Southeast Asia Indicators Handbook for Just and Inclusive Energy Transitions

International Energy Agency

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Introduction

Energy demand in Southeast Asia [1] is growing, driven by rapidly growing population and economies, industrialisation and urbanisation. Clean energy production has a key role to play in meeting this demand and many countries in the region are changing their energy mix to increase the share of renewable energy. The recently endorsed ASEAN[2] Plan of Action for Energy Cooperation (APAEC) 2026-2030 includes an ambitious set of clean energy targets such as achieving a 45% share of renewable energy in installed power capacity by 2030 while advancing sustainable and inclusive energy development. For these clean energy transitions to be just and inclusive they need to be managed in a way that is equitable, sustainable, affordable, and secure. This requires detailed analysis, mapping and planning, adequate financial and policy support, and meaningful stakeholder engagement.

Clean energy transitions in the region present unique opportunities to deliver broad socio-economic benefits, beyond emissions reductions, such as the creation of new decent jobs, economic diversification, reduced energy poverty and improved air quality. Tracking these benefits can help ensure that all parts of society benefit from these changes and can communicate the positive socio-economic impacts of clean energy transitions across different population groups.

This Indicators Handbook for Just and Inclusive Energy Transitions in Southeast Asia (hereafter, "Indicators Handbook") presents a set of indicators for energy planning for just and inclusive energy transitions. It draws on previous work of International Energy Agency (IEA) Global Commission on People-Centred Clean Energy Transitions: Designing for Fairness (hereafter, "IEA Global Commission"), consultations with stakeholders, regional case studies and IEA analysis. The Indicators Handbook is organised around three thematic areas: jobs and skills; fair distribution, affordability and access; and social inclusion and participation. Case studies from across the region are included under each theme alongside lessons learned.

The themes explored in this Indicators Handbook are grounded in the Voluntary G20 Principles for Just and Inclusive Energy Transitions, endorsed by G20 leaders in November 2024. Discussions on these Principles have continued to evolve under South Africa's G20 Presidency and Brazil's COP30 Presidency, both of which have made just and inclusive energy transitions a key priority. Reflecting

[1] Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.
[2] ASEAN: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam and Timor-Leste (from October 2025).

diverse perspectives, contexts and experiences, the Principles provide a valuable framework for guiding energy transitions in ways that maximise benefits while mitigating the risk of unintended consequences.

Designed as a technical resource, the Indicators Handbook provides guidance for governments and other stakeholders on identifying relevant indicators as a first step towards tracking policy design and implementation in line with the G20 Principles for Just and Inclusive Transitions. It provides tools to track progress, evaluate the effectiveness of existing or planned programmes, and support the design of just and inclusive energy policies from the outset.

Recognising the diversity of national energy systems and socio-economic contexts within Southeast Asia, this Indicators Handbook does not offer a prescriptive framework with a defined set of indicators. Instead, it presents a selection of indicators and evaluation methodologies, drawn from practical applications, within the framework of the G20 Principles, that can be adapted to different national circumstances. Many of these indicators are already being used by governments and stakeholders in the region to address key dimensions of just energy transitions. Countries can tailor these to suit their unique priorities, institutional capacities and national landscapes. The indicators can also support the development of Nationally Determined Contributions (NDCs) and other climate and adaptation strategies.

Just and inclusive energy transitions: Turning principles into measurable action

In 2024, G20 energy ministers and subsequently G20 leaders endorsed ten voluntary Principles for Just and Inclusive Energy Transitions. These Principles are as follows:

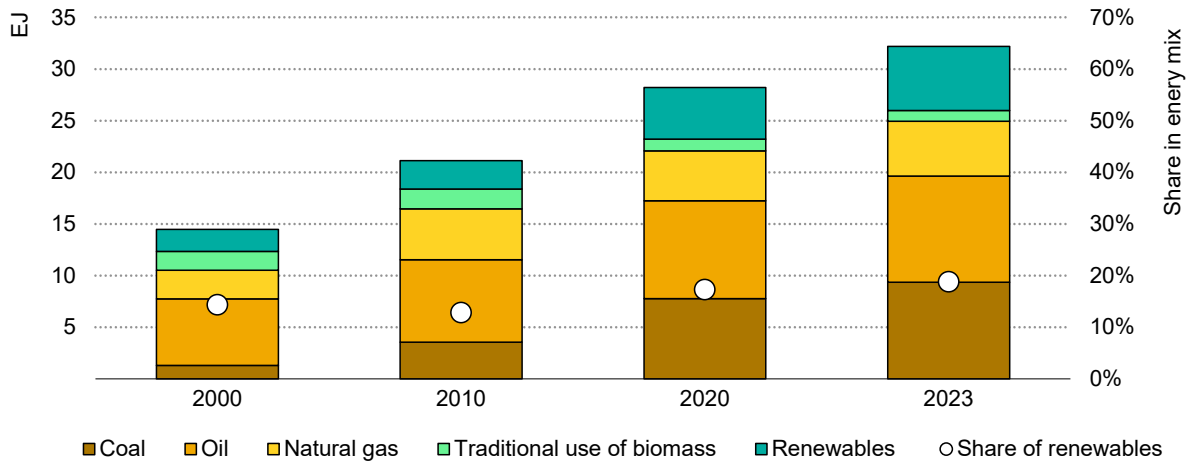
1. Energy planning for just and inclusive energy transitions
2. End energy poverty
3. Social dialogue and stakeholder participation
4. Social protection
5. Policy inclusiveness
6. Respect rights
7. Invest in affordable and reliable solutions for just and inclusive energy transitions
8. Implement secure and sustainable solutions
9. Sustainable and inclusive economic growth for all
10. Quality jobs and workforce development.

To explore how these principles are being implemented, the IEA Global Commission - comprising government ministers and high-level representatives from international organisations, labour, Indigenous, youth and civil society groups - developed two key resources. The first is a Blueprint for Action on Just and Inclusive Energy Transitions, a guidebook to help governments and stakeholders design and implement clean energy policies in line with the G20 Principles, which was published on 12 June 2025 at an IEA Global Commission meeting in the sidelines of the IEA's 10th Annual Global Conference on Energy Efficiency in Brussels, Belgium. The second is the Global Indicators Handbook for Just and Inclusive Energy Transitions, which explores tracking and evaluation of these principles, which was published on 9 October 2025 at an IEA Global Commission meeting hosted by South African Minister of Electricity and Energy Kgosientsho Ramokgopa, as part of the official programme of the G20 Energy Transitions Ministerial Meeting in Durban, South Africa. This Southeast Asia Indicators Handbook builds on this previous work and provides a regional focus by identifying regional case studies, indicators and evaluation methods.

Southeast Asia overview

Southeast Asia is host to nearly 10% of the world's population. Rapid urbanisation, population growth and industrialisation have driven a 45% increase in the region's economy over the past decade and doubled its energy demand since 2000. Based on existing policies and policy announcements in the IEA's Stated Policies Scenario (STEPS[3]), over the next decade Southeast Asia is expected to account for 25% of the world's global energy demand growth as countries continue to expand their economies and governments improve the living standards of their populations. The way the region will transform its energy systems to meet this additional demand, including by moving toward a cleaner energy mix, presents unique challenges and opportunities for its diverse communities, workers and households. Supporting communities where local employment is affected by changes in the energy mix, reskilling workers for new energy jobs and keeping energy affordable and accessible, are key to ensure that clean energy transitions provide benefits to people across Southeast Asia.

Energy demand by fuel in Southeast Asia, 2000-2023



Notes: EJ = Exajoules.

Source: IEA (2024), Southeast Asia Energy Outlook 2024.

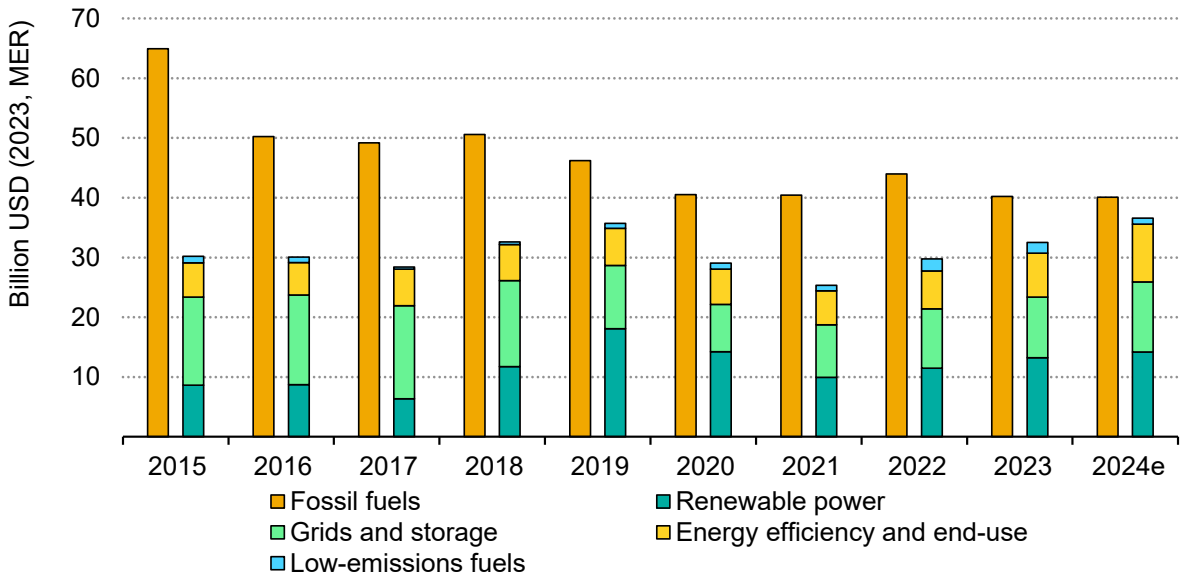
Today, Southeast Asia is highly dependent on fossil fuels, with coal and oil serving as the region's primary energy sources. Over the past decade, oil and gas have consistently accounted for around 50% of the energy mix, while coal production and use has expanded, particularly in Indonesia which supplies 90% of the region's coal. The IEA's 2024 Southeast Asia Energy Outlook highlights that based on the IEA STEPS, demand for all major energy sources is projected to

[3] STEPS = Stated Policies Scenario. See the IEA (2024) *Global Energy and Climate Model* for further details on the IEA scenarios. The STEPS scenario cited in this report is based on IEA (2024) Southeast Asia Energy Outlook.

increase through 2035, with oil, gas and coal demand expected to rise by around 20%. In this scenario, oil and gas demand continues to rise to 2050, while coal demand begins to decline in the 2040s. However, in a more ambitious scenario where countries fully meet their climate commitments (APS), coal demand will decrease threefold between 2025 and 2050, while oil and gas demand drops by around a third.

While energy investment patterns vary across Southeast Asia, renewable energy supply has almost tripled since 2000, increasing its share in the overall energy mix to roughly one-fifth today. In the STEPS, renewables are projected to meet more than a third of the region's energy demand growth to 2035, and in a more ambitious scenario - the Announced Policy Scenario (APS)[4], where announced climate ambitions and targets are met - they could comprise two-thirds of the energy mix by 2050. In order to meet a higher ambition scenario, investment into low-emission power would need to increase fivefold between 2025 and 2035. Although much of the historical clean energy investment has gone to hydropower projects, the expansion of solar and wind are expected to drive the future growth in renewables deployment. New clean energy projects are being announced in this direction across several countries, such as the Philippines where the world's largest solar and battery storage project was recently approved.

Investment in clean energy and fossil fuels in Southeast Asia, 2015-2024e



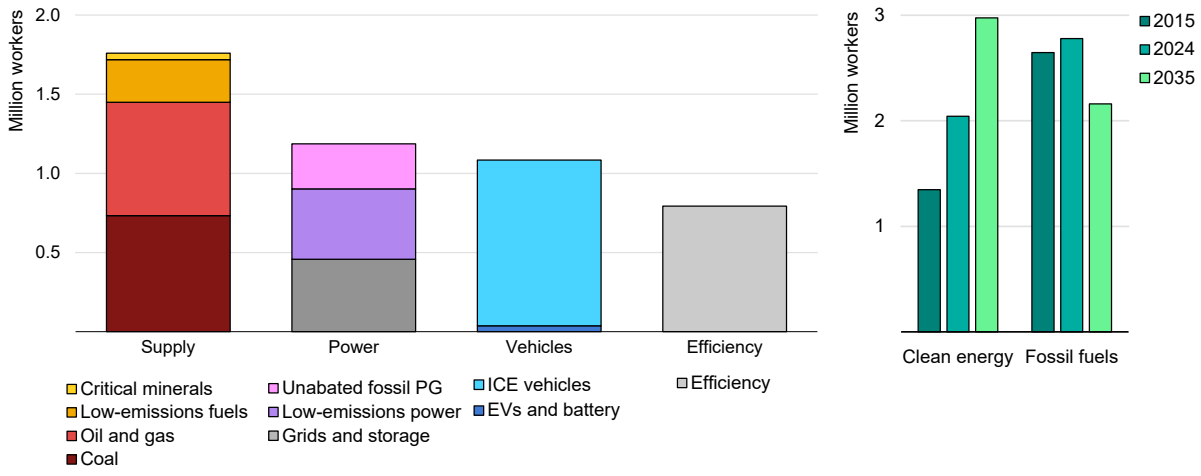
Notes: 2024e = estimated values for 2024. MER = market exchange rate.

Source: IEA (2024), Southeast Asia Energy Outlook

[4] APS = Announced Pledges Scenario. See the IEA (2024) *Global Energy and Climate Model* for further details on the IEA scenarios.

This progressive shift toward cleaner energy is reflected in employment trends, with clean energy jobs growing significantly since 2015. In 2024, low-emissions energy jobs represented 42% of total energy employment, and this share is set to rise to 58% by 2035 under current policy settings. Fossil fuel supply remains a significant employer. Coal supply alone supports 730 000 jobs, the majority of which are in Indonesia, and the oil and gas sectors employ hundreds of thousands more across the region, particularly in Indonesia, Malaysia, and Thailand. Addressing the changes in fossil fuel employment will require considered planning, especially in communities that are heavily dependent on coal for jobs and economic revenue.

Energy employment in Southeast Asia by technology, 2024, and clean energy vs fossil fuel employment, 2015 and 2024



Notes: PG = power generation; ICE = internal combustion engine; EV = electric vehicle.

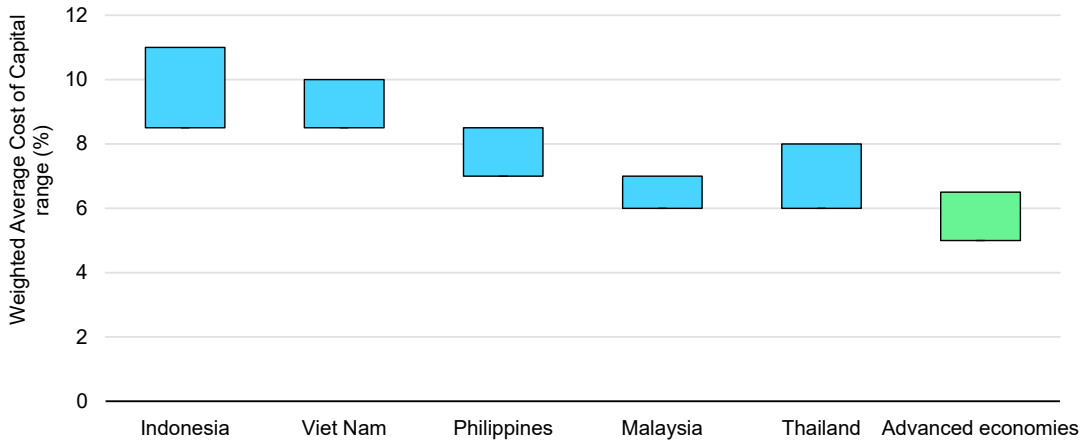
Southeast Asia has abundant critical mineral resources that present opportunities for economic development. Global demand for these resources will continue to rise, mainly driven by electronics and clean energy technologies such as electric vehicles, battery storage and grid networks. Indonesia and the Philippines together already account for 72% of global nickel production and 14% of cobalt today and the region hosts some of the world's largest resources of rare earth elements. Yet while critical minerals are driving employment growth in cleaner energy segments, most jobs are in metal ore mining, which are predominantly lower-skilled and often informal. In Indonesia, for example, 86% of the workforce in critical minerals is informal. In addition, a substantial portion of the region's critical mineral resources are located on Indigenous lands. To ensure just and inclusive energy transitions, the extraction of these minerals needs to be managed responsibly as there is concern across many regions that extractive activities can often lead to environmental degradation and health risks for Indigenous Peoples and local communities. Providing workers with employment safeguards and

protecting local communities affected by the industry's expansion will be key to ensure transitions create opportunities for decent work and improve socio-economic outcomes at the local level.

