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Indicators Handbook for Just and Inclusive Energy Transitions

Global Commission on People-Centred Clean Energy Transitions: Designing for Fairness

Durban, South Africa, 9 October 2025

International Energy Agency

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Introduction

In addition to reducing emissions, clean energy transitions present unique opportunities to create socio-economic benefits (e.g. new decent jobs, reduced energy poverty and improved air quality). Tracking these benefits can help highlight and communicate the positive effects of clean energy transitions across different population groups.

This year, the South African G20 Presidency and Brazilian COP30 Presidency have prioritised just and inclusive energy transitions and this Indicators Handbook has been developed to support and promote these efforts.

The Indicators Handbook is based on the voluntary G20 Principles for Just and Inclusive Transitions, endorsed by G20 leaders in November 2024. The principles, which reflect varying perspectives, contexts and experiences, form a framework for approaching transitions that maximises benefits and mitigates 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. The Handbook provides tools for tracking progress, evaluating the effectiveness of existing or planned programmes, and supporting the design of just and inclusive energy policies.

Recognising the diversity of national energy systems and socio-economic contexts, the handbook does not offer a prescriptive framework with a defined set of indicators. Instead, it outlines a selection of indicators and evaluation methodologies, drawn from practical applications, for each of the G20 principles. Most of these indicators have already been used by stakeholders across the world to address the key dimensions of just transitions. Countries can tailor these proposed indicators and evaluation methods to suit their unique priorities, institutional capacities and national policy landscapes. On the global stage, these indicators can also support countries as they develop their Nationally Determined Contributions (NDCs) and other climate and adaptation strategies.

As countries move from acknowledging principles on just transitions to translating them into implementation and progress tracking, international collaboration is more important than ever. This handbook lays the groundwork for ongoing cooperation among countries to identify, refine and develop indicators that advance just and inclusive energy transitions. Countries and organisations with well-established technical systems for data collection and monitoring policies can support others through capacity-sharing and knowledge exchange. Such an approach is crucial for enhancing mutual learning and scaling up results on just and inclusive energy transitions, at the pace and scale required to deliver global climate ambitions and strengthen energy security.

The Global Commission on People-Centred Clean Energy Transitions: Designing for Fairness and South Africa's G20 Presidency

In 2024, the IEA Executive Director Dr. Fatih Birol convened a new Global Commission on People-Centred Clean Energy Transitions: Designing for Fairness to explore key issues on how to fully integrate the principle of fairness into the design of all clean energy policies.

The Global Commission is co-chaired by Alexandre Silveira de Oliveira, Brazil's Minister of Mines and Energy and Teresa Ribera, European Commission Executive Vice-President for a Clean, Just and Competitive Transition. It comprises energy, climate and labour leaders from governments around the world, along with high-level representatives from international organisations and labour, Indigenous, youth and civil society groups.

In 2024, the Global Commission met directly before the G20 Energy Transitions Ministerial meeting in Foz do Iguaçu, Brazil. This was followed by the approval of the ten voluntary Principles for Just and Inclusive Energy Transitions by G20 energy ministers and subsequently by leaders.

The Global Commission believes these principles constitute a powerful framework for helping governments to advance clean energy transitions in ways that maximise benefits and reduce negative impacts.

The ten G20 Principles for Just and Inclusive Energy Transitions are:

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.

In 2025, as South Africa's G20 Presidency is making just and inclusive energy transitions one of its priority areas, the Presidency invited the Global Commission on People-Centred Clean Energy Transitions[1] to explore translating the voluntary G20 Principles for Just and Inclusive Transitions into policy design, implementation, and tracking through the development of a Blueprint for Action on Just and Inclusive Energy Transitions and the Indicators Handbook.

The Blueprint for Action on Just and Inclusive Energy Transitions was launched at the meeting of the Global Commission on 12 June 2025 in Brussels, Belgium. In this Blueprint, the Global Commission developed a guidebook for governments and other stakeholders to design and implement clean energy policies in line with the G20 Principles in their own domestic contexts. The document includes more than sixty case studies representing different geographies and local contexts.

