PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

KNOWLEDGE PRODUCT

INTEGRATING THE CIRCULAR ECONOMY INTO INDONESIA'S NDC

The AKSARA Planning Module

How circular economy actions from the National Circular Economy Roadmap 2025–2045 are registered, owned and tracked inside Bappenas climate planning platform.



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Integrating the Circular Economy into Indonesia's NDC: The AKSARA Planning Module

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EXECUTIVE SUMMARY

Indonesia has committed to a circular economy as a pillar of its low-carbon, climate-resilient transition, but until recently circular economy (CE) actions had no formal place in the national climate planning system. This paper describes how that gap has been closed through the CE planning module in AKSARA, Bappenas' national platform for monitoring low-carbon and climate-resilient development, and what it means for Indonesia's ability to plan, finance and report CE as part of its Nationally Determined Contribution (NDC).

What has been built. The planning module ("CE House") registers the actions of the National Circular Economy Roadmap and Action Plan (RAN ES) in the same system that tracks the NDC and the PRKBI framework, links each action to the ministry that owns it, the indicator it moves and the climate category it supports, and tags ministries' existing budgeted outputs (*Rincian Output*) with a CE lens so that activities already under way become visible to climate planning without new reporting obligations.

What the evidence shows. An analysis of the CE–NDC–PRKBI linkage found that CE-relevant activity is already widespread across at least fifteen ministries and agencies but implicit, sectoral and fragmented; that CE's contribution is strongest on the mitigation side (food, plastic packaging, construction) and still largely a co-benefit on the adaptation side (food and construction being the exceptions); and that the binding constraint is integration and coordination, not the absence of policy instruments.

Strategic significance. For Bappenas, the module provides a single register of CE actions aligned with the RPJMN and the NDC. For line ministries, it converts existing outputs into recognised climate contributions. For the Ministry of Finance, it creates the basis for linking CE actions to climate budget tagging. For Indonesia's international reporting, it establishes the structure (though not yet the emissions accounting) through which CE outcomes can be presented under the Paris Agreement's enhanced transparency framework.

What comes next. A differentiated integration strategy by sector; formal adoption of the indicator metadata and tagging convention as Bappenas guidance; a live pilot with ministries; the technical integration with AKSARA's core platform; a complementary life-cycle assessment to express CE outcomes in greenhouse-gas terms; and extension to provincial and district governments.

This paper is one of three knowledge products prepared under UN-PAGE Indonesia with Bappenas and UNDP. Its companion, *Measuring Circularity: The Circular Economy M&E Module in AKSARA*, covers the measurement system in detail, and the policy brief *From Plans to Proof* summarises both for decision-makers.

How to read this paper

The paper is written for three readerships. Policymakers in Bappenas and line ministries will find the case for integration and its institutional consequences in the sections on context, policy alignment, the integration gap and strategic implications. Planners and AKSARA users will find the mechanics (the four-level hierarchy, the Rincian Output tagging convention, the data model and a worked example) in the sections on the planning module and the planning-to-results loop. Development partners and reviewers will find the results logic, governance arrangements, risks and the phased roadmap in the second half of the paper.

Throughout, the paper distinguishes between what has been built and tested (the planning module and the RO mapping), what has been designed and peer-reviewed but not yet run live (the M&E module), and what is proposed for later phases (the emissions link and sub-national extension). Where figures are indicative or still rest on proxies, this is stated.

CONTEXT: NDC, LCDI AND THE CIRCULAR ECONOMY ROADMAP

Indonesia's climate commitments run on two pillars. The NDC under the Paris Agreement sets the national targets for greenhouse-gas mitigation and for adaptation. In national planning, the mitigation pillar is carried out through Low Carbon Development (*Pembangunan Rendah Karbon*, PRK) and the adaptation pillar through Climate-Resilient Development (*Pembangunan Berketahanan Iklim*, PBI) and the National Adaptation Plan. Together these form the PRKBI framework, led by Bappenas, which carries climate targets into the national development plan and into the budgets and work programmes of ministries and provinces. AKSARA (*Indonesian Low Carbon Development Planning and Monitoring Application*) is the platform Bappenas built to monitor both pillars: ministries and regions report their actions and the system tracks progress against the national trajectory.

The quantitative anchor of this system is the NDC itself. Indonesia's Enhanced NDC (2022) raised the 2030 mitigation target to a 31.89 per cent reduction in greenhouse-gas emissions against the business-as-usual baseline with national resources, and 43.20 per cent with international support, on the way to net-zero emissions by 2060 or sooner; the Second NDC extends the planning horizon to 2035 and places greater weight on adaptation, just transition and transparency. The targets are expressed across five sectors: energy; waste; industrial processes and product use (IPPU); agriculture; and forestry and other land use. It is through these sector categories, not through a separate CE heading, that any circular economy contribution has to be read.

Under the Paris Agreement's enhanced transparency framework (ETF), Indonesia now reports progress through biennial transparency reports (BTRs). The ETF asks for more than aggregate emission figures: it asks for information on the policies and measures behind them, the institutions responsible and the methods used to track them. A planning system in which CE actions are registered with owners, targets and indicator links therefore has direct value for international reporting, even before the emissions effect of each action can be quantified.

The circular economy entered this picture through the National Circular Economy Roadmap 2025–2045 and its first Action Plan (RAN ES 2025–2029). The roadmap concentrates on five priority sectors chosen for their economic weight, material intensity and emission-reduction potential:

Table 1. The five priority sectors of the National Circular Economy Roadmap

Sector	Share of national GDP (2025, BPS)	Why it matters for circularity
Food	19.7%	Largest material flow; food loss and waste, organic fertiliser and alternative feed
Construction	9.8%	Steel and cement; secondary materials and demolition waste
Electronics	1.6%	Fast product turnover, critical materials, hazardous e-waste
Textiles	1.2%	Fibre-level circularity, textile waste, microplastics

Sector	Share of national GDP (2025, BPS)	Why it matters for circularity
Plastic packaging	0.4%	Single-use plastics, recyclate use, marine leakage

Together the five sectors account for roughly a third of national GDP. The roadmap frames CE not only as a waste or industry agenda but as a contributor to the NDC: less virgin material, longer product life and more recycling mean lower emissions in the waste, industrial-process and energy sectors.