At the same time, Southeast Asia is rapidly becoming a clean manufacturing hub, which positions the region to capture high-value segments and jobs in the energy supply chain. New factories and international investments, such as Hyundai-LG's battery plant in Indonesia and BYD's EV factory in Thailand, are generating thousands of new positions, while Indonesia's leadership in nickel extraction strengthens its role in global battery supply chains. Under current policy settings, clean technology manufacturing employment in Southeast Asia is set to more than double from 140 000 today to 340 000 by 2035.

The region's ability to further develop its clean energy industries will partly depend on addressing high cost of capital. As it reflects the minimum rate of return on investment of projects, a high cost of capital lowers the profitability of projects and thereby increases overall project costs. This poses difficulties, as much of the clean energy investments required to meet climate ambitions are expected to come from the private sector. In Southeast Asia, the weighted average cost of capital is often at least twice that of advanced economies, a significant barrier to investment. The IEA Cost of Capital Observatory has recently expanded its coverage of Southeast Asian countries, enabling a greater overview of trends across countries. While the cost of capital for solar is now closer or lower than levels seen in other EMDEs, battery energy storage systems and offshore wind experience a higher range. This elevated cost is driven by a range of factors that undermine project viability, including complex permitting processes, limited grid access, perceived country risks, and a relatively thin pipeline of bankable projects.

Weighted Average Cost of Capital for utility-scale solar PV in selected regions, 2024



Source: IEA (2025), High cost of capital and limited project pipeline hinder clean energy investment in Southeast Asia

The high cost of capital is a factor in global imbalances in energy investments. Southeast Asia represents only 2% of global clean energy investment, despite accounting for about 6% of global domestic product (GDP) and 5% of global energy demand. Reducing financing costs is key to expand the region's potential as a global hub for clean energy. Advancing energy transitions would also unlock significant affordability gains by reducing reliance on fossil fuels, which have been the source of price volatility and spikes in public spending on fossil fuel subsidies during the energy crisis.

Over the past two decades physical energy access in Southeast Asia has increased dramatically. Today, 95% of the population has access to electricity, though with strong disparities across the region. Affordable and reliable energy access remains a major concern, especially for those living in rural and remote areas. Affordability concerns may intensify with incomes rising and demand for cooling growing as temperatures increase. Based on current policy settings, the stock of air conditioners in Southeast Asia is projected to increase ninefold between 2020 and 2040. Yet access to affordable cooling remains highly unequal across the broader East Asia and Pacific region: only around 25% of low-income households own an air conditioning unit compared to 75% of households in the highest income deciles.

Clean cooking access has progressed significantly in the region overall, rising from 45% in 2010 to 80% in 2023. However, improvements are not even among countries and progress is still needed to achieve universal access to clean cooking. Clean cooking access remains particularly low in the Lao People's Democratic Republic (Lao PDR), Myanmar, Cambodia, and the Philippines. Across the region, over 130 million people (or one in five) still rely on traditional biomass, coal, or kerosene for cooking. In 2023, around 85% of Southeast Asia's population was exposed to air pollution that exceeded World Health Organization (WHO) safety limits, with nearly 50% of premature deaths linked to household air pollution.

Southeast Asia will also face growing climate-related challenges to its energy systems. Approximately 40% of Southeast Asia's renewable energy facilities and 20% of its power grids are in tropical cyclones-prone areas, rates that are two to three times higher than the global averages. While extreme weather events tend to increase poverty risks, those in the lowest income deciles also tend to be most vulnerable to their consequences. Targeted interventions will be necessary to protect poorer households from these shocks and build local resilience and energy security.

Policies to ensure just and inclusive energy transitions in Southeast Asia

Southeast Asia has begun to make progress in developing and implementing ambitious national just energy transition policies and programmes. In 2022, two major initiatives – the Just Energy Transition Partnerships in Indonesia and Viet Nam – were launched, mobilising billions of dollars in private and public funding to support local projects aimed at economic diversification and green job creation in two heavily fossil-fuel dependent countries.

Building on the Philippine Energy Plan 2023–2050, the main national roadmap for energy transitions, and the National Green Jobs Human Resource Development Plan, the Philippine government will soon publish a National Framework on Just Energy Transition following stakeholder consultations. Similarly, Cambodia is set to develop a Green Policy Framework to promote innovation, create green jobs, increase competitiveness and qualitative inclusion in value chains, and improve quality of life.

The Malaysian National Energy Transition Roadmap, created in consultation with stakeholders, has the objective of accelerating the nation's energy transition and meeting its 2050 energy targets while also promoting green and sustainable growth, including job creation. In Thailand, although there is no dedicated just transition framework, the National Economic and Social Development Plan and the forthcoming National Energy Plan aim to expand renewable energy and invest in skilling workers.

Important cross-national work in the region such as policy toolkits, country-specific projects and technical support to integrate just transition principles into projects are helping to drive progress on just energy transition plan development. The APAEC 2026-2030 stresses the importance of inclusive energy transitions with advancing cross-sectoral and comprehensive energy planning as a key objective.

This Indicators Handbook builds on this work and provides concrete examples of best practice, indicators and evaluation methods to track and monitor energy transitions and improve and develop current energy plans and policies.

Ensuring just and inclusive energy transitions for all

Southeast Asia is rich in cultural diversity, with a wide range of ethnic groups and socio-economic contexts. For clean energy transitions to be fair and inclusive in line with the G20 Principles, clean energy policies should be designed to benefit every part of the society, with special attention to women, youth and Indigenous Peoples.

Women remain significantly under-represented in the energy sector, highlighting the urgent need for a gender-sensitive approach to energy policy across the region to attract and train more women to the sector. Women make up less than 20% of the total energy workforce in Southeast Asia largely due to substantial barriers in acquiring the necessary skills. Financial constraints and social and cultural obstacles to accessing STEM education (science, technology, engineering and mathematics) are among the key factors that hinder progress towards gender equality in the regional energy landscape.

Southeast Asia has one of the youngest populations in the world with 31% of the population aged 15-34 years. A number of youth-led clean energy initiatives are emerging across Southeast Asia, and one survey found that 80% believed that their respective country should have a decarbonisation target. However, 84% of young people believe that relevant skills training for energy transitions is lacking, highlighting a critical gap that must be addressed to ensure that economic benefits reach young people.

Engagement with Indigenous peoples is essential if clean energy transitions are to be fair and inclusive, both as landowners of areas with significant clean energy potential and as energy citizens. Southeast Asia is home to more than 150 million Indigenous peoples, whose lands have been significantly impacted in recent years by resource development programmes, including the construction of clean energy infrastructure. These projects can disrupt landscapes and have in the past overlooked community interests. By prioritising ongoing dialogue and real consultation Indigenous peoples can play a key role in shaping local energy transitions that benefit their communities.

Purpose and development of the Indicators Handbook

A flexible contextual approach

This Indicators Handbook complements the Blueprint for Action and the Global Indicators Handbook for Just and Inclusive Energy Transitions published by the IEA's Global Commission on People-Centred Clean Energy Transitions: Designing for Fairness. The Indicators Handbook is a flexible, pragmatic and evidence-based resource to provide guidance on tracking the implementation of various aspects of just and inclusive transitions.

Indicators in this Handbook cover energy planning for just and inclusive energy transitions as well as indicators related to three broad themes: jobs and skills; fair distribution, affordability and access; and social inclusion and participation. Each of these themes includes one or more of the G20 voluntary Principles for Just and Inclusive Energy Transitions. For each theme, the Indicators Handbook presents emerging practices and approaches from several Southeast Asian case studies, illustrating both indicators and methodologies for tracking progress, monitoring effectiveness and designing better policies. Each theme also includes lessons learned from the region and key considerations relevant to measuring the specific issues associated with the theme. The indicators proposed for each theme are by no means exhaustive. Governments are encouraged to adapt, refine and select those approaches that resonate with their distinctive priorities, socio-economic realities and institutional capacities. In this way, the Indicators Handbook lays the groundwork for future efforts, including:

- Identifying commonly used indicators, including those responding to shared regional priorities or cross-border challenges.
- Encouraging transparent documentation of how indicators are applied in different contexts, including data sources, assumptions and methods, to support mutual understanding and comparability.
- Creating space for future collaboration among countries, through technical working groups, structured peer learning or voluntary review mechanisms, to strengthen the credibility and comparability of national approaches.

Why indicators matter

Indicators can play a critical role in informing programme design, monitoring progress, assessing impacts, and driving public and political support for clean energy transitions. When well designed and effectively used, indicators and evaluation tools can allow governments to:

- Track progress towards domestic and shared international goals, such as the Sustainable Development Goals (SDGs) and the Global Stocktake to assess collective progress toward achieving the Paris Agreement's long-term goals,
- Enhance public trust and reduce conflict by promoting transparency and accountability.
- Drive local support for clean energy transitions by making data visible and accessible to the public.
- Highlight the different benefits of clean energy developments, from health and gender equality outcomes to employment opportunities.
- Help monitor the social and economic impacts of energy transitions, including potential risks or unintended consequences.
- Enable comparability across jurisdictions, helping identify trends, gaps and best practices.

Whenever relevant, all indicators should be systematically disaggregated by gender, and wherever possible further broken down by age, ethnicity, region or other intersecting categories, in order to ensure that the impacts of energy transitions on all groups are fully understood and that action can be taken to address and mitigate any unintended outcomes.

In the Southeast Asian context, the role of indicators is especially critical. The region is highly dependent on fossil fuels and is experiencing some of the world's fastest-growing energy demand. As Southeast Asia expands and transforms its energy mix, the region will face several challenges, particularly the specific vulnerabilities of fossil fuel-dependent communities. Many of these communities are concentrated around coal production and use, making them especially exposed to the impacts of the energy transition. The shift away from coal and other fossil fuels will have profound implications for local economies, employment and social cohesion.

This shift also comes with health and energy security benefits, which could be pivotal to ensure just transition in a region like Southeast Asia where people face heightened health-related problems and the burden of extreme weather events compared with the rest of the world. At the same time, Southeast Asia's countries are characterised by social, economic, and geographic diversity with different levels of data maturity, institutional capacity, and policy priorities. As such, this Indicators Handbook offers a nonprescriptive list of indicators as opposed to following a one-size-fits-all approach.

In this context, robust, locally relevant indicators can therefore help governments and regional bodies align clean energy transitions with inclusive development objectives. They can support evidence-based planning that balances affordability, reliability, and social equity; help identify communities most at risk from energy or

labour transitions; and guide investment towards projects that deliver shared benefits such as job creation, improved air quality and energy access for underserved populations.

In short, indicators are not only about measuring and tracking progress. They are also tools for learning, inclusive policy making and continual improvement in clean energy transitions.

How to use this Indicators Handbook

This Indicators Handbook is not meant as a universal prescriptive framework. It is designed to provide guidance through real-world case studies where indicators have been successfully applied to just transition goals. Policy makers and key stakeholders can use these case studies and the suggested indicators as inspirations for designing indicators that address the key issues embodied by each of the themes and their corresponding G20 Principles as they unfold in their own local contexts. Considerations for selecting indicators could include:

- Sensitivity to context, ensuring the indicators selection process is aligned with policy priorities and socio-economic realities, balancing national development goals with local needs, and addressing regional disparities.
- Data quality and availability, prioritising indicators where robust data exist, considering the cost and effort needed to collect data and ensuring there is a necessary scientific basis for data collection.
- Transparency and independence of the process, in which diverse stakeholders are involved in setting priorities and have the capabilities to monitor and interpret results should this be needed. The suggested indicators in this Indicators Handbook are meant as starting points to spur international collaboration in this domain.

Developing the Indicators Handbook though regional knowledge sharing

To inform the development of the Indicators Handbook, the IEA People-Centred Clean Energy Transitions Programme organised a series of regional workshops and consultations. An in-person workshop was held in Jakarta in July 2025, convening over 60 participants representing policy makers, international organisations, trade unions, business, think tanks and civil society organisations (CSOs) from across the region. The workshop provided a forum to discuss regional priorities and challenges in designing and monitoring indicators for just and inclusive energy transitions. In addition, four thematic online workshops were organised, each engaging a specific stakeholder group: CSOs, labour representatives, policy makers and industry experts. These virtual sessions

brought together around 90 experts from across Southeast Asia to share practical experiences, methodologies, and lessons learned on developing people-centred indicators.

Through these dialogues, participants exchanged insights on existing and emerging indicators, institutional mechanisms for data collection, and capacity-building needs. Their contributions have been invaluable in shaping this Indicators Handbook. Consultations for the regional case studies also included key partners such as the Indonesia JETP secretariat, Clean, Affordable and Secure Energy (CASE) for Southeast Asia, the Indonesian Ministry of Finance, Geres, the Philippines Department of Energy, Mee Panyar, GIZ Indonesia, Youth for Energy in Southeast Asia, the ASEAN Centre for Energy (ACE), CREATE Borneo and-Bantay Kita-PWYP Philippines.

Key findings from workshops on challenges and opportunities for tracking progress on just and inclusive energy transitions

Several challenges and opportunities in tracking progress on just and inclusive energy transitions emerged from the five Southeast Asia focused IEA workshops. Stakeholders stressed the importance of the local and national context within Southeast Asia, emphasised that although there are many similarities, socio-economic and environmental landscapes differ within the region.

Data improvements and digital opportunities

Improving the availability of disaggregated data offers new ways to monitor key just transition dimensions.

Stakeholders noted the need for more disaggregated data, including on gender, age and location to improving tracking energy policies. Cross-ministerial data sharing could allow for more detailed data to be collected and shared. Collecting quality data at a granular level requires in-depth knowledge of the context.

Stakeholders can help gather disaggregated data.

Engaging with stakeholders in the region offers additional channels to collect data on specific groups (workers, local communities, Indigenous communities). However, Indigenous representatives highlight the importance of data protection stressing that collecting data in a manner that protects individual identities, especially in small rural communities, is important to build trust.

Integrating qualitative indicators with quantitative metrics to fully capture lived experiences and understand real impacts in communities.

While quantitative data remain essential, many topics related to just energy transitions benefit from qualitative input. Stakeholders raised the importance of surveys and interviews to provide additional information on barriers, opportunities and consequences (e.g. job satisfaction, quality of life).

Agreed definitions allow for better monitoring of energy transitions including at regional level

Inconsistent definitions on less well-defined concepts, for example on “green jobs’’ or “vulnerable groups’’ can be a barrier to collecting comparable information across different ministries and agencies. Agreed definitions is an important first step to building a data sharing framework to track progress across the region. Using internationally recognised classifications, for example International Labour Organization (ILO) definitions on green jobs or Indigenous peoples, could help better categorise data.

Investing in technical capacity building can enhance data collection to track progress.