[1] See G20 South Africa Sherpa Track Concept Note for the Energy Transitions Group, February 2025: https://g20.org/wp-content/uploads/2024/09/Annexure-C-Concept-Note-2025-South-African-ETWG_Final-Version-04.pdf

The Blueprint for Action and this Indicators Handbook support the development of South Africa's G20 Action Agenda on Just and Inclusive Transitions.

Purpose and Development of the Handbook

A flexible contextual approach

The Indicators Handbook complements the Blueprint for Action as a flexible, pragmatic and evidence-based resource to provide guidance on tracking the implementation of the G20 Principles for Just and Inclusive Transitions.

Each chapter corresponds to one of the G20 principles. For each principle, the Handbook presents emerging practices and approaches from several country case studies, illustrating both indicators and methodologies for tracking progress, monitoring effectiveness and designing better policies. Each chapter also includes lessons learned from international experience and key considerations relevant to measuring the specific issues associated with the principle.

The indicators proposed for each principle 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 toward domestic and shared international goals, such as the Sustainable Development Goals (SDGs) and the Global Stocktake.
- 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.

The development and use of indicators can help governments build stronger national data systems. It can strengthen institutional capacity for evidence-based decision making, mobilise technical and financial support for improved data collection and analysis. This supports adaptive, iterative policymaking, enabling governments to course-correct policies as new challenges and opportunities emerge.

Whenever relevant, all indicators should be systematically disaggregated by gender, and wherever possible further broken down by age, ethnicity, region or other intersecting categories. This ensures the opportunities and impacts of energy transitions for all groups are fully understood, and that actions can be taken not only to address and mitigate any unintended outcomes, but also to support the broader participation and engagement needed for programme efficiency and effectiveness.

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

How to use this 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 can use these case studies and the suggested indicators as inspirations for designing indicators that address the key issues embodied by each of the 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 exists, 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 handbook are meant as starting points to spur international collaboration in this domain.

Developing the Handbook through global knowledge sharing

To inform the development of the handbook, on behalf of the Global Commission on People-Centred Clean Energy Transitions, the IEA Secretariat organised a series of consultations and seven regional and thematic workshops on indicators for just and inclusive energy transitions, in collaboration with governments and key stakeholders.

These included five virtual workshops: one focused on sub-Saharan Africa and one with G20 members and partners, both held in collaboration with the Council for Scientific and Industrial Research (CSIR) and the South African Department of Electricity and Energy (DEE); one focused on Latin America and the Caribbean in collaboration with OLADE; one focused on advanced economies in collaboration with the Spanish Ministry for the Ecological Transition and the Demographic Challenge; and one focused on labour issues with representatives from major labour unions around the world. In addition, two in-person workshops were held: one dedicated to Brazil, in Brasília, in collaboration with the Brazilian Ministry of Mines and Energy; and one dedicated to Southeast Asia, in Jakarta, in collaboration with the Indonesian Ministry of Energy and Mineral Resources.

More than 360 participants took part in these workshops, that brought together diverse constituencies, including policymakers at national and municipal level, international organisations, experts and representatives from civil society representing different key constituencies including labour, business, youth, women, and Indigenous groups. This included participation and attendance from major international organisations including C40 Cities, Food and Agriculture Organization (FAO), Global Green Growth Institute (GGGI), International Atomic Energy Agency (IAEA), International Energy Forum (IEF), International Labour Organization (ILO), International Renewable Energy Agency (IRENA), International Trade Union Confederation (ITUC), the Latin American Energy Organization (OLADE), Organization of the Petroleum Exporting Countries (OPEC), Sustainable Energy for All (SEforALL) and World Resources Institute (WRI) among others.

In each of these workshops, participants were invited to share indicators they had developed or adapted, as well as their evaluation methods, relevant to the G20 Principles for Just and Inclusive Transitions. They were also invited to discuss institutional mechanisms and capacity that enabled this data collection, where relevant, as well as lessons learned and remaining gaps. The Global Commission would like to extend its sincere gratitude to all participants for taking the time to participate and to contribute so insightfully to the development of the Handbook.