The economic case for the roadmap was set out in the Bappenas–UNDP study The Economic, Social and Environmental Benefits of a Circular Economy in Indonesia (2021), which estimated that circular approaches in the five sectors could add in the order of IDR 593–638 trillion to GDP by 2030, create about 4.4 million net new jobs (a majority of them for women), cut waste generation by 18–52 per cent depending on the sector, and reduce emissions by roughly 126 million tonnes of CO2-equivalent in 2030. These projections are the reason the roadmap treats CE as a growth and employment strategy as much as an environmental one, and the reason its progress needs to be visible in the same system that tracks the NDC.

UN-PAGE Indonesia (the Partnership for Action on Green Economy, with Bappenas as national implementing partner and UNDP as coordinating agency) has supported this integration since Indonesia joined PAGE in 2018.

PAGE support to the circular economy in Indonesia has moved through three stages. The first produced the evidence base and the roadmap: the 2021 benefits study, sector deep-dives and the drafting support that led to the National Circular Economy Roadmap 2025–2045. The second, which this paper documents, built the planning module in AKSARA, updated the CE baseline and analysed the CE–NDC–PRKBI linkage. The third, now under way, adds the M&E module and MRV framework described in the companion paper, and prepares the system for hand-over to routine Bappenas operation.

POLICY ALIGNMENT

The integration of CE into AKSARA sits at the intersection of Indonesia's national development, climate and sectoral frameworks and of the global commitments the country reports against. The table sets out where each framework creates the mandate or the demand for the planning module.

Table 2. Policy frameworks creating the mandate for CE integration in AKSARA

Framework	Relevance to CE integration in AKSARA
Paris Agreement and Indonesia's NDC	CE contributes to mitigation in the waste, IPPU, energy and agriculture categories and to adaptation through food-system and infrastructure resilience; the enhanced transparency framework requires traceable, verifiable reporting of actions and their effects
Long-term National Development Plan (RPJPN 2025–2045) and Medium-term Plan (RPJMN 2025–2029)	A green, circular economy is among the transformation agendas toward Indonesia Emas 2045; ministries' *Rincian Output* are the budgeted expression of these plans
Low Carbon Development Initiative and PRKBI	The planning and monitoring framework through which climate targets are carried into development planning; AKSARA is its monitoring system

Framework	Relevance to CE integration in AKSARA
National Circular Economy Roadmap 2025–2045 and RAN ES 2025–2029	Defines the five priority sectors, the actions and the three national indicators that the module registers and the M&E module measures
Sustainable Development Goals	SDG 12 (responsible consumption and production) directly; SDG 13 (climate action), SDG 9 (industry and infrastructure), SDG 11 (cities, including waste) and SDG 8 (decent work, through green jobs in recycling and repair)
UN-PAGE country outcomes	Integration of sustainability into economic planning; evidence-based policy; strengthened national capacity for inclusive green economy transitions

Why integration matters now

Three developments make the integration timely. First, the new planning cycle: the RPJMN 2025–2029 and the RAN ES 2025–2029 run on the same horizon, so the actions registered now define the baseline against which the mid-term review will judge progress. Second, the NDC cycle: Indonesia's updated NDC and the transparency reporting that follows it place a premium on actions that can be traced to owners, budgets and results. Third, the material agenda itself: the five priority sectors represent roughly a third of GDP and the bulk of Indonesia's municipal and industrial waste streams, so the economic and environmental stakes of getting the planning architecture right are substantial.

The approach also reflects a principle Bappenas has applied across the PRKBI agenda: integrate through existing systems rather than build new ones. A separate CE portal would have duplicated AKSARA's action register, created a second reporting calendar for ministries and left CE outside the system that reports to Government and to the NDC process.

THE INTEGRATION GAP

Before the planning module existed, CE and climate planning ran as parallel systems. The roadmap listed actions by sector; AKSARA tracked mitigation actions by NDC category. Nothing connected the two. Four problems followed:

1. **Invisible contribution.** A ministry could deliver a CE action, such as more recycled content in cement or a food-rescue programme, without it ever appearing in the national climate accounts.
2. **No common action list.** Each ministry held its own list of CE activities, with different names, units and reporting cycles. Bappenas had no single register of what was planned.
3. **Indicators without owners.** The roadmap defined CE indicators but did not say which institution supplied which data or how the pieces added up to a national figure.
4. **Planning without a feedback loop.** With no monitoring layer, there was no way to tell whether CE actions were on track, and no evidence base for adjusting the next planning cycle.

An analysis of the linkage between the circular economy and the NDC–PRKBI framework, carried out under UN-PAGE, confirmed the diagnosis and sharpened it. Mapping the detailed outputs (*Rincian Output*, RO) of ministries' work plans showed that a large number of CE-relevant activities already exist and are already funded, in agriculture, environment, public works, industry and elsewhere, but that their link to the climate agenda is implicit, sectoral and fragmented. The challenge, the analysis concluded, is not a lack of CE activity or policy instruments but the absence of an integration

framework, cross-ministry coordination and a monitoring system able to read activities across sectors and across the mitigation–adaptation divide.

Three patterns in the RO mapping are worth drawing out. First, the same CE outcome is often pursued by several ministries under different output names: food loss and waste, for example, appears in the work plans of the National Food Agency, the Ministry of Agriculture and the Ministry of Environment, each measured in its own unit. Second, most CE-relevant outputs are tagged to the mitigation pillar or to neither pillar; very few are tagged to adaptation, even where the adaptation logic is strong, as with food-system resilience or climate-proof construction materials. Third, the enabling outputs that make circularity possible (standards, fiscal incentives, data systems, regional guidance) sit with ministries (Finance, Home Affairs, BPS, BRIN) that do not see themselves as CE actors at all. A planning module has to be able to represent all three patterns: shared outputs, dual-pillar outputs and enabling outputs.

The second stage of UN-PAGE support addressed this by building the planning module and updating the CE baseline. The third stage, now under way, adds a dedicated M&E module and MRV framework.

AKSARA AS THE BACKBONE

AKSARA was chosen as the home for CE planning because it already does three things the circular economy needed: it holds a national register of actions by ministry and region, it links actions to NDC and LCDI targets, and it is the system Bappenas uses to report progress to Government. Building CE into AKSARA rather than into a separate portal means CE actions inherit the same reporting calendar, user roles and institutional authority as every other low-carbon action.