Building technical capacity and training more people to work in data collection and analysis continue to be priorities. However, most stakeholders reported that knowledge gaps or a lack of data collection prevents the integration of socio-economic indicators into energy models and scenarios. Increased budget is often required both to train and hire more experts and to upgrade statistical systems which is a barrier for some governments and organisations.

Integrated governance and stakeholder engagement

Strengthening co-ordination across different institutions can accelerate tracking efforts.

Just energy transitions touch on issues that extend beyond traditional energy domains, such as labour, education, Indigenous rights, and social protection. Data on these issues are frequently siloed between government ministries and agencies. Interinstitutional collaboration including building centralised databases and strong co-ordination across implementing partners, government agencies and regulators can enhance monitoring efforts on just transition outcomes and ensure a more holistic approach.

Stakeholder engagement builds trust and ensures the legitimacy of tracked indicators.

Developing data collection methods with key stakeholders (e.g. trade unions, local communities, youth and Indigenous groups) can help build trust and ensure that the indicators used reflect local priorities.

Energy planning for just and inclusive energy transitions

Many countries in Southeast Asia have established long-term plans to guide transitions toward cleaner energy systems. Given the complexity of the co-ordination and alignment required, robust tracking is important to ensure that these plans meet the targets they set out. Tracking is also necessary to ensure that these planning processes are inclusive. Measuring the extent and quality of engagement with multiple stakeholders in the process can help ensure that long-term planning reflects the needs and experiences of all groups that may be impacted by transitions.

Emerging practices and approaches to track progress on energy planning for just and inclusive energy transitions

The following case studies illustrate how tracking on energy planning for just and inclusive energy transitions can take place:

- **Indonesia - Just Energy Transition Partnership (JETP)**, using a monitoring framework to ensure inclusive energy planning.
- **Southeast Asia - Clean, Affordable and Secure Energy (CASE) for Southeast Asia**, driving change in the power sector with governments and key stakeholders

Indonesia – Just Energy Transition Partnership (JETP)

Objective:

The Just Energy Transition Partnership Indonesia mobilised an initial USD 20 billion in public and private financing to support a just energy transition in Indonesia. The partnership, between the government of Indonesia and the International Partners Group, was launched in 2022 and has the objective of increasing the share of renewable electricity generation to at least 44% by 2030 and for total electricity sector emissions to decrease from 2030.

Through the JETP, Indonesia is channelling new investments to help workers and communities affected by the country's coal phase-out. The JETP Secretariat is supported by five working groups: technical, policy, financing, just transition, and

electrification and energy efficiency. The Just Transition working group engages and consults with civil society and think tanks including through collaborative workshops and online dissemination and feedback procedures.

The Just Transition working group has developed a framework to identity a comprehensive set of socio-economic and environmental areas that the JETP can impact. Nine just transition standards have been developed (e.g. economic diversification and transformation) as part of the Just Transition Framework which is used to manage the risks and opportunities presented by JETP investments. To measure success, indicators are being developed with stakeholders for the nine standards of the Just Transition Framework including those listed below, which cover economic diversification and transformation. In addition, the establishment of a grievance mechanism will allow for issues and complaints to be logged and for improvements to be made in relation to any JETP funded projects.

Selected indicators tracked

- number of jobs created through JETP projects (pre-construction, construction, and operational phases)
- number of workers reskilled, upskilled, or retrained
- number of projects that create and implement the just transition standards included in the agreed Just Transition framework
- number of complaints submitted and resolved to assess grievance mechanisms
- number of jobs created for women, local citizens, and people with disabilities
- share of marginalised group participation in stakeholder consultations

Evaluation methodology:

The JETP Taskforce will adopt a mixed-methods approach to monitor and evaluate progress under the JETP framework. This will include:

- Quantitative data collection, through mechanisms such as regular reporting from project implementers on key indicators (e.g. jobs created, reskilling numbers, grievance cases) using standardised templates.
- Qualitative assessments, such as through targeted interviews, stakeholder consultations and focus group discussions. This will allow for the collection of insights from communities, civil society and affected workers, ensuring inclusive and representative feedback.
- Desk-based research. This includes reviewing relevant policy documents, energy sector data, and existing evaluations to contextualise findings and support evidence-based recommendations.
- Periodic surveys to measure stakeholder satisfaction, quality of employment outcomes, and participation of marginalised groups.

- External evaluators engaged at key intervals to conduct independent reviews and assess progress against the nine just transition standards.

Outcomes:

As of 30 September 2025, five programs worth USD 858 million and four projects worth almost USD 2 billion have been approved as well as 43 grants totalling over USD 180 million. Each project is required to incorporate the Just Transition Framework, monitoring these programme's outcomes will help ensure that investments to accelerate the country's energy transition also respond to key socio-economic developments

JETP has developed support at local and region level through the establishment of three regional just energy transition multi-stakeholder forums (Kuta in Bali, Medan in North Sumatra, and Sorong in Southwest Papua). Just transition support for specific projects has been provided at Dieng Geothermal where a pilot study analysed the implementation of the Just Transition Framework through a literature review, household survey, in-depth interviews and a focus group discussion which led to concrete policy recommendations. In addition, site visits have been conducted for example for a floating solar PV project at Singkarak Lake in West Sumatra to help identify bottlenecks and make improvements.

Southeast Asia – Clean, Affordable and Secure Energy for Southeast Asia

Objective:

The Clean, Affordable and Secure Energy (CASE) for Southeast Asia project aims to drive systemic change in the Southeast Asian power sector by providing evidence-based solutions to decision makers and fostering societal and political support for clean energy solutions. CASE is led by the German Agency for International Cooperation (GIZ) with support from regional and local experts.

CASE operates in Indonesia, the Philippines, Thailand, and Viet Nam, countries that together account for nearly three-quarters of total power generation in Southeast Asia. The project aims to drive systemic change in the region's power sector towards renewable energy, strengthen policy ambition, and support a just energy transition aligned with the Paris Agreement goals.

Through research, dialogue, and technical cooperation, CASE supports policy development, builds institutional capacity, and facilitates coordination among governments, the private sector, academia, and civil society. At the regional level, CASE advances data transparency and progress tracking through the Southeast

Asia Information Platform for the Energy Transition (SIPET) and fosters peer learning through the Regional Energy Transition Dialogue (RETD) and National Energy Transition Dialogues (NETDs).

Selected indicators tracked

- official power sector development plans which project higher renewable energy additions than fossil fuels in the medium term (2032–2036).
- number of significant policy or regulatory measures influenced or supported by CASE that are adopted to address barriers in the power sector.
- number of consecutive Nationally Determined Contributions (NDCs) which show a higher level of ambition in the energy sector.
- number of national and regional energy transition dialogues, expert workshops, and training events, as well as expanded participation from civil society organisations, NGOs, and academic institutions.
- number of energy administrations in partner countries which integrate CASE-supported analyses into national strategies, laws, or regulations promoting clean energy deployment.

Evaluation methodology:

CASE monitors its activities and keeps track through a results-based monitoring (RBM) framework that combines both quantitative and qualitative approaches. Data sources and verification methods include:

- Quantitative data collection from implementing partners on key indicators such as the number of activities and projects implemented, progress toward policy milestones, and contributions to renewable energy deployment and emissions reductions.
- Qualitative assessments conducted through stakeholder interviews, surveys and consultations to capture policy influence and collaboration dynamics.
- Desk-based research and document reviews of official policy and planning documents, publications, and media coverage to track policy and market developments.
- Event and capacity-building evaluations based on participant lists, feedback forms, and meeting protocols to monitor engagement and knowledge-sharing outcomes.

Outcomes:

Partner countries have strengthened policy ambition, increased renewable energy deployment, and improved grid integration, while reducing reliance on fossil fuels. These efforts are fostering reliable and affordable energy systems, supporting new green jobs and local industries, and enabling civil society to play a more active

role in shaping the transition. By strengthening regional cooperation and building trust across sectors, CASE is helping to advance a clean, inclusive, and sustainable energy future for Southeast Asia.

Lessons learned and key considerations

Insights drawn from national experiences in Southeast Asia have helped identify key considerations when tracking progress towards energy planning for just and inclusive energy transitions.

- Tracking the effectiveness of inclusive energy planning requires the institutions responsible to have the necessary tools, capacity and co-ordination mechanisms.
- Stakeholder tracking tools, such as engagement quality metrics and a number of consultation rounds, can help to monitor both the participation of various stakeholders and the integration of their feedback in decision-making.
- Tracking social indicators and disaggregated outputs through energy modelling frameworks and qualitative analysis can help ensure these interconnected dimensions are accounted for in planning and evaluation.

Selected indicators tracked on energy planning for just and inclusive energy transitions

Selected indicators tracked	
Indicators	**Evaluation methods**
Number of national and regional energy planning strategies, energy planning bodies or advisory panels	Desk review of officially published regional/national energy plans and strategies; analysis of government and ministry websites for evidence of energy planning bodies or advisory panels; verification of ministry/department websites and international energy data resources (e.g. IEA, Sustainable Energy for All).
Number of energy policies/plans explicitly referencing principles of justice, inclusion and equality	Desk review of officially published energy transition strategies; comparison across regions and timelines; targeted search for standalone “just transition” policies/acts; content analysis of policy documents; keyword search for justice, inclusion, gender, youth and Indigenous references; cross-comparison over time.

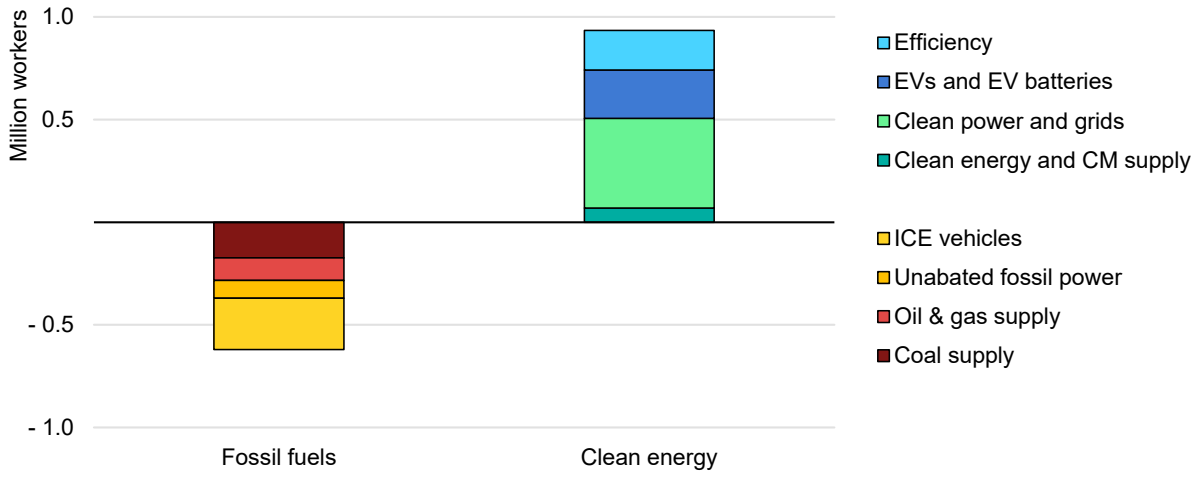
Selected indicators tracked	
Indicators	**Evaluation methods**
Level of stakeholder participation and satisfaction in the inclusiveness and effectiveness of energy planning strategies disaggregated by gender, energy planning bodies or advisory panels	Qualitative assessment with stakeholder interviews and/or surveys to assess perception of participation quality of different groups; desk analysis of plans and meeting records to evaluate integration of multi-stakeholder perspectives.
Number of indicators tracking key fair and inclusive transition issues in relevant energy policies and monitoring frameworks	Content analysis of policy frameworks and monitoring systems to identify and catalogue relevant indicators used.
Level of cross-sectoral and inter-ministerial engagement in fair and inclusive energy transition planning and implementation	Desk review of policy documents, mapping of participating ministries/agencies; mapping of inter-ministerial committees/task forces and their mandates; analysis of cross-sectoral co-ordination mechanisms; stakeholder interviews and scoring of interministerial involvement levels.
Number of regions with fair and inclusive energy transition plans	Desk review of published regional energy plans and transition strategies; verification via governmental websites and central registries.
Amount of resources and governance capacity allocated to formalised national government bodies responsible for energy transitions	Review of budget documents, staffing levels, and authorising legislation; policy or budget provisions for all designated national energy transition entities (including external councils, task forces and commissions), with quantitative reporting on allocated funding, staff and legal mandates.
Number of successful indicators per just energy transition (JET) programme.	Number of jobs created by JET programmes, number of new local green businesses and value chains created linked to JET projects, number of complaints received and resolved, number of improvement measures made to projects following feedback.

Theme 1: Jobs and skills

Workers are central in ensuring access to safe and reliable energy, with 76 million people currently employed in energy worldwide. This is reflected in the fact that three of the ten G20 principles are directly related to jobs and skills: social protection, sustainable and inclusive growth for all, and quality jobs and workforce development.

In Southeast Asia over 4.8 million people are employed in energy (around 6% of the global energy workforce), which is set to rise to over 5.1 million by 2035 under current policy settings and policy announcements (STEPS). Increased education and training required to train the clean energy workforce of the future, plus economic diversification, new jobs opportunities and support for impacted workers.

Projected change in Southeast Asia energy workforce by technology in STEPS, 2024-2035



Notes: EV = electric vehicle; ICE = internal combustion engine; CM = critical minerals.
Source: IEA modelled estimates.

Fossil fuel phase out and ensuring just energy transitions

Under IEA STEPS, fossil fuel jobs in Southeast Asia are expected to decline in the medium-term, with around 620 000 jobs lost over the next decade. Oil and gas supply and coal supply lose around 110 000 and 170 000 workers respectively,

representing a 15% and 24% reduction from 2024 levels. The number of workers in fossil fuel power generation, decreases with 87 000 fewer workers needed by 2035, with most of the losses seen in the construction and manufacturing of new infrastructure.

The shift to cleaner energy and resulting job losses highlight the need to create new jobs and diversify economies in regions dependent on fossil fuels, especially those reliant on coal. In Indonesia, provinces such as East Kalimantan, South Sumatra and South Kalimantan are particularly exposed. East Kalimantan alone accounts for nearly half of Indonesia's coal output, contributes around 30% of East Kalimantan's GDP and provides 11% of total employment through coal-related activities. Similarly, in Viet Nam, Quảng Ninh Province produces 99% of the country's hard coal and employs around 100 000 workers in the mining sector, forming the backbone of its local economy. This high dependency makes these provinces particularly vulnerable in the phaseout of coal.

Clean energy opportunities

Energy demand in Southeast Asia continues to increase with renewable sources playing a key role in the future energy mix. Clean energy investment in the region is on the rise and amounted to almost USD 47 billion in 2025, up from USD 30 billion is 2015. Investment in clean energy could result in a strong increase in new clean energy job creation in the region over the next decade. Based on current policy settings and policy announcements (STEPS), clean energy investment, is expected to at least double in the next five years, generating almost 950 000 new jobs by 2035. This would result in the clean energy workforce representing almost 60% of the total energy workforce in Southeast Asia by the end of the decade.

