption programmes. › Safe and accessible transport systems benefiting women and vulnerable groups. › Targeted EV training for women in automotive and transport sectors. › Support for women-led MSMEs adopting EVs in logistics or processing.	› Coordination between Women's Empowerment Agency, Transport Agency, and Cooperatives and MSME Agency › Gender-sensitive planning for EV infrastructure (safety, lighting, accessibility). › Targeted training for women through TVET/training centres and vocational schools.	› Lower mobility costs for women-led businesses. › Safer and cleaner mobility systems. › More inclusive access to transport-related jobs.	› Greater economic participation of women in urban logistics and transport services. › Reduced exposure to air pollution and unsafe transport environments. › Wider inclusion in green jobs and green enterprise activities.	› Provincial Women's Empowerment Agency › City/Regency Women's Empowerment Agency › Provincial Transport Agency › City/Regency Transport Agency › Provincial Bappelitbangda › City/Regency Bappeda › Provincial Cooperatives and MSME Agency › City/Regency Cooperatives and MSME Agency › Provincial Workforce Agency › City/Regency Workforce Agency › TVET/Training centres