The CE components sit inside AKSARA as two modules:

- **The planning module ("CE House"), built** in the second stage of PAGE support, where RAN ES actions, their targets, owners and indicator links are registered.
- **The monitoring and evaluation module, designed** in the third stage, where ministries submit indicator data, Bappenas verifies it, and the three national CE indicators are calculated and displayed.

Both draw on one indicator framework and one set of sector definitions, so a figure entered for monitoring refers to the same action, sector and boundary that was defined at the planning stage.

HOW THE CIRCULAR ECONOMY CONNECTS TO MITIGATION AND ADAPTATION

The circular economy is not a climate agenda of its own with separate emission targets. It is a cross-sector approach that works through existing climate categories, and its relevance differs by sector and by pillar. The UN-PAGE linkage analysis identified three mitigation mechanisms (material and energy efficiency in production; waste reduction and better waste management; and longer product and material life) and three adaptation mechanisms (more resilient food systems, more resilient infrastructure and buildings, and reduced pressure on natural resources and ecosystems).

Table 3. Sector linkages to mitigation and adaptation

Sector	Main mitigation contribution	NDC categories touched	Mitigation linkage	Adaptation linkage
Food	Lower emissions from organic waste; more efficient supply chains; food loss and waste prevention	Agriculture, waste	High	High: food supply stability
Plastic packaging	Lower landfill emissions and less virgin plastic production	Waste, IPPU, energy	High	Low–medium
Electronics	Energy-efficient products; longer product life; e-waste management	Energy, waste, IPPU	Medium	Low
Construction	Lower emissions from material production and building operation	Energy, IPPU	Medium	Medium–high: resilient infrastructure
Textiles	Production efficiency and waste reduction	Energy, IPPU	Low–medium	Low

Two conclusions follow for planning. Food and construction are the natural entry points for integration because they contribute to both pillars. Plastic packaging and electronics are best positioned as low-carbon contributors, while the textiles sector still needs clearer policy articulation before its climate contribution can be defined. This differentiated picture is built into how the planning module links actions to climate categories.

Sector entry points in detail

Food. With the largest material flow and the widest ministerial involvement, food is the sector where integration pays off soonest. On the mitigation side, preventing food loss along the supply chain and diverting unavoidable waste from landfill to compost, animal feed or biogas reduces methane from the waste category and emissions from agricultural inputs. On the adaptation side, shorter and more efficient supply chains, food rescue and organic soil amendment contribute directly to food-supply stability, the reason food is the only sector rated high on both pillars. The RAN ES actions most relevant here concern the quality of raw-material production and the prevention and use of food loss and waste.

Plastic packaging. The smallest sector by GDP share but the most visible politically, plastic packaging is a near-pure mitigation agenda: less virgin polymer production (energy and IPPU) and less landfilled or leaked plastic (waste). The policy instruments (extended producer responsibility, waste banks, recycled-content requirements, single-use restrictions) are comparatively mature and already generate reportable data through the Ministry of Environment's SIPSN. Its adaptation linkage is indirect (reduced drainage blockage and flood risk from marine and urban leakage) and is rated low to medium.

Electronics. Circularity in electronics works through longer product life, repair and refurbishment, and the recovery of critical materials from e-waste. The emissions effect is spread across energy (more efficient products), IPPU (less primary metal production) and waste (hazardous e-waste handling), which makes it real but hard to attribute to any single NDC category. The sector's climate link is therefore described as implicit; the planning module records it as a low-carbon contributor with a medium mitigation linkage and a low adaptation linkage.

Construction. The second-largest sector and the most strategic for the long term. Steel and cement dominate Indonesia's IPPU emissions, so secondary materials, design for disassembly and the reuse of demolition waste have a large mitigation potential; green-building standards reduce operational energy as well. Construction is also one of two sectors with a substantial adaptation linkage (resilient, longer-lived infrastructure and buildings), although this linkage is not yet made explicit in ministries' outputs. The module positions construction, with food, as an entry point for cross-pillar integration.

Textiles. Textiles has the least developed policy articulation of the five. The current agenda is essentially industrial efficiency (water, energy and chemical use in production, and pre-consumer waste reduction), with fibre-level recycling and post-consumer textile waste still at an early stage. Its mitigation linkage is rated low to medium and its adaptation linkage low. The planning module registers the sector's RAN ES actions, but the roadmap's recommendation is to strengthen the sector's policy framing before attempting to define its climate contribution.

THE CE PLANNING MODULE

The planning module organises the circular economy as a hierarchy that runs from national ambition down to individual actions, and back up again when results are reported.

Level 1: three national indicators. The roadmap's headline measures of circularity, each a GDP-weighted aggregate of the five sectors:

Table 4. The three national circularity indicators

Indicator	What it measures	Position in the material cycle
Circular Input Rate (*Tingkat Input Material Sirkular*)	Share of secondary, recycled, reused or alternative material entering production	Inflow
Usage Rate (*Tingkat Daya Guna*)	Share of material or product kept in use through reuse, repair, refill, refurbishment or food rescue	Use and stock
Recycling Rate (*Tingkat Daur Ulang*)	Share of post-use material returned to the cycle as secondary material	Post-use

Level 2: fifteen sector indicators. Each national indicator is built from one sector-specific indicator in each of the five priority sectors (coded A1–A5, B1–B5, C1–C5). Every sector indicator has a formula, a defined system boundary, named data sources and a confidence rating.

Level 3: RAN ES actions. Each sector indicator is linked to the roadmap actions that move it. The food-sector Circular Input Rate, for example, is tied to the actions on improving the quality of food raw-material production and on preventing and using food loss and waste. The link is what lets a ministry's action register count toward a national indicator.

Level 4: institutions. Each action and each data variable has an owner: the ministry or agency that implements the action and supplies the data. More than ten ministries and agencies are already mapped in the module, out of the fifteen or more that the linkage analysis identified as holding CE-relevant outputs, including the Ministries of Agriculture, Industry, Trade, Environment, Public Works, the National Food Agency and Statistics Indonesia (BPS).

The module records, for every action: its sector, the indicator it contributes to, the responsible institution, the target and timeframe from RAN ES, and, where an analytical link has been

established, the NDC or LCDI mitigation category it supports. That last field is the integration point: it is how a CE action becomes visible in the climate planning view of AKSARA.