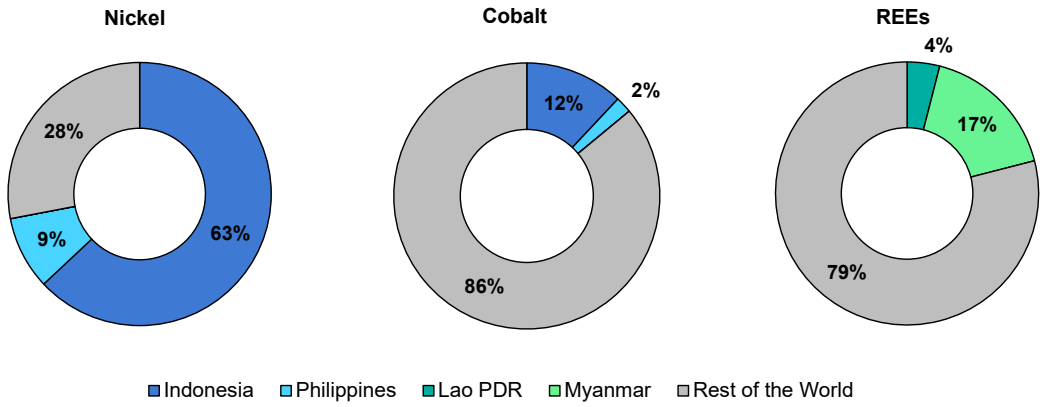
In the same scenario, jobs in clean power and grids drives employment growth, creating around 440 000 new jobs, followed by the electric vehicles and batteries sector which, although currently limited in scale, increases from 39 000 workers in 2024 to almost 280 000 in 2035. Energy efficiency measures add another 190 000 jobs.

Clean energy manufacturing will also play a big role in the workforce expansion. Southeast Asia already hosts 60% of clean energy manufacturing jobs outside of China and advanced economies, and is expected to rise in STEPS especially in solar PV manufacturing which received the majority of clean energy investment in Southeast Asia in 2023 (USD 5 billion).

Critical minerals job growth

Clean energy transitions can provide opportunities for local economic development including in critical minerals. Southeast Asia holds substantial reserves, with more than 40% of the world's nickel and cobalt. Indonesia alone accounts for more than 63% of global nickel production, and together with the Philippines, brings Southeast Asia's share above two-thirds of the world total. Both cobalt and rare earth elements are important for magnet manufacturing, and Southeast Asia contributes approximately 14% of global output of cobalt and 21% of global output of REEs.

Southeast Asian countries' share of global mining supply of nickel, cobalt and rare earth elements (REEs), 2024



Notes: The production figures are for magnet REEs only and reserves figures for all REEs.
Source: IEA (2025), Global Critical Minerals Outlook.

Setting up tracking mechanisms for the extraction and processing of critical mineral resources can help ensure that labour rights are respected, local environmental degradation is prevented, and socio-economic costs and revenues are fairly distributed.

Education and skills for the energy workforce of tomorrow

To prepare the clean energy workforce, many countries in Southeast Asia are increasing their focus on skills. In the Philippines, the National Green Jobs Human Resource Development Plan aims to enhance education and training systems to

meet green economy demands. In Viet Nam, the industry-education collaboration RENEW Skills programme aims to train over 4 000 students in wind energy and grid integration.

To ensure that fossil fuel workers can transition to new jobs, reskilling programmes need to be developed in coal-phase out regions. This work is still in early stages in Southeast Asia but is progressing and training programmes for policy makers on skills development for coal mining regions are being rolled out. Analysis has shown that for clean energy jobs to be attractive, they also need to be decent jobs, including good wages and working conditions. Occupational and occupational health and safety protections.

Social protection

Several countries are advancing social protection measures linked to the coal phase-out. In the Philippines the government looking at how to provide safety nets and support mechanisms for transitioning workers in line with the United Nations Global Accelerator on Jobs and Social Protection. In Viet Nam, a multistakeholder group is developing a roadmap for the Global Accelerator on Jobs and Social Protection for Just Transitions.

Tracking developments in employment, from job losses and gains to the quality of jobs and training opportunities, is key to developing policy responses to address the changing landscape of the energy sector. Ensuring the participation of workers, along with employers and governments, in the development of indicators and policies will help make sure the approaches are relevant to the lives and needs of workers themselves.

Emerging practices and approaches to track progress on jobs and skills

The following case studies highlight existing tracking mechanisms to monitor key aspects related to jobs and skills:

- **Indonesia - SIMBARA,** a system to monitor, manage and optimise mineral and coal resources through unified data and supervision systems
- **Cambodia - Geres' KjuonGo project,** to promote sustainable forest resource use in the Cardamom Mountains
- **Malaysia - Green Economy Framework,** which will track the socio-economic impacts of the country's clean energy transition

- **Philippines - National Green Jobs Human Resource Development (NGJ HRD) Plan 2020–2030,** preparing the future green labour force and ensuring a just transition

Indonesia – SIMBARA

Objective:

Given the abundance of critical raw materials in Indonesia, the aim of SIMBARA, an interministerial digital platform led by the Ministry of Finance, is to monitor mineral and coal resources to enhance transparency. The platform requires data integration among the Ministry of Energy and Mineral Resources (overseeing mining operations), Ministry of Transportation (managing 264 ports), Ministry of Trade (handling export regulations), Ministry of Industry (overseeing downstream processing), and the National Economy Council (NEC).

The objective of the platform is to improve the traceability of raw materials extraction and processing which can also help prevent illegal mining and better track the number of people employed in the sector including in critical minerals. By collecting more detailed analysis, the growth and opportunities of jobs in an expanding sector such as critical minerals can be better monitored.

Selected indicators tracked:

- increase rate of state revenue from critical minerals taxation
- frequency and reliability of inter-ministerial data exchange
- mining production quotas
- discrepancy rate in output and sales data (to confirm all production activities are accounted for and traced)
- number of illegal mining activities detected/prevented

Evaluation methodology:

- Inter-ministerial data integration and real-time monitoring, using systems which verify transactions and monitors compliance across the supply chain
- Mandatory reporting and documentation from mining companies, which are required to submit reports including production figures, sales data, mining locations and export information through SIMBARA
- Data collected through miner taxpayer identification numbers, related to transactions, production quotas and sales

Outcomes:

Indonesia has strengthened its capacity to manage mineral resources through enhanced data analytics and enforcement mechanisms. By identifying and addressing illegal mining activities, since 2022 the SIMBARA platform prevented revenue leakage and illegal mining, avoiding losses amounting to USD 300 million, and improved risk profiling of 828 business operators. These efforts have contributed to curbing illicit practices and fostering a more equitable and accountable mining ecosystem, and the platform will soon expand its supervision to copper and bauxite.

Cambodia – Geres KjuonGo project

Objective:

The target of the KjuonGo project in Cambodia, led by the non-governmental organisation Geres, was to develop sustainable, legal, and traceable wood fuel value chains that reduce deforestation, lower greenhouse gas emissions, and improve local livelihoods. The initiative specifically sought to build local capacity by educating community members, local government agencies and local authorities on sustainable forestry and energy planning. Initially focusing on community forests as the primary source of sustainably harvested wood, the project has engaged both the National Forestry Administration and traditional charcoal producers to highlight the benefits of new income streams for local communities. In doing so, it has also secured cooperation from a sector that has historically operated outside formal legal frameworks.

Selected indicators tracked:

- hectares of forest area restored
- volume of sustainable charcoal produced
- number of households supplied with sustainable charcoal
- percentage increase in individual's income
- rate of individuals with increased income on the total population
- number of community members and local authorities trained, by gender
- number of training sessions conducted
- number of jobs created
- number of improved charcoal kilns built or renovated by the producers

Evaluation methodology:

- Forest restoration and protection is evaluated through on-site participatory mapping and evaluation, as well as logs of protection patrols
- Analysis of harvesting quotas issued, kilns and chainsaws registered, and transportation permits issued

- Recording of income generated by the economic activities (sales, volumes and prices) on a specially created platform
- Training attendance records and post-training feedback surveys and interviews to track the reach and quality of the training activities

Outcomes:

The project has successfully onboarded 20 community forests for wood supply, established a robust supply chain documented through a unique IT-based tracking system for sustainably harvested timber, and demonstrated the financial viability of charcoal production that competes favourably with traditional alternatives on the market.

With the active involvement of the Forestry Administration, the initiative has helped integrate sustainable charcoal production into national forestry development plans. As the project concludes, plans are already underway to scale up its impact. Moreover, the project has shown that well-managed community forests offer significant climate adaptation benefits, particularly in mitigating flood risks. Restoring degraded community forests therefore brings added value to local communities, not only through environmental resilience but also by creating additional income streams from fuelwood, an important source of livelihood for vulnerable groups.

Malaysia – Green Economy Framework

Objective:

Malaysia will soon publish a new Green Economy Framework, a comprehensive national strategy as part of the country's commitment to achieve carbon neutrality by 2050. The framework will include six strategic priorities with one pillar on Just Transition and Social Development, which specifically targets Malaysia’s coal-dependent regions and the anticipated workforce displacement risks in fossil fuel sectors.

To advance the Green Economy Framework’s pillar on Just Transition and Social Development, the government will use a comprehensive monitoring system, in which several indicators will be used to systematically track the socio-economic impacts of the country’s clean energy transition.

Selected indicators tracked

- green jobs created (by relevant economic activities)
- jobs displaced (by relevant economic activities)
- unemployment rate (%)
- percentage of successful reemployment of displaced workers
- household disposable income
- percentage of population living in poverty
- coverage of transition assistance (% of displaced workers receiving support)
- income inequality (Gini coefficient)
- public spending on just transition measures
- number of just transition elements in energy policies

Evaluation methodology:

Data could be collected for the framework through a mixed-methods approach which could include:

- Analysis of labour force data capturing employment by sector, occupation, education level, wage rates and region, disaggregated by gender, to support impact modelling and labour market analysis
- Education and skills development records from technical and vocational education and training and higher education institutions, including current skills inventory, enrolment and graduation rates in green-related programmes, outcomes tracking and disaggregation by gender
- Review of administrative datasets on social protection and retraining programmes, with details on coverage, operational costs and programme effectiveness linked to policy interventions under each sector or policy area

Outcomes:

The implementation of the Green Economy Framework is designed to ensure energy policy design considers the socio-economic impact of the country's energy transition, minimising unintended consequences and enhancing policy coherence. Efforts are under way to institutionalise the Framework and its associated indicators across all relevant ministries, to ensure policy co-ordination and systematic tracking of progress towards Malaysia's clean energy transition.

Philippines – National Green Jobs Human Resource Development (HRD) Plan 2020–2030

Objective:

The National Green Jobs Human Resource Development Plan 2020–2030 follows the Philippine Green Jobs Act (2016) and was developed through a multi-stakeholder process. The plan is based on a five-point Strategic Action Framework which includes developing a green jobs-ready and skilled labour force, establishing an adequate and accessible green jobs labour market, implementing shared green jobs and just transition governance, building a green jobs and just transition stakeholder base, and ensuring inclusive social protection and just transition of the labour force.

The plan aims to integrate green competencies into education and training into secondary education curricular and tertiary education. It will support the implementation of green technical and vocational education and training systems and will expand scholarships, and incentives for the green workforce, will formalise green occupations and training providers while ensuring that the education and training meet international standards. To help match the appropriately skilled people with green jobs, a national database of green jobs will be created. Importantly, the plan will engage with social partners and aims to integrate the green jobs agenda in existing tripartite bodies (policy makers, workers' and employers' representatives). In addition, it will strengthen collaboration on data sharing and management among tripartite stakeholders.

The Plan also aims to ensure that all green jobs are decent jobs and that social protection legislation covers all workers impacted sectors, including fossil fuel sectors. Assessments of at-risk workers will be completed as part of a mapping exercise to prepare for just transitions and unemployment benefits and insurance schemes will be made available for displaced workers with grants for reskilling and upskilling prioritised for these workers with livelihood and emergency employment plans to be adapted for these workers.

A range of potential indicators could be used to track progress of the NGJ HRD Plan. This includes the following recommendations.

Selected indicators tracked

- number of training and education programmes that include green skills
- number of scholarships offered that include green skills
- number of green job training courses formalised
- number of courses aligned with international standards
- number of users of the new green jobs database, number of users who successfully find a green job using the platform
- number of workplace green jobs and just transition bodies established
- number of discussions on green jobs and just transition at the National Tripartite industrial Peace Council
- percentage of green jobs classified as a decent job (ILO guidelines) with social protection coverage
- percentage of at-risk energy plants with a risk assessment carried out
- percentage of at-risk workers who have completed an upskilling or reskilling training course
- percentage of successful reemployment of displaced workers
- number of new renewable jobs created

Evaluation methodology:

Data could be collected for the framework through a mixed-methods approach which could include:

- Desk analysis on education and skills development records on the number of secondary and tertiary courses that include green skills in the curricula, the number of scholarships offered and the number of courses that meet international standards.
- Quantitative analysis on the number of green jobs, vacancy rates, and the success of the green skills and job matching platform.
- Quantitative and qualitative analysis on the engagement at tripartite level including analysis on the number of times green jobs and just transition have been discussed at national meetings, the number of committees set up in the workplace and surveys and in-depth interviews with social partners (workers' and employers' representatives) on satisfaction of information sharing and engagement.
- Quantitative analysis on social protection coverage, analysis on the number of labour inspections carried out at relevant sites.
- Review of administrative datasets on social protection and retraining programmes to assess coverage for at-risk sites.

Outcomes:

The NGJ HRD Plan aims to increase education and training capacity for green jobs. Improvements and investments in current curricula could result in more trained workers entering the expanding renewable energy sector. Improving skills and jobs mapping and ensuring the green jobs are decent jobs could encourage

more skilled workers to go into the renewable energy sector. The Plan will also provide social protection measures for workers to be affected by the country's transition to low-carbon future.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards sustainable and inclusive economic growth through clean energy supply chains.

- The effectiveness of social protection measures is assessed not only in terms of their coverage, which differs greatly among countries in Southeast Asia, but also their accessibility. Disaggregated data are key to help assess coverage gaps for different stakeholder groups, including informal workers, and to inform adjustments to programme design.
- Continuous monitoring can help make policies more responsive to the way groups are being affected by energy transitions over time. Monitoring social protection in the context of energy transitions requires coordination across agencies responsible for energy, labour, housing and social policy. Developing specific social protection schemes in coal phase-out regions could help provide a safety net for impacted workers.
- Indicators can assess the contribution of clean energy supply chains to national and community-level development. These include the percentage of critical minerals processed domestically, the number of decent jobs created in transition-related industries, and the extent to which revenue is reinvested in infrastructure, education, or health services near extraction and processing zones.
- Monitoring systems can combine third-party assessments with information from workers and communities to improve reporting. Independent audits can be used to verify company compliance with labour and environmental standards, while participatory methods, such as surveys co-designed with communities, can reflect local priorities and experience on the ground.
- Long-term sustainability requires capacity building within governments, agencies and stakeholders as well as cross-sectoral cooperation. Training in technical skills and governance capabilities ensures that benefits are retained locally and that communities are actively engaged in value creation.
- Tracking labour outcomes in the energy sector requires co-ordinated data systems and sector-specific indicators. Data on energy-related employment (including gender), training, and labour conditions can be fragmented across ministries, particularly among labour, education, and energy sectors. Working with employers and workers' representatives can help close data gaps and bring worker perspectives into energy-related labour monitoring systems.
-

- Informal employment remains a significant area where data coverage could be improved, particularly in emerging economies. New tools, such as the ILO's Informality Dashboard, provide opportunities to quantify and address informal work in energy sectors.
- Useful indicators for monitoring the effectiveness of workforce development measures include enrolment and completion rates in reskilling or upskilling programmes related to energy transitions, placement rates into clean energy sectors, and employer feedback on the relevance of training to energy-related roles.
- Co-ordination among training providers, trade unions and energy sector employers can improve curriculum relevance. These coordination efforts can be tracked by monitoring the existence of formal advisory bodies, frequency of joint planning meetings, or employer participation in training programme design and evaluation.
- Tracking gender, youth participation, and access for marginalised groups in energy-related employment is essential to assess whether job creation is inclusive and fair. Tools such as the IEA's Gender and Energy Data Explorer can support this effort by providing gender-disaggregated data and indicators relating to the energy sector.
- Worker surveys and participatory methods, such as establishing just energy transition taskforces, can help capture lived experiences, including perspectives on job satisfaction, security and training needs. In regions with long-standing fossil fuel employment, this may also include shifts in identity, loss of status or psychological impacts as workers transition out of historically valued roles.