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

Several challenges and opportunities emerged from the seven workshops. These include:

Data improvements and digital opportunities

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

Clean energy programmes and policies can affect groups differently. Indicators tracking their just and inclusive dimensions, therefore, require disaggregated data that allow for intersectional analysis of key socio-economic factors such as gender, age, disability, household tenure, migration status or rural-urban divides. While the availability of disaggregated data remains a fundamental challenge for tracking just transitions across the world, improving it also represents a major opportunity for policymakers to target their interventions and mainstream inclusion in their energy programmes, maximising equity and beneficial outcomes for all parties. Additionally, disaggregated indicators can help reveal distributional effects, highlighting population segments that may benefit from energy transitions as well as those that may bear unintended burdens.

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

Key dimensions of just transitions, such as active stakeholder engagement, or women's sense of empowerment and increased agency, cannot be captured by numbers alone. They often require qualitative data collection approaches, such as perception surveys, interviews or participatory methods. These methods can help reveal, in a nuanced manner, additional points of context about barriers, aspirations, opportunities and the impacts of policies on daily life, including unanticipated

consequences. Elevating the role of qualitative evidence with real voices on the ground can also successfully support adjustments and course corrections in the policy implementation process.

Tracking data at different points in time is important to effectively measure and evaluate just transition outcomes.

The social impacts of clean energy transitions (e.g. improvements in health or reductions in socio-economic inequalities) can take longer to be observed than technical indicators like CO_2 emissions. Indicators are therefore essential at different time scales, including medium-term indicators that bridge the gap between immediate activities (e.g. workshops held) and long-term indicators (e.g. jobs created). These medium-term indicators can help evaluate early effects and create immediate feedback loops for policymakers to make course corrections and adjust policies as necessary.

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

Many countries experience challenges with statistical systems, that can prevent the collection of complex data on energy systems, and miss interlinkages with other social dimensions. Even in countries with more robust statistical systems, knowledge gaps can be found in their capacity to integrate socio-economic indicators into energy models and scenarios.

Digitalisation and artificial intelligence unlock new opportunities to track progress

Digital tools and artificial intelligence, with appropriate data protection standards in place, bring new opportunities to overcome some of the time and resourcing challenges robust measurement and monitoring systems often present. For instance, remote sensing, smart meters and mobile surveys can automate data collection and facilitate real-time monitoring. Artificial intelligence tools can also accelerate the integration and analysis of disparate datasets, supporting more nuanced scenario analysis and ways to visualise co-benefits of clean energy transitions. However, these

digital tools and data collection methods should be implemented within robust data governance frameworks that prioritise consumer rights, including informed consent, the rights to move personal data between services, and effective redress mechanisms when data is misused[2].

Integrated governance and stakeholder engagement

Strengthening coordination 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, or social protection. Data on these issues are frequently siloed within individual institutions and agencies. For example, national energy ministries may not have access to household data held by ministries of social affairs, making integration difficult. Discrepancies between datasets from different administrative levels can further complicate data collection. Building centralised databases and strong coordination across implementing partners, government agencies, and regulators, can enhance monitoring efforts on just transition outcomes.

Capturing indicators across geographic scales is important.

Just energy transitions are implemented at the national, regional and local levels. Some sub-national regions will experience greater socio-economic impacts than others. It is therefore essential to ensure data collection across geographic scales and to include local authorities and civil society organisations in processes to measure progress on just energy transitions. Building local tracking capacity is not only important to reflect geographic variation but also to involve local communities in co-developing policy responses that are tailored to their specific needs.

[2] Consumers International (2025). "Recommendations for Interoperable & Consumer-centric Redress in the event of Personal Data Misuse in International Data-transfers." Payne & Routledge, Ford Foundation, London.

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

Co-developing metrics with key stakeholders (e.g. trade unions, local communities, consumer groups, youth and Indigenous groups) can help build trust, better reflect local priorities and ensure the indicators collected are legitimate. Stakeholder engagement in developing and co-designing indicators can also support better data collection in hard-to-reach groups or territories. It can also provide effective feedback loops that support continuous improvement, particularly when local actors are involved in interpreting data.