The data model: what a registered action looks like

Each record in the planning module is built from a small number of controlled fields. Controlled vocabularies (for sectors, pillars, contribution types and NDC categories) are what allow the register to be filtered and aggregated consistently across ministries; free text is kept to the action description and notes.

Table 5. Fields of a registered action in the planning module

Field	Content	Controlled by
Action code and title	The RAN ES action as worded in the Action Plan, with its roadmap reference	RAN ES 2025–2029
CE sector	Food, plastic packaging, electronics, construction, textiles (one or more)	Roadmap sector list
Sector indicator	The A/B/C-coded sector indicators the action moves (e.g. B1, food-sector Usage Rate)	Indicator metadata (M&E module)
National indicator	Circular Input Rate, Usage Rate or Recycling Rate	Roadmap
Lead and supporting institutions	Ministry or agency responsible for implementation and for supplying the data	K/L master list in AKSARA
Target and timeframe	Quantified target and year, as stated in RAN ES; interim milestones where defined	RAN ES
Climate pillar	PRK (mitigation), PBI (adaptation) or both	PRKBI framework
Contribution type	Direct contribution, co-benefit or enabling condition	Linkage analysis typology
NDC / LCDI category	Energy, waste, IPPU, agriculture, FOLU; recorded only where an analytical link has been established	NDC sector categories
Linked Rincian Output(s)	The budgeted output line(s) in ministry work plans that deliver the action	Ministry work plans (Renja K/L)
Data variable(s)	The measured quantity the action reports in the monitoring cycle (e.g. tonnes of edible food rescued)	Indicator formula
Status and notes	Planned, under way, completed; confidence rating of the link; comments from verification	Bappenas super-administrator

The *Rincian Output* layer: integrating without a new reporting burden

The most operational link between CE and the climate agenda is the *Rincian Output* (RO), the detailed output line in a ministry's work plan and budget. ROs are where a ministry's mandate, a CE sector and the PRK/PBI agenda actually meet, and they are already monitored in AKSARA. The planning module therefore treats CE as a thematic layer over existing RO data rather than as a separate reporting stream. Each CE-relevant RO is tagged on four dimensions:

Table 6. The four tagging dimensions applied to CE-relevant Rincian Output

Dimension	Values
CE sector	Food, plastic packaging, electronics, construction, textiles (one or more)
Climate pillar	Low-carbon development (PRK), climate-resilient development (PBI), or both
Contribution type	Direct contribution, co-benefit, or enabling condition
Institutions	Lead ministry, supporting ministries, and whether the RO is shared across ministries

Tagging changes nothing in the AKSARA data structure and adds no reporting obligation for ministries: the same RO continues to be reported once, appears in the PRK or PBI dashboard as before, and is additionally readable through the CE lens. ROs that cut across sectors, across both pillars, or across several ministries are flagged as priority ROs for coordination. The mapping completed under UN-PAGE identified several dozen such ROs, from the National Food Agency's food loss and waste policy, through the Ministry of Environment's producer-responsibility and waste-bank programmes, to the Ministry of Industry's secondary-material (scrap) policy and the Ministry of Public Works' green-building programme, and is the starting database for the layer.

A worked example: tracing a food-rescue action

The hierarchy is easiest to see through a single action. Suppose the National Food Agency registers the RAN ES action on preventing and using food loss and waste, with a food-rescue programme as one of its instruments. In the planning module the action is recorded under the food sector, linked to the food-sector Usage Rate (the share of food kept in the human food chain through rescue and redistribution) and, through it, to the national Usage Rate. The Agency is the lead institution; the Ministry of Social Affairs and provincial governments running distribution networks are recorded as supporting institutions. The action is tagged to both climate pillars (mitigation, because rescued food does not become landfill methane, and adaptation, because redistribution strengthens food-supply stability), with contribution type "direct" for mitigation (waste category) and "co-benefit" for adaptation.

The Agency's existing Rincian Output on food loss and waste policy is then tagged with the CE lens: sector food; pillar both; contribution direct; institutions shared with Agriculture and Environment. Nothing changes in how the RO is budgeted or reported. When the monitoring cycle opens, the Agency is asked for one variable, the tonnage of edible food rescued in the reporting year, together with its source and confidence rating. Bappenas verifies the figure, the M&E module recalculates the food-sector Usage Rate and the national aggregate, and the action's status and contribution appear in the CE view of AKSARA alongside the PRK dashboard entry that the same RO already feeds. If a later life-cycle assessment establishes an emission factor per tonne of food rescued, the same record can carry a greenhouse-gas estimate without any re-entry.

What the planning module does not yet do

The module registers actions and their intended contribution; it does not calculate greenhouse-gas reductions from CE indicators. The external peer review of the CE baseline (September 2026) confirmed that the current indicators measure material circularity, not emissions, and recommended life-cycle assessment as a complementary method for a later phase. The integration with the NDC is therefore structural (CE actions planned and tracked in the same system, against the same targets) rather than a direct emissions accounting.

FROM PLANNING TO RESULTS

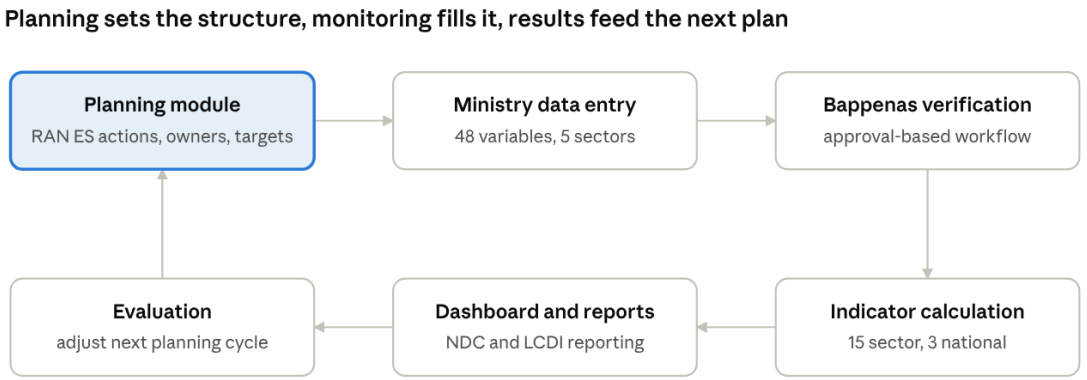


Figure 1. Planning-to-results loop in AKSARA · 6 steps

The planning module is the first step of a loop. Actions registered there define what each ministry must report; the M&E module collects and verifies that data, calculates the indicators and publishes them; the evaluation of results feeds the next planning round. The two modules share the same sector definitions, indicator codes and institutional map, so nothing has to be re-entered or re-mapped between planning and monitoring.