Selected indicators tracked on jobs and skills

Indicators	Evaluation methods
Net change (number/percentage) in total employment and unemployment in energy and related sectors, disaggregated by region, occupation level, age and gender	Analysis of labour force surveys, regional employment statistics, social security exit records and employment databases.
Number of jobs created linked to just energy transition policies and plans; percentage of impacted workers successfully transferred into new employment; disaggregated by occupation level, age, gender, race and ethnicity	Analysis of labour force surveys, employment records and post-training job placement data; longitudinal labour tracking through employment agencies and national employment observatories; analysis of youth or gender employment trackers, national employment equity reports, labour ministry gender audits and compliance monitoring of gender quotas.

Indicators	Evaluation methods
Number of publicly funded retraining or upskilling programmes; number of affected workers retrained or re-employed in other sectors in energy transition regions, disaggregated by occupation level, age and gender	Review of education and training records, job placement service data, government and local authority programme records, administrative data or official programme registries, certified training providers, national workforce development strategies; verification through regional employment agencies and implementation partners.
Percentage of affected workers with access to career and social supports; amount of social funds for affected regions; number of early retirees receiving extra support payments, disaggregated by occupation and gender	Review of budgetary allocations for social protection and inventories of career and social support funding, social security agency records and pension benefit claims data; fund distribution monitoring and impact evaluations; verification through regional employment agencies and implementation partners.
Percentage of workers in clean energy and related sectors with access to core employment benefits; percentage of new clean energy jobs meeting decent work criteria; median clean energy wage compared to economy-wide average; disaggregated by occupation level, age and gender	Analysis of disaggregated labour force surveys and human resources records; review of labour inspection results and compliance with ILO decent work indicators; review and comparative analysis of national wage databases; verified by workers' and employers' representatives.
Percentage of the energy workforce covered by international labour protections	Review of trade union membership statistics and collective bargaining coverage data from national labour ministries or statistics agencies; workplace safety incident data; analysis of labour inspection reports; labour court decisions and international complaints (e.g., ILO cases); verified by workers' and employers' representatives.
Proportion of informal energy sector workers transitioned into formal employment in clean energy, disaggregated by gender	Analysis of national employment databases and informal labour registries, income tax records and enterprise registration data.

Indicators	Evaluation methods
Percentage of mining/processing projects with transparent human rights impact assessments; responsible sourcing policies; compliance measures in lines with ESG standards and number of cross-border agreements/partnerships in line with ESG standards	Analysis of public disclosures from companies (e.g. ESG reports); third-party audit verification; benchmark comparison with OECD Due Diligence Guidance or other international standards; review of agreements with documented ESG compliance mechanisms and transparency reporting requirements; regulatory enforcement records; inspection and compliance reports from environmental protection agencies; review of legal cases or fines related to violations.
Recycling rates of critical raw materials; rate of biodiversity loss, and water quality levels in regions surrounding extraction or processing facilities	Review of national or industry-level waste tracking and reporting systems, input-output material flow analysis, facility-level recycling performance audits, satellite remote sensing and geographic information system to track habitat loss and land degradation, ecological field assessments for species diversity and abundance and data from water monitoring stations.

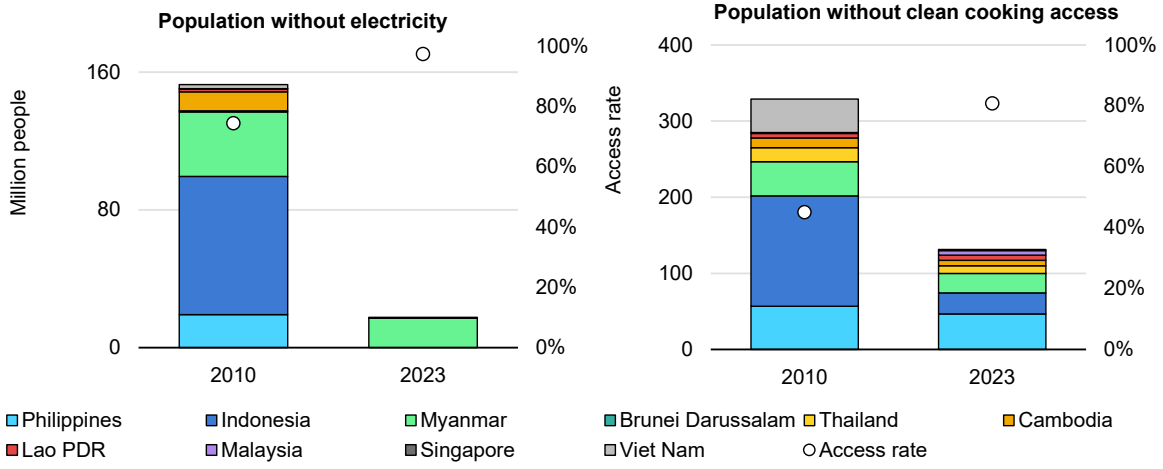
Theme 2: Fair distribution, affordability and access

As energy demand continues to grow in the region, driven by incomes rising and living standards improving, there is a shared concern among many governments regarding the inequalities of access to reliable and affordable energy, especially for the lowest-income deciles. The way that policies are designed and implemented directly impacts how benefits and harms are distributed among populations. These concerns are reflected in three of the G20 principles: end energy poverty (principle 2), invest in affordable and reliable solutions for just and inclusive energy (principle 7), and implement secure and sustainable solutions (principle 8).

Access to electricity and clean cooking

Southeast Asia has made significant progress in expanding energy access over the past decade, but significant disparities remain. In 2023, 97% of households in the region have access to electricity, and the region is on track to reach universal access by 2030. Yet around 3% of the population, more than 18 million people, still lived without electricity in 2023, the majority of whom are in Myanmar and Lao PDR. While the National Electrification Project has doubled Myanmar's access rate since 2015, many remote and low-income communities remain underserved, often relying on diesel generation or informal mini-grids that can be unreliable and costly.

Number of people lacking electricity access and clean cooking access in Southeast Asia, 2010 and 2023



Notes: STEPS = Stated Policies Scenario.

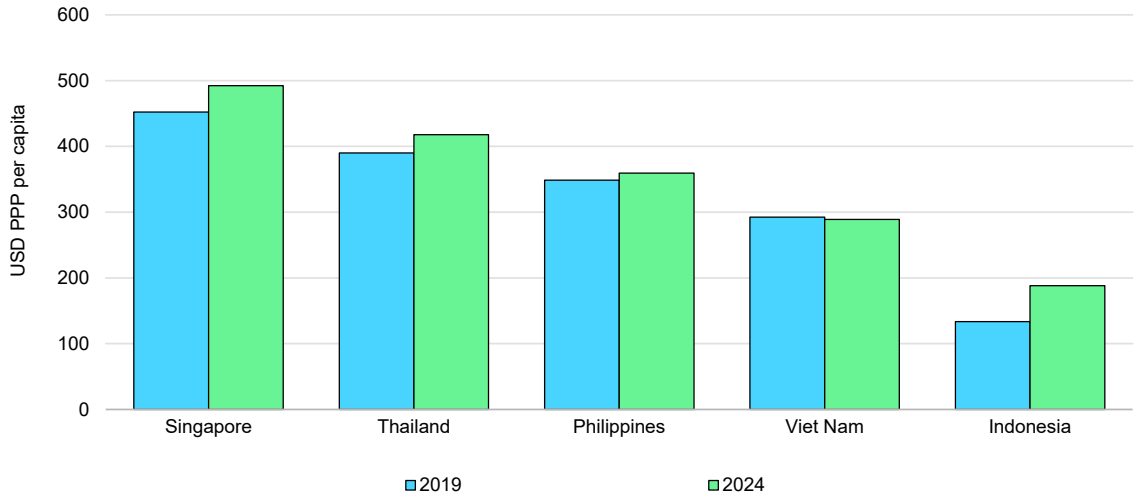
Source: IEA (2024), Southeast Asia Energy Outlook.

Progress on improving access to clean cooking has been slower. In 2023, more than 130 million people across Southeast Asia, approximately one in five residents in the region, still relied primarily on traditional biomass, coal, or kerosene for cooking, exposing households to health risks and environmental degradation. Countries such as the Lao PDR (11%), Myanmar (53%), Cambodia (57%) and the Philippines (60%) have the lowest clean cooking access rates, especially in rural areas. Regional progress on clean cooking slowed notably during the pandemic and global energy crisis, as fuel prices surged and some households reverted to biomass despite government price supports.

Household energy spending and affordability

While many households have gained access to electricity, the region still faces significant energy affordability challenges. In Lao PDR for example, lower-income households spend up to a third of their disposable income on energy. Energy poverty, which encapsulates challenges in accessing and affording electricity and clean cooking, has many consequences for households including the inability to keep their homes adequately cool or warm or to safely store food or medicine. It can also impact people's access to essential opportunities and services such as education, healthcare and work. Since pre-COVID times, household energy expenditure - measured in USD purchasing power parity (PPP), thus adjusted for inflation and cost-of-living differences - has increased by nearly 12% on average in Singapore, Thailand, the Philippines, Viet Nam and Indonesia.

Household energy expenditure, 2019 and 2024



Source: IEA (2025) Energy End-uses and Efficiency Indicators and Energy Prices.

Distributional impacts of energy policies

The energy crisis made clear that the region's reliance on fossil fuel exposed it to higher affordability risks. In 2022, spending on fossil fuel subsidies increased three-fold compared with the previous year, partly driven by oil price spikes. While fossil fuel subsidies are meant to support households by lowering the price of energy, they tend to benefit wealthier households if they are not well targeted. Globally, the IEA estimates that only 14% of fossil fuel subsidies are targeted and only 10% of residential and transport fossil fuel subsidies reach the poorest two income deciles. Efforts to better target this government spending has increased in Southeast Asia, where the highest income households consumed six times more energy than the lowest income households in 2023. Several countries in the region, including Indonesia, Thailand and Malaysia, have reformed the subsidies to better target revenues towards vulnerable households and ensure they receive greater support including through cash assistance programmes for low-income households. In Indonesia, the reform resulted in a USD 15 billion savings in government budget. Beyond targeted fossil fuel subsidy reforms, several countries in the region including Indonesia, Singapore and Thailand have been developing carbon pricing tools. While some of those schemes have been designed to ensure that the impacts of price increases and the benefits generated from additional revenue are distributed across households, it will be important to assess how those impacts will be distributed overtime.

At the community level, designing projects to generate benefits can ensure that local job creation and revenue gains are retained locally and that negative impacts such as environmental degradation or pollution are mitigated against. This is especially relevant to the critical mineral industry that is taking hold in the region. Increasing transparency and monitoring is critical to ensure that the critical mineral industry is a motor of economic growth and decent work and that its environmental impact is minimised.

Emerging practices and approaches to track progress on fair distribution, affordability and access

The following case studies highlight existing tracking mechanisms to monitor key aspects related to fair distribution, affordability and access:

- **Singapore – U-Save Rebate Programme,** tracking energy poverty and benefits of targeted subsidies

- **Cambodia – Smoke-Free Village Programme**, promoting behavioural change communication to clean cooking access and tracking through real-time and annual inquiries
- **Myanmar – Mee Panyar**, delivering universal energy access while promoting local workforce development and economic development

Singapore – U-Save Rebate programme

Objective:

The U-Save Rebate programme is a long-running initiative to make energy affordable for low- and middle-income households in Singapore. Under this scheme Singaporean households in publicly subsided housing receive quarterly utility bill rebates to offset their electricity, gas, and water expenses. The programme, partially funded by national carbon tax revenues, aims to ease the cost burden of essential energy services for vulnerable groups, ensuring that even as energy prices or taxes rise, basic utilities remain accessible, and no household is pushed into energy poverty.

The rebates are tiered by household type (as a proxy for income level), with smaller one and two bedroom flats, typically housing lower-income families, receiving the largest rebates. The use of carbon tax revenue that helps fund the programme aims to ensure that the effects of higher carbon taxes boost energy and decarbonisation efforts in Singapore while preventing the poorest households from disproportionately suffering from higher energy bills.

Over time, the U-Save programme has been enhanced in response to rising living costs, with additional rebates provided during periods of high energy prices and other cost-of-living increases. This adaptive approach helps maintain affordability of energy for those most in need.

Selected indicators tracked

- number of eligible households disaggregated by housing type
- average rebate per household per year
- proportion of average monthly utility bill offset by U-Save rebates
- estimated change in share of income spent on utilities after rebates
- rate of utility-bill arrears and disconnections among eligible households

Evaluation methodology:

- Administrative monitoring: automatic crediting of rebates through utilities accounts allows real-time tracking of beneficiary numbers, rebate values, and utilisation rates.

- Data integration: government agencies (Ministry of Finance, Ministry of Sustainability and the Environment, and Energy Market Authority) combine utility billing, household income and public housing-type data to evaluate affordability impacts.
- Household expenditure analysis: household-level surveys and anonymised utility-consumption records used to estimate the average share of bills covered and to model affordability by income quintile.
- Policy review cycles: annual and mid-term budget reviews to assess energy-price movements.

Outcomes:

The U-Save programme has generated a range of positive outcomes. Around 950 000 public households received U-Save rebates in 2025, covering nearly all low- and middle-income public-housing residents. Total annual support reached up to USD 580 per household for one and two room flats, offsetting 25–33% of average annual utility bills. During periods of elevated energy prices, enhanced rebates doubled their coverage, paying for eight to ten months of utility bills for one to two-room households and four to six months for three to four-room households. Regular policy updates under the Assurance Package (2023-2025) introduced quarterly top-ups (USD 25 per quarter) to cover cost increases. The share of income spent on utilities among the lowest-income deciles remained stable despite tariff and tax changes, and the incidence of bill arrears among eligible households stayed minimal demonstrating effective protection against energy poverty.

Cambodia – Smoke-Free Village programme

Objective:

The Smoke-Free Village (SFV) programme, implemented by SNV, aims to reduce household air pollution, improve access to clean cooking technologies, and promote sustainable behaviour change in rural Cambodia. Launched in 2020 across four provinces (Kampong Speu, Kampot, Siem Reap, and Battambang), the SFV programme engages communities through behavioural change, local authority training, and participatory events. Villages achieving at least 85% adoption of smoke-free practices are certified as Smoke-Free Villages.

The approach draws inspiration from the Community-Led Total Sanitation model, encouraging collective responsibility for clean cooking and inclusion of vulnerable groups such as single- female parent households, people with disabilities and low-income households.

Selected indicators tracked

All indicators are disaggregated by age, gender and gender equality and social inclusion (GESI) categories (GESI categories include women-led, poor and disability-affected households):

- number and share of households exclusively using clean cooking fuels among participating households
- total number of clean cookstoves sold and adopted
- number of ceramic wood or charcoal stoves decommissioned
- shift in primary stove use by type of cookstove
- total number of participants and share of women in SFV programme awareness and training activities
- percentage of households practising all four clean-cooking behaviours — proper ventilation, drying fuelwood, keeping children away from smoke, and investing in clean stoves/fuels
- time savings for primary household cooks: percentage of end users reporting 30-60 minutes per day saved through reduced fuel collection and faster cooking

Evaluation methodology:

The SFV programme uses a mixed method monitoring and evaluation system combining internal and external assessments:

- Real-Time Evaluation (2021–2022): Household survey with 410 households (309 treatment, 101 control) across four provinces; quantitative comparison of cooking behaviours, stove ownership, and gender participation.
- Annual logbook monitoring: Village chiefs and Commune Councils for Women and Children track behavioural adoption, stove types, and fuel use monthly.
- Energy audits and cooking energy tests: Conducted periodically to validate self-reported data and measure efficiency gains.
- Administrative and learning cycles: Annual reviews inform adaptive implementation; 2024 progress data integrated into Energising Development's (EnDev) global results monitoring framework

Outcomes:

The SFV programme has achieved significant progress in expanding access to clean cooking and reducing household reliance on traditional fuels. Between 2020 and 2025, the number of participating villages grew more than fivefold (from 90 to 488), reaching around 100 000 households. Over 118 000 clean cookstoves were purchased, 59 000 households transitioned to clean fuels as their primary fuel, and 43 973 traditional stoves were phased out.