The six steps of the loop, as shown in Figure 1, are:

1. **Register.** The ministry registers or updates its RAN ES actions in the planning module, with sector, indicator link, institutions, target and linked Rincian Output.
2. **Define.** Bappenas confirms, for each registered action, which data variable(s) the ministry will report, in what unit, from which source and on which date: the reporting contract for the cycle.
3. **Collect.** In the reporting window, contributing ministries enter the variables in the M&E module, attaching the source document and a self-assessed confidence rating; where a variable is not yet reported, the module records the proxy used and its basis.
4. **Verify.** Bappenas reviews each submission against the previous period, the sector boundary and other ministries' figures, returns queries where needed and approves the data for calculation.
5. **Calculate and publish.** The module calculates the fifteen sector indicators and the three GDP-weighted national indicators, publishes them with confidence levels and proxy flags, and makes the results visible in the PRK/PBI and CE dashboards.
6. **Evaluate and re-plan.** Bappenas and the ministries review which actions are moving their indicators and which are not, and feed the findings into the next RAN ES update, RPJMN mid-term review and NDC reporting cycle, which is where the loop returns to step one.

In practical terms this means a ministry that registered a food-rescue action in the planning module will, in the monitoring cycle, be asked for the tonnage of edible food rescued (the variable that feeds the food-sector Usage Rate) and will see its contribution reflected in the national figure after Bappenas verification.

THEORY OF CHANGE

The results logic behind the two modules is simple: if CE actions are registered where climate actions are planned, and if the data behind them are verified where climate data are verified, then CE becomes a managed part of the national climate effort rather than a parallel agenda.

Laid out as a results chain, the logic runs as follows:

Table 7. Theory of change as a results chain

Level	What it consists of	How it is evidenced
Inputs	PAGE technical assistance; Bappenas staff time and AKSARA development capacity; ministries' existing data and work plans; BPS statistics	Project deliverables; Bappenas decision records
Activities	Linkage analysis; RO mapping; indicator metadata and baseline; design and build of the planning module; design, peer review and desk pilot of the M&E module; training	Completed products; peer-review report (September 2026)
Outputs	A populated CE action register in AKSARA; CE-tagged ROs; agreed indicator framework with owners; verification procedure; user guidance	Number of actions and ROs registered; share of variables with named owners
Outcomes	Ministries report CE variables on the AKSARA calendar; Bappenas publishes the three national indicators annually; CE actions appear in PRK/PBI reporting and in the RPJMN mid-term review	Reporting compliance; share of variables on proxies; use of the register in planning documents
Impact	CE is a managed component of Indonesia's climate effort: circularity indicators improve, and, once the emissions link is in place, the CE contribution to the NDC can be quantified and reported under the ETF	Trend in national indicators; CE content in BTRs and NDC updates; LCA-based emission estimates

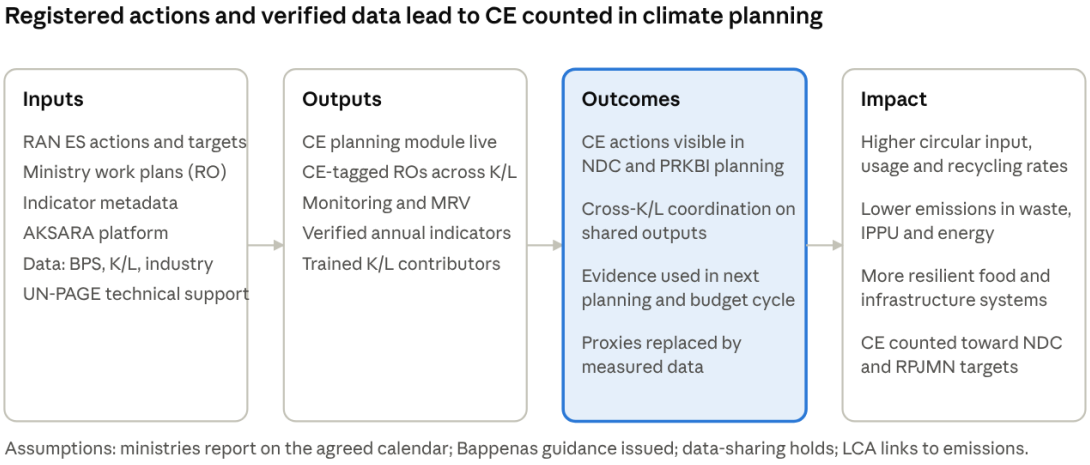


Figure 2. Theory of change · inputs to impact

The chain depends on four assumptions, each of which the implementation roadmap addresses: that ministries report on the agreed calendar (institutionalization through Bappenas guidance); that data holders share on time (standing data-sharing agreements); that the technical integration with AKSARA's core platform is completed (schema and API agreement); and that the emissions link is established (life-cycle assessment), without which the impact level remains a structural rather than a quantified contribution to the NDC.

GOVERNANCE AND ROLES

Integration only works if every part of the chain has an owner. The design confirmed with Bappenas assigns roles as follows:

Table 8. Roles and responsibilities in the CE modules

Role	Institution	Responsibility
System owner and super-administrator	Bappenas (Directorate of Environment, LCDI Secretariat)	Sets indicator definitions and boundaries, approves submitted data, publishes national figures, reports to Government and to NDC processes
Contributing ministries and agencies (*Kontributor K/L*)	Line ministries and agencies mapped to each variable	Register and update their RAN ES actions; enter indicator data on the agreed calendar; respond to verification queries
Statistical authority	BPS	Supplies GDP by sector (the weighting basis) and national production statistics
Technical and coordinating support	UN-PAGE Indonesia (UNDP)	Methodology development, peer review, pilot testing, capacity building

The RO mapping shows which ministries carry each sector in practice:

Table 9. Ministries carrying each sector, from the RO mapping

Sector	Ministries and agencies with relevant outputs	Pattern
Food	Agriculture; Marine Affairs and Fisheries; Environment; Villages and Disadvantaged Regions; National Food Agency; Bappenas	Widest involvement; the only sector balanced across mitigation and resilience
Plastic packaging	Environment; Industry; Trade; Cooperatives and	Narrow and waste-focused;

Sector	Ministries and agencies with relevant outputs	Pattern
	SMEs; Bappenas; regional governments	strongly mitigation
Electronics	Industry; Energy and Mineral Resources; Environment; Trade; BRIN; Bappenas	Climate link implicit, through energy and industry policy
Construction	Public Works; Industry; Environment; Agrarian Affairs and Spatial Planning; Bappenas; regional governments	Strategic across both pillars; adaptation not yet explicit
Textiles	Industry; Trade; Environment; Cooperatives and SMEs; BRIN; Bappenas	Limited; mainly an industrial-efficiency agenda
Cross-cutting enablers	Bappenas; Finance; Home Affairs; Communication and Digital Affairs; BPS; BRIN	Planning, fiscal incentives, regional guidance, data and research

The choice of an approval-based workflow (ministries submit, Bappenas verifies before anything is published) was a deliberate one. It keeps the national CE figures under the same quality control as other AKSARA data, and it gives Bappenas the "helicopter view" needed to reconcile sector submissions that use different boundaries or reference years.

The verification workflow

Verification follows the same maker–checker pattern used elsewhere in AKSARA. A ministry's data officer enters the variable and attaches its source; a nominated ministry focal point confirms the submission; the Bappenas super-administrator then checks it on four points: completeness against the reporting contract, consistency with the sector boundary and reference year, plausibility against the previous period and against related submissions from other ministries, and the adequacy of the stated confidence rating. Submissions can be approved, returned with a query, or approved with a flag (for example where a proxy is still in use). Only approved data enter the indicator calculation, and every change is logged with its author, date and reason.

Two design choices keep the workflow light. Variables are few, typically one to three per action, and are chosen to coincide with quantities ministries already measure for their own purposes. And the verification queries are standardised, so a ministry sees the same questions each cycle and can prepare for them. The aim is that, after the first live cycle, a complete submission and verification round for one sector should take weeks rather than months.

An indicative reporting calendar

The CE cycle is aligned with the existing AKSARA reporting rhythm so that ministries face one calendar, not two. The sequence below is indicative and will be confirmed in Bappenas guidance.

Table 10. Indicative annual reporting calendar

Period	Step	Lead
January–February	Planning module update: ministries confirm or revise RAN ES actions, targets and RO tags for the year; Bappenas issues the list of variables due	Ministries; Bappenas
March–April	Reporting window: ministries enter indicator variables for the previous year with sources and confidence ratings	Ministries

Period	Step	Lead
May–June	Verification: Bappenas reviews submissions, issues queries and approves data; BPS supplies GDP weights and production statistics	Bappenas; BPS
July	Calculation and publication of the fifteen sector indicators and three national indicators, with confidence levels and proxy flags	Bappenas
August–October	Evaluation and use: results feed the annual LCDI/PRKBI progress report, RPJMN monitoring and, in BTR years, Indonesia's transparency reporting; coordination forums review shared ROs	Bappenas; ministries
November–December	Improvement plan: proxies scheduled for replacement, metadata changes versioned for the next period, training delivered to new data officers	Bappenas; UN-PAGE (during project period)

Two governance questions were raised in the peer review and are carried forward to the next phase: the role of provincial and district governments, which hold much of the primary data and authority for waste and material management, and the use of spatial (sub-national) breakdowns so that RAN ES planning is not limited to national aggregates.

STRATEGIC IMPLICATIONS

The planning module changes what different actors can do with the circular economy. The implications below are the basis for the recommendations in the companion policy brief.

Table 11. Strategic implications by actor

Actor	What the module enables	What it asks of them
Bappenas	A single register of CE actions aligned with RPJMN, RAN ES and NDC categories; a cross-sector view of which ministries carry which part of the agenda; evidence for the RPJMN mid-term review	Issue the indicator metadata, tagging convention and reporting calendar as guidance; chair coordination on shared outputs; resource the AKSARA integration
Line ministries and agencies	Recognition of existing outputs as climate contributions without new reporting; a clear statement of which variables they own	Keep RO tags current; report indicator variables annually; respond to verification queries; nominate data owners
Ministry of Finance	A defined set of CE-tagged outputs that can be aligned with climate budget tagging, giving visibility of CE expenditure within the climate budget	Consider a CE marker or cross-reference within the climate budget tagging system; use the register when assessing proposals for green or climate finance
Ministry of Environment and other data holders	A structured demand for SIPSN, e-waste and industrial data, with a defined place for each variable	Standing data-sharing arrangements; progressive replacement of proxies with reported data

Actor	What the module enables	What it asks of them
Provincial and district governments	A future route for regional CE actions and data to enter national planning	Participate in the next phase on sub-national roles and data reconciliation
Development partners and the private sector	A transparent, government-owned register of CE actions and gaps against which to align support, investment and sustainability reporting	Align programmes with registered actions and data gaps rather than with parallel pipelines
NDC and transparency reporting	A traceable chain from action to owner to indicator for CE in biennial transparency reports and NDC updates	Commission the emissions link so that CE outcomes can be quantified, not only described

Links to climate budget tagging and finance

Indonesia's climate budget tagging, administered by the Ministry of Finance, already marks budget lines by their mitigation and adaptation relevance. Because the CE planning module works at the level of the Rincian Output, the same unit the budget tagging uses, the two systems can be cross-referenced without a new classification: a CE-tagged RO that is also climate-tagged can be read as CE climate expenditure, and a CE-tagged RO that is not yet climate-tagged becomes a candidate for review. This gives the Ministry of Finance, for the first time, a defensible figure for how much of the climate budget supports circularity and gives Bappenas a basis for the fiscal-incentive actions in the roadmap.

The register has a similar use for external finance. Development partners, green-bond issuers and corporate sustainability reporters increasingly need to show alignment with government-owned plans and indicators. A public register of CE actions, owners and data gaps, rather than project-by-project pipelines, allows support to be directed at registered actions and at the variables still on proxies, and allows results to be reported against the same national indicators that Bappenas publishes.