Behavioural adoption increased markedly, with 96% of households now practising all four promoted clean-cooking behaviours, and the share of households using clean cookstoves as their primary stove rising from 29% to 87%. Firewood use

declined by 77%, saving an estimated 255 000 kilogrammes of wood per day, while women, who make up nearly 80% of participants, reported daily time savings of up to one hour.

The inclusion of vulnerable and women-led households has been a core success: clean cooking adoption among GESI households grew from 20% to 95% in four years. The approach's proven scalability has inspired replication in other countries and informed Cambodia's National Clean Cooking Energy Strategy (2024), highlighting the SFV model as a cost-effective, community-led pathway to ending energy poverty.

Myanmar – Mee Panyar

Objective:

Mee Panyar is a social enterprise founded in 2019, to expand energy access while investing in local workforce development to support local business growth. This initiative helps tackle skilled labour shortages in rural and remote areas through targeted and inclusive training interventions and employment transition support. The enterprise also facilitates community ownership of solar energy systems, reducing households and small and medium -sized enterprises' exposure to energy shortages, providing affordability gains and improving local energy security.

Selected indicators tracked

- percentage employed/self-employed within three months
- percentage income change within six months
- number of job placements facilitated
- share of employment across types
- percentage still employed after 12 months
- percentage employed workers needing to relocate for work
- areas served by alumni (disaggregated by urban, rural)
- number of people served with reliable electricity
- number of micro, small and medium-sized enterprises/businesses served
- number of youth (18-35) trained
- percentage women trained
- percentage women applied to programmes
- percentage graduates without higher education
- employer feedback on relevance and outcomes
- number of workers re-skilled/upskilled
- number of companies hiring from alumni pool
- number of companies engaged through market research, events, and programmes

Selected indicators tracked

- perceived difficulty in filling roles
- public perceptions of quality/reliability
- number of people attending industry events
- staff growth/hiring and salary patterns

Evaluation methodology:

- Participant follow-up surveys: standardised questionnaires administered to all graduates approximately three months after course completion to assess employment status, income changes, and skill utilization
- Tracer study: independent external tracer study validating employment outcomes, wage data, and career progression for a representative sample of graduates
- Focus group discussions and stakeholder interviews: engagement with employers, training partners, and alumni to gather qualitative feedback on training relevance, workplace integration, and perceived barriers to employment
- Stakeholder surveys: targeted solar companies and MSMEs to collect data on recruitment trends, workforce needs, and satisfaction with graduate performance

Outcomes:

Since 2019, over 5 000 people in rural areas of Myanmar have gained access to energy through community solar mini-grid deployment and over 6 700 internally displaced persons have gained basic energy access. Over 650 technicians and engineers have been trained since 2024 to be employed in the solar industry, 34% of them women. Within three months of course completion, 76% of graduates have found employment. Over 35 solar companies are hiring trainees from the initiative.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards granting fair and affordable energy access to all:

- Regular monitoring of key energy poverty determinants such as household income levels, energy prices, housing quality and energy efficiency helps assess the risk factors and conditions that may cause households or specific communities to fall into energy poverty.
- Tracking energy poverty involves analysis on availability, accessibility, affordability, consumption and end uses of energy. Indicators such as reduced respiratory illness and thermal discomfort, improved school attendance, reduced household emissions linked to energy efficiency or increases in women's employment and entrepreneurship can offer insights into the daily lives of groups affected by energy poverty.

- Collecting information in-person at the local level, such as one stop shop information points in town centres may reach more lower-income, less educated, elderly, or unemployed groups compared with online surveys.
- Spatial and demographic analysis, such as geospatial mapping, census data and household surveys, can help identify high-risk and unserved groups.
- Developing indicators to monitor the distribution of energy funds across specific groups, such as low-income households, women-led businesses, informal settlements or small and medium-sized enterprises, can help monitor who receives benefits.
- Disaggregated tracking of funding instruments for energy investments (e.g. reporting by finance type and recipient group) can assess whether support is targeted to reduce upfront costs for low-income groups or avoid unaffordable debt for vulnerable countries.
- Combining administrative records with surveys or interviews can improve understanding on who is accessing financing, which groups are left out, and the barriers applicants face (e.g. lack of digital access or literacy or complex paperwork).
- Indicators can measure both local benefits created from clean energy projects (e.g. number on jobs created, percentage of procurement contracts awarded to local suppliers) or avoided harms (e.g. water and soil quality).

Selected indicators tracked on fair distribution, affordability and access

Indicators	Evaluation methods
Percentage of households without access to electricity and/or clean cooking fuels, by gender (for heads of households), region or income	Energy access databases, evaluation based on disaggregated household survey and census data; supplemented by targeted field surveys and administrative records.
Percentage of income spent on energy (to highlight affordability or the burden of energy costs), by gender and rural/urban/region	Disaggregated household expenditure surveys and income data; utility data and qualitative assessments also needed to better capture hidden energy poverty.
Percentage of households reporting energy rationing behaviours (e.g. reducing heating/cooling or limiting appliance use), by gender (for heads of households)	National/regional household surveys; qualitative interviews and focus groups (grouped by gender of household head); analysis of administrative and social welfare data; longitudinal survey panels to monitor changes over time.

Indicators	Evaluation methods
Social impacts of energy poverty measures (e.g. improvements in health, education and income after interventions), by gender	Health sector data, impact evaluations; surveys and questionnaires; longitudinal studies; multi-criteria and mixed-method impact assessments.
Percentage of informal settlements or off-grid areas reached with clean energy solutions	Remote sensing, census and implementation data.
Percentage of energy infrastructure by ownership type (e.g. public, private, co-operative) to understand underlying structural causes of energy poverty	Mapping of asset and licence registries, company reports, utility databases, and ministry records; review and validation through surveys with local energy providers to fill gaps in ownership data especially for community or cooperative owned assets.
Number of energy-efficiency and clean energy programmes specifically targeted at low-income households	Desk review of national programme records; analysis of recipient databases; verification via surveys or targeted interviews with beneficiary households.
Share of households in energy poverty by gender (heads of households)	National and regional household surveys on energy access; energy expenditure as a percentage of income; large-scale surveys capturing thermal discomfort, fuel usage, and coping strategies; national poverty and affordability thresholds such as home performance indicators (e.g. standard of insulation) or thermal comfort.
Share of disposable income spent on energy and change in energy bills over time, by population segment and by gender (heads of households)	Time series analysis of utility billing data; household expenditure and income surveys; pre- and post- intervention comparisons for targeted populations.
Distribution of clean energy subsidies and financial support, by income, gender, race and ethnicity	Review of energy finance access programmes; financial inclusion surveys; analysis of loan/grant disbursements by income brackets; disaggregated data from microfinance institutions, renewable energy fund reports, and donor or national programmes; tracking of grants/loans by recipient profile.

Indicators	Evaluation methods
Number of homes insulated or retrofitted, by gender (for heads of households)	Energy efficiency programme implementation reports; construction/retrofit tracking by local governments or housing authorities; integration with national social housing databases.
Improvements in population health after adoption of clean energy subsidies (measured by pharmaceutical/medical usage), by gender	Analysis of trends in household or national spending on respiratory and cardiovascular medications; public health records; surveys on out-of-pocket health expenditures, disaggregated by energy access or intervention group.
Gender-differentiated health impacts from indoor air pollution and clean cooking adoption	Public health statistics and national datasets; aggregated gender-differentiated health data; context-sensitive models accounting for roles and exposures.
Average reduction in household energy bills following implementation of clean energy and energy efficiency programmes, by gender (for heads of households)	Comparison of pre-intervention and post-intervention utility bills using household surveys, utility records, and statistical analysis.
Share of carbon auction revenue or equivalent directed to disadvantaged or low-income communities	Climate/public finance reports; tracking of earmarked budget lines for marginalised groups; analysis of national or regional carbon pricing mechanisms and revenue distribution policies.
Change in local air quality index (particulate matter 2.5 and 10)	Continuous monitoring using local air quality sensors; verified by environmental agency reports.
Community facilities and social infrastructure upgraded in affected areas	Municipal and regional development project records; infrastructure investment reports; monitoring of budget allocations to social services.
Change in annual municipal revenue from energy transition-related activities	Financial analysis of municipal budgets and official revenue accounts before and after interventions.

Indicators	Evaluation methods
Share of community-led or co-owned clean energy projects	Review of national and subnational project registries; documentation of community ownership shares and governance structures; stakeholder verification through participatory audits
Number of new community benefit agreements signed	Legal and regulatory review of signed agreements; centralised registry of agreements; validation through community consultations and agreement implementation tracking.

Theme 3: Social inclusion and participation

Ensuring broad stakeholder engagement in energy policy creation, development and monitoring is central to ensuring social inclusion and participation, which is a core aspect of just and inclusive energy transitions. Theme 3, social inclusion and participation, refers to the following G20 principles: social dialogue and stakeholder participation, policy inclusiveness and respecting rights.

Social dialogue and stakeholder engagement

There are different ways to approach stakeholder engagement including at project, regional and national level. In the Philippines, stakeholder consultation workshops have been held in preparation for the national just transition framework. In Indonesia, a grievance mechanism is being established as part of the JETP to provide stakeholders with an official channel to lodge comments on energy transition-related projects.

Social dialogue differs from other forms of stakeholder engagement as a formal process of negotiation and consultation, guided by ILO standards, which directly involves employers' and workers' representatives in shaping energy transition policies. The Singapore Tripartism Forum provides an official mechanism for policy makers, employers and workers' representatives to meet, discuss and form agreements on important topics such as energy transitions. In the Philippines, constructive social dialogue has led to the inclusion of support mechanisms for reskilling linked to energy transitions in collective agreements.

Ensuring policy inclusiveness

Increased stakeholder engagement provides a clear road to policy inclusiveness to allow for clean energy transitions to reduce social inequities and maximise benefits for all. Policy design that intentionally focuses on improving the inclusion of those on the margins of energy systems can help ensure that they benefit from transitions. This means fully understanding the specific and multi-layered barriers some groups may face in accessing those benefits, including cost or broader social norms. Tracking the effectiveness of these policy interventions is essential to ensure they deliver benefits to those most in need.

Ensuring youth engagement for just energy transitions

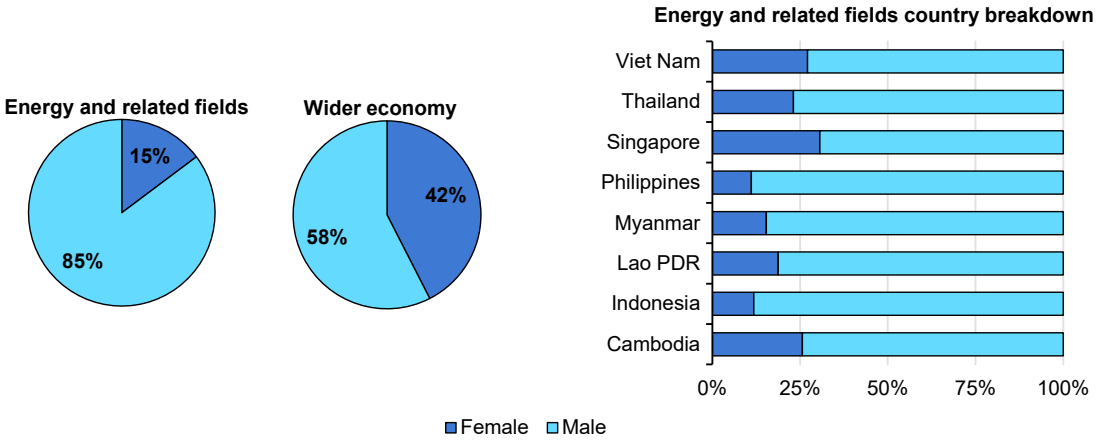
Around 31% of the population in Southeast Asia is aged 15-34 years, and this is projected to rise to 50% by 2050. Involving young people in policy discussions on clean energy is vital as they are key stakeholders in ensuring the success of energy transitions across the region. Youth are also powerful supporters of clean energy with one survey finding that 87% of youth in Southeast Asia are concerned about the pollution and emissions caused by the current global energy system.

The ASEAN Youth Development Index (2022) shows that civic and community engagement among young people is improving. However, formal representation in policy processes continues to vary widely across ASEAN countries and remains lower compared with other areas of youth engagement. Developing indicators to monitor the participation of youth in policy development as well as the impact of energy transitions on youth can help ensure that energy policy benefits are shared.

Gender equity for just and inclusive energy transitions

Female employment in the energy sector in Southeast Asia remains on average at 15%, significantly lower than women's participation in the overall workforce. Currently, in Southeast Asia, women make up only around 20% of tertiary-level graduates in the fields of engineering, manufacturing, and construction (EMC).

Share of workers in energy and related fields and in the wider economy by gender in Southeast Asia based on latest available year (2020- 2023)



Note: Latest available year is 2023 for all the countries listed besides Lao PDR (2022) and Myanmar (2020). Energy and related fields include: Mining and quarrying, electricity, gas and water supply.

Source: IEA analysis based on ILO data.

Efforts are currently underway in some countries in Southeast Asia to encourage more women into the energy sector. In Viet Nam, the Women in Energy Viet Nam Network aims to increase the participation of women in the energy sector by improving their professional knowledge and personal skills. In the Philippines, the Department of Energy has recently released a Gender Toolkit for the Energy Sector to promote gender equality.

Up-to-date and disaggregated data are essential to measure this progress, and gender data gaps need to be addressed including in energy access, education, employment, decision-making, and entrepreneurship. Developing gender indicators for just and inclusive transitions with up-to-date data can help track progress and identify where additional policies or support are needed. While gender statistics have improved in Southeast Asia, particularly in key areas such as labour and education, further work is needed to collect disaggregated data across all energy related areas to fully assess the impact of clean energy transitions on women.

Respecting Indigenous rights in clean energy transitions

Southeast Asia is home to a number of Indigenous populations. Engagement with Indigenous peoples is essential to ensure that energy policies and projects do not impede on rights and specific community needs. Clean energy transitions can benefit Indigenous communities, but they must be designed and implemented in consultation and in collaboration to ensure that benefits are shared. In the Philippines, such as approach with micro-hydro technology, provided clean energy to more than 2 000 households and created training opportunities and jobs for Indigenous People.

Critical minerals are a central component of the energy transition and is a growing industry in Southeast Asia, both in extraction and processing. Extraction needs to be conducted in a way that respects international labour conventions, environmental standards and Indigenous land right, if it is to be deemed part of fair and inclusive energy transitions . Engaging with local Indigenous communities and following the best practice of free, prior, and informed consent can facilitate a social license to operate.

Measuring the meaningful engagement of stakeholders in decision making processes is not always straightforward. Given the diversity of perspectives and contexts of different stakeholders, an intentional, early and continuous engagement process is needed to ensure inclusivity. There is an important relationship between how these processes are monitored and how they are

designed. Identifying in advance the factors that result in inclusion allows for an effective tracking mechanism.

Emerging practices and approaches to track progress on social inclusion and participation

The following case studies highlight existing tracking mechanisms to monitor social inclusion and participation. These include:

- **Indonesia - Regional Consultation Forums,** which are considering indicators to track multistakeholder collaboration in coal producing regions.
- **Southeast Asia - Youth for Southeast Asia Energy (Y4E-SEA),** indicators to track meaningful youth participation in energy transition policies.
- **Southeast Asia - ASEAN Centre for Energy Gender Indicators Frameworks for Energy Policy Action,** to better monitor the impact of energy transitions on women.
- **Malaysia – Centre for Renewable Energy & Appropriate Technology (CREATE) Borneo**, a project focused on providing renewable energy to small villages and training local Indigenous people to operate these.
- **Philippines - Bantay Kita-PWYP Philippines,** an initiative to empower communities to use data for accountability in mining.