Gender and inclusion

The five priority sectors employ large numbers of women and informal workers, in food processing and retail, waste collection and sorting, textile manufacturing and electronics dismantling. The planning module records actions and owners; it does not yet record who benefits or who bears the cost of circular transitions. Adding a gender and social-inclusion marker to the RO tagging convention, drawing on the gender-responsive planning and budgeting practice already in use in Indonesia, is a low-cost step that would allow CE planning to be read against the inclusive-growth objectives of the RPJMN and of PAGE.

RISKS AND MITIGATION

The risks below were identified in the design work and the external peer review. They are rated for likelihood only; the effect column describes what would happen to the system if the risk materialised, and the mitigation column lists the measures already designed into the modules or scheduled in the roadmap. The two rated high (the persistence of proxy data and the gap in sub-national coverage) are both data-quality risks rather than institutional ones, which is why the next phase gives them dedicated workstreams.

Table 12. Risk register

Risk	Likelihood	Effect	Mitigation
Ministries do not report on the calendar once project support ends	Medium	Indicator series breaks; register goes stale	Bappenas guidance making reporting an obligation; reporting calendar aligned with existing AKSARA cycle; escalation SOP
Technical integration with core AKSARA is delayed	Medium	CE modules run as a side system; duplication	Early schema and API agreement with the AKSARA development team; phased integration starting with the RO tags
Proxies persist and the 2025 indicative figures are read as actuals	High	Misleading progress claims; loss of credibility	Confidence levels and proxy flags published with every figure; improvement plan with named owners; third-party validation in next phase
Sector boundaries drift between periods	Medium	Time series not comparable	Metadata locked per period; versioned changes; material flow analysis (MFA) reconciliation check
CE is read as a separate climate target	Low–medium	Confusion with NDC accounting; double counting	Clear framing as a cross-sector approach; emissions link only through LCA; no new quantitative targets in NDC or PRKBI documents
Sub-national data and authority remain outside the system	High	National figures understate or misplace activity	Dedicated next-phase workstream on provincial and district roles and reconciliation
Reporting burden perceived as excessive by ministries	Medium	Low-quality or late submissions	Tagging over existing ROs; integration with SIINas, SIPSN and other systems; training and user guidance

IMPLEMENTATION ROADMAP

The planning module is in place, and the M&E module has completed design, external peer review and a desk-based pilot. The roadmap below sets out an indicative sequence to a fully institutionalized system; the phases and gates are proposals for Bappenas and the UN-PAGE PMU to confirm.

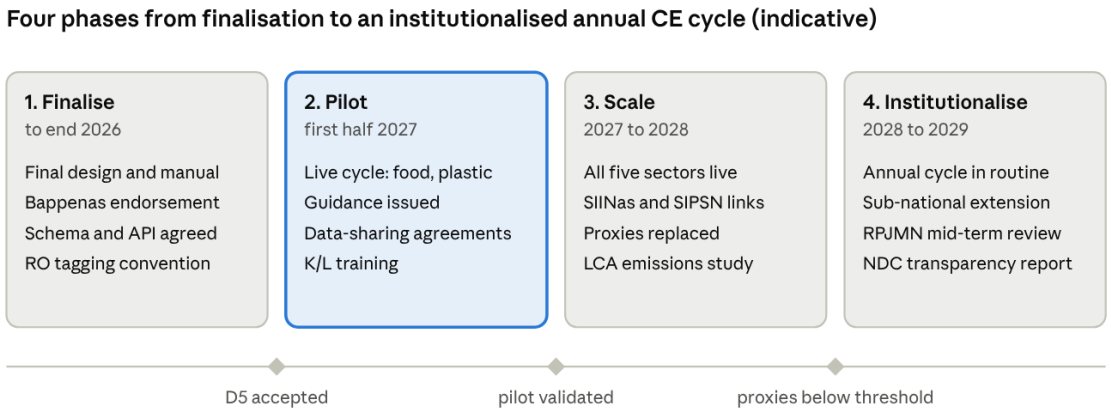


Figure 3. Implementation roadmap · 4 phases, 3 gates, indicative

Each phase passes a gate before the next begins: Bappenas' acceptance of the final M&E module design; validation of the live pilot with the first two sectors; and a data-quality threshold (the share of variables still on proxies) below which the system can be declared routine. The actions within the phases are:

- **Technical integration.** Agree the database schema and API between the CE modules and the core AKSARA platform with Bappenas' development team, including the RO-tagging fields.
- **Ministry pilot.** Run the first live reporting cycle with two sectors (plastic packaging and food) before extending to electronics, construction and textiles.
- **Differentiated sector strategy.** Use food and construction as entry points for cross-pillar integration; position plastic packaging and electronics as low-carbon contributors; strengthen the policy articulation of textiles.
- **Coordination on shared ROs.** Use the RO mapping as the agenda for existing cross-ministry coordination forums, starting with outputs that recur across ministries without a coordinating mechanism.
- **Emissions link.** Commission a life-cycle or complementary assessment so that CE indicator changes can be translated into greenhouse-gas terms for the NDC.
- **Sub-national extension.** Map provincial and district data sources and authorities and design the reconciliation between regional and national figures.
- **Institutionalization.** Adopt the indicator metadata, reporting calendar, verification procedure and RO-tagging convention through Bappenas guidance so that reporting continues beyond the project.

Grouped into the four phases of Figure 3, the indicative sequence is:

Table 13. Indicative implementation phases and gates

Phase	Scope	Gate to the next phase	Indicative timing
1. Design completion and integration agreement	Finalize the M&E module design after peer review; agree database schema and API with the AKSARA development team; adopt the RO-tagging fields; prepare user guidance	Gate 1: Bappenas accepts the final M&E module design	Late 2026
2. Live pilot	First live reporting cycle with plastic packaging and food; verification workflow tested end-to-end; first published national indicators with confidence levels	Gate 2: pilot validated: data submitted, verified and published on calendar for both sectors	2027
3. Roll-out and deepening	Extend to electronics, construction and textiles; commission the life-cycle (emissions-link) assessment; map sub-national data and authorities; begin coordination on shared ROs; link to climate	Gate 3: data-quality threshold: share of variables still on proxies below the agreed level	2027–2028

Phase	Scope	Gate to the next phase	Indicative timing
	budget tagging		
4. Routine operation	Reporting, verification and publication continue under Bappenas guidance without project support; results feed the RPJMN mid-term review, the next RAN ES and Indonesia's transparency reporting	Steady state; periodic review of metadata and boundaries	2029 onwards

Timing is indicative and depends on confirmation by Bappenas and the UN-PAGE PMU and on the AKSARA development schedule.

MEASURING SUCCESS

The planning module is an instrument, not an end. Its success should be judged by whether CE actions become easier to plan, fund and account for, and ultimately by whether circularity in the five sectors improves. Four tiers of measure are proposed:

Table 14. Measures of success

Tier	Measure	Indicative milestone
System in place	Share of RAN ES actions registered with sector, indicator link, owner and RO tag; share of CE-relevant ROs tagged	All RAN ES 2025–2029 actions registered by the end of Phase 1; priority ROs tagged for the two pilot sectors
System in use	Reporting compliance (variables submitted on calendar); verification turnaround; share of variables on proxies	Full compliance for pilot sectors in 2027; proxy share below the Gate 3 threshold by 2028
System influencing decisions	References to the CE register in Bappenas guidance, RPJMN monitoring, the RAN ES update and the climate budget; coordination forums using the shared-RO list	CE results reported in the RPJMN mid-term review; CE marker considered in climate budget tagging
Outcomes	Trend in the three national indicators and the fifteen sector indicators; CE content in Indonesia's BTRs; emission estimates from the LCA	Measurable improvement against the 2025 baseline by the end of RAN ES 2025–2029

FREQUENTLY ASKED QUESTIONS

Does the planning module create a new CE target in the NDC? No. CE is treated as a cross-sector approach that works through the existing NDC categories (energy, waste, IPPU, agriculture, FOLU).

The module makes CE actions visible and traceable within those categories; it does not add a separate CE emission target, and the roadmap's three circularity indicators are not NDC indicators.

Do ministries have to report twice? No. CE tagging is a thematic layer over Rincian Output data that ministries already report in AKSARA. The only new request is the small number of indicator variables per action in the monitoring cycle, and these are chosen to coincide with quantities ministries already measure.

Can the module tell us how many tonnes of CO2 the circular economy saves? Not yet. The current indicators measure material circularity: how much material enters as secondary input, stays in use or is recycled. Translating changes in those indicators into greenhouse-gas terms requires a life-cycle assessment, which the peer review recommended and the roadmap schedules for Phase 3. Until then the CE contribution to the NDC is structural and descriptive, not quantified.

What happens to the 2025 baseline figures that still rest on proxies? They are published with confidence levels and proxy flags, and each proxy has a named owner and a replacement plan. The share of variables still on proxies is the data-quality threshold that gates the move to routine operation, so proxies cannot quietly become permanent.

Where do provinces and districts fit? Much of the primary data and legal authority for waste and material management sits with regional governments, and the current modules are national. Mapping sub-national data sources and designing the reconciliation between regional and national figures is a dedicated workstream in Phase 3; until then, regional activity enters the system through the national ministries' outputs.

Who owns the system after the project ends? Bappenas. The modules are built inside AKSARA, are administered by the Directorate of Environment and LCDI Secretariat and are intended to run under Bappenas guidance from Phase 4 onwards. UN-PAGE's role is methodological support, peer review, piloting and capacity building during the project period.

CONCLUSION

The circular economy has been part of Indonesia's development narrative since the 2021 benefits study and part of its formal planning since the Roadmap 2025–2045 and RAN ES 2025–2029. What it lacked, until the planning module was built, was a place in the system through which climate commitments are actually planned, budgeted and reported. The module supplies that place without creating a parallel apparatus: it registers RAN ES actions in AKSARA, gives each an owner, an indicator and a climate category, and reads ministries' existing budgeted outputs through a CE lens.

The evidence assembled in the process is as important as the software. It shows that CE activity is already widespread and funded across at least fifteen ministries and agencies, that its climate relevance is strongest in food, construction and plastic packaging, and that the constraint on progress is coordination and integration rather than the absence of instruments. It also shows the limits of what has been done: the integration with the NDC is structural, not yet an emissions accounting; the M&E module has been designed and reviewed but not run live; and sub-national government is not yet inside the system.

The next steps follow directly. Bappenas' adoption of the indicator metadata, tagging convention and reporting calendar as guidance would make the system durable; a live pilot with food and plastic packaging would prove it; the technical integration with AKSARA's core platform would make it

permanent; the life-cycle assessment would make its climate contribution countable; and the sub-national workstream would make it complete. Each of these is within reach in the current RPJMN period, and each would strengthen Indonesia's ability to show, under the Paris Agreement's transparency framework, that its circular economy is a managed part of its climate effort.

ACRONYMS

Table 15. Acronyms and Indonesian terms

Acronym	Meaning
AKSARA	Indonesian Low Carbon Development Planning and Monitoring Application
Bappenas	Ministry of National Development Planning
BPS	Badan Pusat Statistik (Statistics Indonesia)
BRIN	National Research and Innovation Agency
BTR	Biennial transparency report (under the Paris Agreement's enhanced transparency framework)
CE / ES	Circular economy / Ekonomi Sirkular
ETF	Enhanced transparency framework of the Paris Agreement
FOLU	Forestry and other land use (NDC category)
IPPU	Industrial processes and product use (NDC category)
K/L	Kementerian/Lembaga (ministries and agencies)
LCA	Life-cycle assessment
LCDI	Low Carbon Development Initiative
M&E / MRV	Monitoring and evaluation / Measurement, reporting and verification
MFA	Material flow analysis
NDC	Nationally Determined Contribution
PAGE	Partnership for Action on Green Economy
PBI / PRK / PRKBI	Climate-resilient development / Low-carbon development / Low-carbon and climate-resilient development
PMU	Project management unit (UN-PAGE Indonesia)
RAN ES	National Circular Economy Action Plan
Renja K/L	Rencana Kerja Kementerian/Lembaga (annual ministry work plan)
RO	Rincian Output (detailed output line in a ministry's work plan and budget)
RPJMN / RPJPN	National medium-term / long-term development plan
SDG	Sustainable Development Goal
SIINas / SIPSN	National industrial information system / National waste management information system
SOP	Standard operating procedure
UNDP / UNEP / UNIDO / UNITAR / ILO	United Nations Development Programme / Environment Programme / Industrial Development Organization / Institute for Training and Research / International Labour Organization