Indonesia – Regional Consultation Forums

Objective:

The Regional Consultation Forums (RCF) are official gatherings, established by the Indonesian provincial governments of East Kalimantan and South Sumatra, to ensure social dialogue and multi-stakeholder collaboration in the planning and implementation processes associated with the economic transformation of these two major coal producing regions. The RCFs are implemented in collaboration with the Ministry of National Development Planning through the global project Innovation Regions for a Just Energy Transition (IKI-JET).

Selected indicators tracked

- percentage of participants from vulnerable groups in the RCF sessions
- number of policy proposals from vulnerable groups discussed in the RCFs that are adopted into stakeholder policies
- percentage of renewable energy projects that meet international standards for social and environmental risk management
- percentage of renewable energy project (partly) owned/controlled by Indigenous peoples or local communities
- stakeholder satisfaction of the RCF process and levels of engagement

Evaluation methodology:

To monitor the performance and impact of the RCFs, a mixed-methods evaluation approach is proposed, including both quantitative and qualitative tools:

- Baseline/endline surveys to measure changes in inclusion, participation, and socio-economic outcomes over time, particularly among marginalised groups and workers in transition sectors.
- Real-time dashboards to track participant diversity, engagement levels, and integration of policy proposals from forums into regional planning processes. Dashboards will enable timely course correction and transparency.
- Where possible, rigorous evaluation methods (such as randomised controlled trials) will be used to assess the effectiveness of specific RCF interventions, such as training programmes or support measures.
- Stakeholder and project-level data, consolidated into a unified database to facilitate cross-region comparison and evidence-based decision making.
- Key indicators and progress updates to be made publicly accessible through an open-access data visualisation platform, to enhance accountability and stakeholder engagement.

Outcomes:

The newly established RCFs have increased formal stakeholder engagement in the region and have provided a vehicle to discuss discussions and make recommendations regarding the economic transformation of the regions away from coal. The next stage will be to monitor the impact of these new bodies including their impact on job creation and policy decisions. The RCFs will also play an important role in monitoring and evaluating the forthcoming action plan which will be developed in 2026.

Southeast Asia – Youth for Energy Southeast Asia (Y4E-SEA)

Objective:

Youth for Energy – Southeast Asia (Y4E-SEA) is a collective of young professionals, students, and experts passionate about advancing the just and sustainable energy future in Southeast Asia. Y4E-SEA advocates for youth engagement in the energy transition including active, meaningful participation of young people in shaping and implementing energy policy, technology, and investment to ensure a fair and inclusive shift from fossil fuels to renewables.

Y4E-SEA puts forward its own youth led proposals for how to track and monitor youth participation in policy making linked to energy transitions as well as how to assess the impacts of energy transitions on youth across Southeast Asia.

Selected indicators tracked:

- proportion of youth (15-34) in national and regional energy governance bodies
- number of youth-led or youth-involved energy initiatives (projects, campaigns, start-ups)
- proportion of youth representation in consultation and decision-making processes (e.g. policy dialogues, stakeholder forums).
- level of access to funding, training, and mentorship for youth in energy-related fields.
- number of young people working in the energy sector (energy technology, new jobs, skill level).
- inclusion of youth perspectives and youth focused initiatives in energy and climate policies.
- age diversity within innovation and decision-making teams (e.g. project teams, national just transition commissions).
- number of youth- led contributions and initiatives included in policy outcomes.
- youth satisfaction levels and perceived influence in the energy transition.
- number and percentage of intergenerational collaboration metrics (e.g. mentorship programmes).
- integration of youth engagement frameworks at institutional level (e.g. youth quotas, youth advisory groups).

Evaluation methodology:

- Collect and disaggregate employee and membership data of energy ministries, energy and climate advisory councils and boards by age and gender.
- Map youth-led initiatives through national registries, project databases, and voluntary reporting by organisations
- Review participant lists and meeting records of energy transition consultation processes to assess youth participation share and level of influence.

- Track the number of youth beneficiaries in capacity-building and funding programs related to energy transitions; collect data from ministries and partners.
- Use labour force surveys and company data to monitor youth employment share in energy-related industries including newly created jobs (by energy technology and skill level).
- Review policy documents for explicit references to youth contributions or co-authored proposals.
- Calculate standard deviation of age in project teams; correlate with innovation outputs such as patents or policy pilots.
- Count youth-led or co-authored policy proposals, research publications, and pilot projects adopted by institutions.
- Conduct periodic surveys to assess perceptions of influence, access, and barriers among young participants.
- Evaluate joint youth–senior initiatives, mentorship programmes, and shared leadership roles in organisations.
- Track adoption of formal youth inclusion strategies, quotas, or advisory groups within ministries and agencies.

Outcomes:

Tracking these outcomes could increase the representation of youth in energy transitions decision-making; improve access to training, funding, and employment for young professionals; provide evidence of youth-led policy and project influence; strengthen regional networks and institutional partnerships and enhance innovation capacity through age-diverse collaboration. Successful outcomes based on these indicators include youth quotas, inclusion frameworks, and regular reporting on generational divides.

Southeast Asia – ASEAN Centre for Energy- Gender Indicators Frameworks for Energy Policy Action

Objective:

The ASEAN Centre for Energy (ACE) through multi-stakeholder engagement has developed concrete gender indicators on energy access and affordability, energy education, energy employment, energy government/decision-making and energy entrepreneurship.

The indicators take a broad approach and include women as energy consumers, producers and energy citizens stressing that women are actively involved and engaged in the energy transition as well as being affected as caregivers in households and as workers in the energy sector. The indicators, split into 5

dimensions and then 14 sub-dimensions call for data to be collected and analysed using relevant indicators that align with the “gender equality” approach.

The policy brief aims to provide concrete examples of gender equality indicators to improve data collection, analysis and the overall policy-making process. Utilising this could better monitor the impact of energy transitions on women to allow for related policies to be adapted or designed to ensure gender equity.

Selected indicators tracked:

- share of male- and female-headed households with electricity access and clean cooking fuel/technology
- share of male- and female-headed households' income spent on fuel and electricity
- % of male and female-headed households with net-metering
- mortality rate attributed to households and ambient air pollution, age-standardised, male and female (per 100,000 male/female population)
- share of male and female tertiary students in energy-related programmes
- graduation rate of male and female tertiary students in energy-related programmes
- share of women employed in the energy sector, disaggregated by roles, including in the renewable energy and energy efficiency sectors
- percentage of women certified as renewable energy professionals
- gender wage gaps in the energy sector
- proportion of women in Executive and Board positions in the energy sector
- percentage of women’s groups engaged in energy governance
- percentage of electric companies and cooperatives (producers, distributors) with women in decision-making bodies (e.g., Board Members)
- percentage of women-owned micro and small enterprises powered by renewable energy
- proportion of finance available for male and female-led energy businesses

Evaluation methodology:

- Household surveys e.g. on households without electricity and clean cooking (disaggregated by gender)
- Collection and analysis of university-level data on energy related degree programmes, both enrolment and graduation rates disaggregated by gender
- Use of labour force surveys and collection of additional company-level data on number of employees at energy technology, occupation, and skills level disaggregated by gender
- Certification data from education providers on the number of energy-related skills certificates provided, disaggregated by gender
- Desk analysis of wages, statistics disaggregated across roles, levels and contact types
- Company-level reporting on the number of women at board level

- Review participant lists and meeting records of energy transition consultation processes to assess women participation share and level of influence

Outcomes:

The new policy brief provides useful gender indicators for ASEAN government agencies, including national statistics offices and ministerial databases to build into their data collection and analysis. Monitoring these indicators will provide clearer information on the impact of energy policies on women and will allow for better policy design and implementation to ensure that women benefit from clean energy transitions as energy producers, consumers and citizens.

Malaysia – Center for Renewable Energy & Appropriate Technology (CREATE)

Objective:

CREATE Borneo empowers Indigenous peoples in Malaysian Borneo to lead their own energy transformation. Founded by the Indigenous-led organisation TONIBUNG, CREATE trains community members to construct, operate, and sustain renewable energy mini-grids that serve their own communities. This approach promotes bottom-up energy development that ensures that communities are consulted and directly benefit from energy transitions. By providing technical, managerial, and leadership training, CREATE ensures that communities can operate and maintain their own systems while protecting their forests and watersheds. The benefits generated by the project are then distributed within the community through benefit-sharing mechanisms such as community funds.

Selected indicators tracked:

- number of community-based mini-grids built and operating
- installed renewable-energy capacity (kilowatts) and total households electrified
- percentage of systems operational and meeting design capacity
- average hours of electricity supplied per day
- average cost of electricity per household compared with diesel baseline
- number of trained local technicians and operators, disaggregated by gender
- number of community members trained in bookkeeping and micro-utility management
- number of environmental education or conservation training sessions conducted
- hectares of forest and watershed area protected under community governance
- reduction in household energy expenditure and diesel consumption
- number of productive-use enterprises supported through mini-grids
- number of systems upgraded or rehabilitated based on performance review

Selected indicators tracked:

- continuity of renewable supply and preparedness measures for floods or landslides
- qualitative evidence of improved community self-determination and participation in decision-making

Evaluation methodology:

- Adaptive monitoring strategy that emphasises community ownership and long-term learning
- Tracking of output-level indicators (e.g. systems installed, capacities built, hectares conserved) through internal records and donor reporting
- Open communication with communities, including ad hoc and periodic site visits to verify system functionality and conservation practices
- Standardised household and micro-utility surveys administered at project completion to assess changes in energy access, savings, livelihoods, and decision-making
- Follow-up interviews to gather qualitative insights into community leadership and resilience
- Balanced use of quantitative and qualitative methods to ensure evaluations reflect lived experiences and community autonomy

Outcomes:

Since its founding, CREATE Borneo and TONIBUNG have supported the installation of over 45 community-managed renewable energy mini-grids in two regions, Sabah and Sarawak, many of which remain fully operational, including the region's first micro-hydro system built in 2001. These systems power homes, schools, and livelihoods while protecting thousands of acres of rainforest through community-led conservation agreements.

The model is on a pathway to scale through the Sabah Renewable Energy Rural Electrification (RE2) Roadmap, a government-endorsed plan to deliver 200-400 community-based energy systems by 2030. CREATE and TONIBUNG's ground-up approach shows that community-led energy transitions not only expand access but also strengthen local governance, environmental stewardship, and community dignity, paving the way for a just, inclusive, and sustainable energy future.

Philippines – Bantay Kita-PWYP

Objective:

The objective of the Bantay Kita-PWYP Philippines project is to empower Indigenous communities to claim their share of royalty payments from mining

activities on their ancestral lands by using data from the Extractive Industries Transparency Initiative (EITI), engaging in advocacy and asserting their rights. This embeds helping communities identify their own concerns related to extraction, which often extend beyond financial compensation to broader issues of land rights and governance. Bantay Kita-PWYP also strengthens community knowledge of legal frameworks such as the Mining Act and the Indigenous Peoples Rights Act, fostering confidence and enabling informed participation in decisions about development interventions.

Selected indicators tracked:

- number of local oversight committees, local / national development bodies participated/engaged
- number of training workshops conducted on informing local communities on their legal rights
- number of community members trained to understand and use EITI data
- instances of royalty payment claims made by communities
- number of requests for data on development interventions in ancestral domains, including mining
- number of corrective measures or actions taken by the government authorities, mining companies, or local bodies in response to the community pressures and engagement.
- percentage of increased confidence and participation in governance and mining projects

Evaluation methodology:

- Desk research: administrative records and desk review to count the number of Indigenous communities engaged, trainings conducted, and individuals trained; training attendance sheets and participant databases.
- Qualitative analysis: use of surveys and feedback forms, community interviews and focus group discussions.
- Quantitative analysis: case documentation and advocacy tracking to record instances of royalty payment claims and review of community income reports.

Outcomes:

The project enhanced the participation of community members, in mining oversight committees and promoted involvement in the conservation and sustainable development of critical ecosystems affected by mining and climate change.

A sustained, effective, and inclusive local coalition of civil society organisations was created. The coalition has been capable of providing legal and paralegal

empowerment assistance to communities and vulnerable sectors threatened or impacted by mining operations. Lastly, lessons from project implementation have been well-documented and used in sustaining and improving strategies of Bantay Kita and its coalition members in achieving a just energy transition.

Lessons learned and key considerations

Insights drawn from national and cross-national experience in Southeast Asia have helped identify key considerations when tracking progress towards social inclusion and participation:

- Participation in energy transition planning, policy design and implementation can be tracked through indicators that measure the diversity of stakeholder groups represented on advisory or planning bodies.
- The accessibility of these processes can be assessed by looking at whether engagement platforms are available in different languages, are offered through multiple formats, and reach remote or underrepresented groups.
- Whether stakeholders' inputs are reflected in the decision-making process can be tracked by recording how often participants receive follow-up information, and whether commitments made during engagement are reported back and fulfilled.
- Formal tripartite social dialogue forums can provide an official vehicle for policymakers, employers' and workers' representatives to discuss important topics and reach agreements which could be useful in tracking and smoothly implementing energy transitions.
- Continuous communication with local can help to gather insights, understand real needs, and moderate plans accordingly.
- Different sources for tracking can be relevant depending on the availability of data. Data collection can be done through administrative records reviews, inspections, or audits linked to energy projects. Civil society groups and Indigenous organisations can be important in tracking land use, safety, or access to benefits, especially where government presence is limited.
- Monitoring systems could be tailored to local conditions and consider specific necessities and features, eschewing a top-down approach. If possible, developing monitoring practices in collaboration with the local actors involved could ensure community ownership.
- Integrated systems that harmonise data, including census data, social protection registries, household energy surveys, and utility billing data, can help track complex issues that require multiple indicators to understand.
- To fully track and monitor the impact of energy transitions on women as consumers, producers and citizens, data collection needs to be disaggregated by gender.
- A holistic approach to data collection is needed to better understand the involvement of and the impact on youth in energy transitions including age-

disaggregated data from labour force surveys but also data collection from companies and government policy-making processes and surveys to collect qualitative data.

- Using multiple qualitative and quantitative methods can help ensure programmes better reflect population needs and capabilities.

Selected indicators tracked on social inclusion and participation

Indicators	Evaluation methods
Percentage of clean energy policy documents negotiated or endorsed through formal tripartite structures; number of social dialogue agreements	Review of co-authorship/participation in drafting of policy texts; validation and verification with employers' and workers' representatives.
Number of stakeholder engagement activities held (consultations, workshops, forums, co-design sessions) for energy sector policy development processes; percentage of stakeholders satisfied with process	Review of stakeholder engagement activities (e.g. invitations, minutes, recordings) in regional and national energy planning processes, triangulation with stakeholder representatives and independent observers including through surveys and interviews.
Number of individuals and stakeholder groups actively participating in energy sector policy development processes, disagree by gender, age, socio-economic status	Review of stakeholder outreach records (attendance at events, submissions to consultations); structured demographic surveys and qualitative interviews to assess levels of engagement and satisfaction.
Share of participants from marginalised groups in stakeholder consultations; percentage of materials available in multiple languages and communication formats accessible to all	Analysis of outreach efforts to target groups comparing against national/regional demographic baselines; review of materials and surveys and interviews to gather user feedback.
Share of women and youth employed in the energy sector; disaggregated by occupation level	Analysis of labour force surveys and additional data collection at company level with comparison against economy-wide average

Indicators	Evaluation methods
Percentage of national energy and just energy transition policies and programmes that reference and/or explicitly address gender, youth, and marginalised groups	Content analysis of policy documents; review of gender impact assessments or dedicated gender/diversity objectives in energy institution; surveys and interviews with stakeholders to collect qualitative feedback
Percentage of women, youth and Indigenous representatives on national energy advisory boards/committees or in responsible government ministries	Review of board/committee membership; analysis of government human resource data including seniority level
Number of energy policies/programmes co-designed by youth groups and perceived influence in the energy transition	Programme records; documentation of co-creation workshops; stakeholder process audits and youth surveys.
Number of grievances reported and resolved related to clean energy projects; percentage of energy projects with formal free, prior, and informed consent (FPIC) agreements	Review of operational grievance mechanisms including analysis on number of submitted complaints, resolution and timeframes; verification of FPIC compliance using audit reports and interviews with Indigenous representatives; completion of user satisfaction surveys and community perception studies.

Conclusions and next steps

Tracking and monitoring polices and initiatives linked to energy transitions can help ensure that they are just and inclusive and benefit all in society. This Indicators Handbook aims to outline potential indicators that policy makers and key stakeholders can use and covers energy planning as well as jobs and skills, fair distribution, affordability and access and social inclusion and participation. Monitoring each of these areas can help ensure that energy transitions are well designed and supported and profit all.

While the case studies focus on Southeast Asia, it is recognised that there is no one size fits all and that countries within the region differ from one another and are at different stages in their energy transitions. As such, this Indicators Handbook is nonprescriptive and instead provides policy makers and key stakeholders, including businesses, trade unions, researchers and CSOs with a list of options from which to choose what works best in their local or national context. It is hoped that sharing examples of best practice, lessons learned and key considerations from across the region can help better collect and analyse relevant data to improve energy transition policy, planning, implementation and monitoring and result in just and inclusive energy transitions across Southeast Asia.

Annexes

Annex A - Voluntary Ten Principles for Just and Inclusive Transitions

1. Energy planning for just and inclusive energy transitions

Acknowledge the importance of long-term regional and domestic energy planning and policies across various sectors to guide actions and financing mechanisms that promote energy transitions and design and implement just and inclusive energy transition policies in individual countries, while ensuring energy security, affordability, accessibility, and markets stability and economic prosperity.

2. End energy poverty

Tackle all forms of energy poverty, with a focus on ensuring access to affordable, reliable, sustainable and modern energy, including clean cooking, for all.

3. Social dialogue and stakeholder participation

Foster social dialogue and encourage meaningful and effective participation by all relevant stakeholders, including from affected communities, employers' organisations and trade unions in the decision-making processes related to energy transitions.

4. Social protection

Strengthen the access to appropriate social protection systems for all as part of just and inclusive energy transitions in order to support workers and communities, with particular consideration to the poor and those in vulnerable situations.

5. Policy inclusiveness

Incorporate intersectional perspectives on gender balance, including women empowerment, age, race, ethnicity and those in any vulnerable situations into energy planning and policies and ensure a fair distribution of costs and benefits.

6. Respect rights

Respect, promote and consider respective obligations on human rights, and on the rights of Indigenous Peoples, local communities, persons with disabilities as well as labour rights in the planning and implementation of energy transitions policies and projects.

7. Invest in affordable and reliable solutions for just and inclusive energy transitions

Explore efficient, inclusive and just mechanisms for cost allocation in energy solutions and their impact on the cost of energy, with a focus on timely mobilisation of resources and working towards facilitating low-cost financing in developing countries for innovative technologies and business models, to widely share the benefits and to help mitigate the burden of energy transitions, especially on the poorest segments of the population.

8. Implement secure and sustainable solutions

Implement effective and inclusive measures to ensure localised value creation and maximise the socio-economic, environmental and other benefits and their fair distribution, while making efforts towards mitigating negative socio-economic and environmental impacts of energy-related policies and infrastructure and the extraction, refining and processing of certain materials and minerals that are critical for energy transitions while respecting permanent sovereignty over natural resources and energy infrastructure.

9. Sustainable and inclusive economic growth for all

Promote social and economic development through reliable, diversified, sustainable and responsible supply and value chains, inclusive international cooperation and local value creation and beneficiation at source for all, including in developing countries and economies in transition.

10. Quality jobs and workforce development

Create decent work and quality jobs in accordance with nationally defined development priorities and enable sectoral labour mobility and workforce transformation through reskilling and up-skilling to create avenues of employment, while creating greater opportunities for all, noting the ILO guidelines on a Just Transition for all in this regard, as relevant.

Annex B - Selected indicators tracked on just and inclusive energy transitions in Southeast Asia

Indicators	Evaluation methods
Number of national and regional energy planning strategies, energy planning bodies or advisory panels	Desk review of officially published regional/national energy plans and strategies; analysis of government and ministry websites for evidence of energy planning bodies or advisory panels; verification of ministry/department websites and international energy data resources (e.g. IEA, Sustainable Energy for All).
Number of energy policies/plans explicitly referencing principles of justice, inclusion and equality	Desk review of officially published energy transition strategies; comparison across regions and timelines; targeted search for standalone “just transition” policies/acts; content analysis of policy documents; keyword search for justice, inclusion, gender, youth and Indigenous references; cross-comparison over time.
Level of stakeholder participation and satisfaction in the inclusiveness and effectiveness of energy planning strategies disaggregated by gender, energy planning bodies or advisory panels	Qualitative assessment with stakeholder interviews and/or surveys to assess perception of participation quality of different groups; desk analysis of plans and meeting records to evaluate integration of multi-stakeholder perspectives.
Number of indicators tracking key fair and inclusive transition issues in relevant energy policies and monitoring frameworks	Content analysis of policy frameworks and monitoring systems to identify and catalogue relevant indicators used.
Level of cross-sectoral and inter-ministerial engagement in fair and inclusive energy transition planning and implementation	Desk review of policy documents, mapping of participating ministries/agencies; mapping of inter-ministerial committees/task forces and their mandates; analysis of cross-sectoral co-ordination mechanisms; stakeholder interviews and scoring of interministerial involvement levels.

Indicators	Evaluation methods
Number of regions with fair and inclusive energy transition plans	Desk review of published regional energy plans and transition strategies; verification via governmental websites and central registries.
Amount of resources and governance capacity allocated to formalised national government bodies responsible for energy transitions	Review of budget documents, staffing levels, and authorising legislation; policy or budget provisions for all designated national energy transition entities (including external councils, task forces and commissions), with quantitative reporting on allocated funding, staff and legal mandates.
Number of successful indicators per just energy transition (JET) programme.	Number of jobs created by JET programmes, number of new local green businesses and value chains created linked to JET projects, number of complaints received and resolved, number of improvement measures made to projects following feedback.
Net change (number/percentage) in total employment and unemployment in energy and related sectors, disaggregated by region, occupation level, age and gender	Analysis of labour force surveys, regional employment statistics, social security exit records and employment databases.
Number of jobs created linked to just energy transition policies and plans; percentage of impacted workers successfully transferred into new employment; disaggregated by occupation level, age, gender, race and ethnicity	Analysis of labour force surveys, employment records and post-training job placement data; longitudinal labour tracking through employment agencies and national employment observatories; analysis of youth or gender employment trackers, national employment equity reports, labour ministry gender audits and compliance monitoring of gender quotas.
Number of publicly funded retraining or upskilling programmes; number of affected workers retrained or re-employed in other sectors in energy transition regions, disaggregated by occupation level, age and gender	Review of education and training records, job placement service data, government and local authority programme records, administrative data or official programme registries, certified training providers, national workforce development strategies; verification through regional employment agencies and implementation partners.

Indicators	Evaluation methods
Percentage of affected workers with access to career and social supports; amount of social funds for affected regions; number of early retirees receiving extra support payments, disaggregated by occupation and gender	Review of budgetary allocations for social protection and inventories of career and social support funding, social security agency records and pension benefit claims data; fund distribution monitoring and impact evaluations; verification through regional employment agencies and implementation partners.
Percentage of workers in clean energy and related sectors with access to core employment benefits; percentage of new clean energy jobs meeting decent work criteria; median clean energy wage compared to economy-wide average; disaggregated by occupation level, age and gender	Analysis of disaggregated labour force surveys and human resources records; review of labour inspection results and compliance with ILO decent work indicators; review and comparative analysis of national wage databases; verified by workers' and employers' representatives.
Percentage of the energy workforce covered by international labour protections	Review of trade union membership statistics and collective bargaining coverage data from national labour ministries or statistics agencies; workplace safety incident data; analysis of labour inspection reports; labour court decisions and international complaints (e.g., ILO cases); verified by workers' and employers' representatives.
Proportion of informal energy sector workers transitioned into formal employment in clean energy, disaggregated by gender	Analysis of national employment databases and informal labour registries, income tax records and enterprise registration data.
Percentage of mining/processing projects with transparent human rights impact assessments; responsible sourcing policies; compliance measures in lines with ESG standards and number of cross-border agreements/partnerships in line with ESG standards	Analysis of public disclosures from companies (e.g. ESG reports); third-party audit verification; benchmark comparison with OECD Due Diligence Guidance or other international standards; review of agreements with documented ESG compliance mechanisms and transparency reporting requirements; regulatory enforcement records; inspection and compliance reports from environmental protection agencies; review of legal cases or fines related to violations.

Indicators	Evaluation methods
Recycling rates of critical raw materials; rate of biodiversity loss, and water quality levels in regions surrounding extraction or processing facilities	Review of national or industry-level waste tracking and reporting systems, input-output material flow analysis, facility-level recycling performance audits, satellite remote sensing and geographic information system to track habitat loss and land degradation, ecological field assessments for species diversity and abundance and data from water monitoring stations.
Percentage of households without access to electricity and/or clean cooking fuels, by gender (for heads of households), region or income	Energy access databases, evaluation based on disaggregated household survey and census data; supplemented by targeted field surveys and administrative records.
Percentage of income spent on energy (to highlight affordability or the burden of energy costs), by gender and rural/urban/region	Disaggregated household expenditure surveys and income data; utility data and qualitative assessments also needed to better capture hidden energy poverty.
Percentage of households reporting energy rationing behaviours (e.g. reducing heating/cooling or limiting appliance use), by gender (for heads of households)	National/regional household surveys; qualitative interviews and focus groups (grouped by gender of household head); analysis of administrative and social welfare data; longitudinal survey panels to monitor changes over time.
Social impacts of energy poverty measures (e.g. improvements in health, education and income after interventions), by gender	Health sector data, impact evaluations; surveys and questionnaires; longitudinal studies; multi-criteria and mixed-method impact assessments.
Percentage of informal settlements or off-grid areas reached with clean energy solutions	Remote sensing, census and implementation data.
Percentage of energy infrastructure by ownership type (e.g. public, private, co-operative) to understand underlying structural causes of energy poverty	Mapping of asset and licence registries, company reports, utility databases, and ministry records; review and validation through surveys with local energy providers to fill gaps in ownership data especially for community or cooperative owned assets.

Indicators	Evaluation methods
Number of energy-efficiency and clean energy programmes specifically targeted at low-income households	Desk review of national programme records; analysis of recipient databases; verification via surveys or targeted interviews with beneficiary households.
Share of households in energy poverty by gender (heads of households)	National and regional household surveys on energy access; energy expenditure as a percentage of income; large-scale surveys capturing thermal discomfort, fuel usage, and coping strategies; national poverty and affordability thresholds such as home performance indicators (e.g. standard of insulation) or thermal comfort.
Share of disposable income spent on energy and change in energy bills over time, by population segment and by gender (heads of households)	Time series analysis of utility billing data; household expenditure and income surveys; pre- and post- intervention comparisons for targeted populations.
Distribution of clean energy subsidies and financial support, by income, gender, race and ethnicity	Review of energy finance access programmes; financial inclusion surveys; analysis of loan/grant disbursements by income brackets; disaggregated data from microfinance institutions, renewable energy fund reports, and donor or national programmes; tracking of grants/loans by recipient profile.
Number of homes insulated or retrofitted, by gender (for heads of households)	Energy efficiency programme implementation reports; construction/retrofit tracking by local governments or housing authorities; integration with national social housing databases.
Improvements in population health after adoption of clean energy subsidies (measured by pharmaceutical/medical usage), by gender	Analysis of trends in household or national spending on respiratory and cardiovascular medications; public health records; surveys on out-of-pocket health expenditures, disaggregated by energy access or intervention group.
Gender-differentiated health impacts from indoor air pollution and clean cooking adoption	Public health statistics and national datasets; aggregated gender-differentiated health data; context-sensitive models accounting for roles and exposures.

Indicators	Evaluation methods
Average reduction in household energy bills following implementation of clean energy and energy efficiency programmes, by gender (for heads of households)	Comparison of pre-intervention and post-intervention utility bills using household surveys, utility records, and statistical analysis.
Share of carbon auction revenue or equivalent directed to disadvantaged or low-income communities	Climate/public finance reports; tracking of earmarked budget lines for marginalised groups; analysis of national or regional carbon pricing mechanisms and revenue distribution policies.
Change in local air quality index (particulate matter 2.5 and 10)	Continuous monitoring using local air quality sensors; verified by environmental agency reports.
Community facilities and social infrastructure upgraded in affected areas	Municipal and regional development project records; infrastructure investment reports; monitoring of budget allocations to social services.
Change in annual municipal revenue from energy transition-related activities	Financial analysis of municipal budgets and official revenue accounts before and after interventions.
Share of community-led or co-owned clean energy projects	Review of national and subnational project registries; documentation of community ownership shares and governance structures; stakeholder verification through participatory audits
Number of new community benefit agreements signed	Legal and regulatory review of signed agreements; centralised registry of agreements; validation through community consultations and agreement implementation tracking.
Percentage of clean energy policy documents negotiated or endorsed through formal tripartite structures; number of social dialogue agreements	Review of co-authorship/participation in drafting of policy texts; validation and verification with employers' and workers' representatives.

Indicators	Evaluation methods
Number of stakeholder engagement activities held (consultations, workshops, forums, co-design sessions) for energy sector policy development processes; percentage of stakeholders satisfied with process	Review of stakeholder engagement activities (e.g. invitations, minutes, recordings) in regional and national energy planning processes, triangulation with stakeholder representatives and independent observers including through surveys and interviews.
Number of individuals and stakeholder groups actively participating in energy sector policy development processes, disagree by gender, age, socio-economic status	Review of stakeholder outreach records (attendance at events, submissions to consultations); structured demographic surveys and qualitative interviews to assess levels of engagement and satisfaction.
Share of participants from marginalised groups in stakeholder consultations; percentage of materials available in multiple languages and communication formats accessible to all	Analysis of outreach efforts to target groups comparing against national/regional demographic baselines; review of materials and surveys and interviews to gather user feedback.
Share of women and youth employed in the energy sector; disaggregated by occupation level	Analysis of labour force surveys and additional data collection at company level with comparison against economy-wide average
Percentage of national energy and just energy transition policies and programmes that reference and/or explicitly address gender, youth, and marginalised groups	Content analysis of policy documents; review of gender impact assessments or dedicated gender/diversity objectives in energy institution; surveys and interviews with stakeholders to collect qualitative feedback
Percentage of women, youth and Indigenous representatives on national energy advisory boards/committees or in responsible government ministries	Review of board/committee membership; analysis of government human resource data including seniority level

Indicators	Evaluation methods
Number of energy policies/programmes co-designed by youth groups and perceived influence in the energy transition	Programme records; documentation of co-creation workshops; stakeholder process audits and youth surveys.
Number of grievances reported and resolved related to clean energy projects; percentage of energy projects with formal free, prior, and informed consent (FPIC) agreements	Review of operational grievance mechanisms including analysis on number of submitted complaints, resolution and timeframes; verification of FPIC compliance using audit reports and interviews with Indigenous representatives; completion of user satisfaction surveys and community perception studies.

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