Open-access indicator databases and digital platforms strengthen transparency and public accountability.

Freely accessible online dashboards help improve the availability of key information. This transparency allows for independent analysis and can help diverse groups better understand how commitments are implemented. New technologies can also facilitate stakeholder engagement through participatory digital platforms with real-time consultations, crowdsourcing feedback or accessible multi-lingual virtual townhalls. In return, these tools can reinforce the credibility of reporting and foster greater public confidence in the transition process.

The role of international frameworks and collaboration

Enhancing international frameworks with socio-economic dimensions can support tracking progress on people-centred clean energy transitions.

Several agreed international frameworks, such as the Sustainable Development Goals (SDGs) or the United Nations Framework Convention on Climate Change (UNFCCC) are already tracking key energy related issues, for instance, indicators on energy access and clean cooking. UNFCCC encourages countries to voluntarily integrate just transition indicators into Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs) and other climate strategies. Efforts to track progress on just energy transitions present opportunities to align with these frameworks, thereby

avoiding duplication. For example, SDG7 on sustainable energy is one of only six SDGs without a dedicated gender indicator, and efforts are underway to address this gap[3]. It is important to recognise the opportunities to develop new indicators to capture specific dimensions of just transitions through international knowledge exchange and to enhance existing tracking efforts.

Global leadership and international collaboration on capacity building are critical.

Governments can play a leadership role not only in publicly communicating key dimensions of just and inclusive energy transitions, but also in sharing technical assistance for data collection, modelling and reporting. Peer learning and international collaboration are key enablers for improving data ecosystems, offering countries the chance to learn from one another's experiences, strengthen global comparability and jointly develop solutions tailored to their contexts.

[3] United Nations. (2025). Gender Indicators for Sustainable Energy: A Call to Action. SDG7 Policy Briefs in Support of the UN High-Level Political Forum 2025.

PRINCIPLE 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.[4]"

Robust policy planning is essential for just and inclusive transitions to deliver widespread benefits. Clean energy transitions involve many different policy sectors and aligning objectives is complex and requires dedicated, inclusive planning processes. In addition, working across different levels of governments and between sectoral authorities is essential to ensure the effective development and implementation of energy policies.

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

The case studies below illustrate how tracking on energy planning for just and inclusive energy transitions takes place. They have been monitoring countries' ambitious

[4] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

transformation towards clean energy using indicators that systematically track social, economic and environmental outcomes, including:

- **South Africa – Just Energy Transition Implementation Plan**, a comprehensive national roadmap for decarbonisation that incorporates indicators to track socio-economic impacts.
- **Scotland – Measuring and Evaluating Success in the Scottish Just Transition**, where a nationally coordinated framework systematically tracks progress toward just transition outcomes.
- **Indonesia - Just Energy Transition Partnership (JETP)**, uses a monitoring framework to ensure inclusive energy planning.

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

Introduction

In addition to reducing emissions, clean energy transitions present unique opportunities to create socio-economic benefits (e.g. new decent jobs, reduced energy poverty and improved air quality). Tracking these benefits can help highlight and communicate the positive effects of clean energy transitions across different population groups.

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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. The Handbook provides tools for tracking progress, evaluating the effectiveness of existing or planned programmes, and supporting the design of just and inclusive energy policies.

Recognising the diversity of national energy systems and socio-economic contexts, the handbook does not offer a prescriptive framework with a defined set of indicators. Instead, it outlines a selection of indicators and evaluation methodologies, drawn from practical applications, for each of the G20 principles. Most of these indicators have already been used by stakeholders across the world to address the key dimensions of just transitions. Countries can tailor these proposed indicators and evaluation methods to suit their unique priorities, institutional capacities and national policy landscapes. On the global stage, these indicators can also support countries as they develop their Nationally Determined Contributions (NDCs) and other climate and adaptation strategies.

As countries move from acknowledging principles on just transitions to translating them into implementation and progress tracking, international collaboration is more important than ever. This handbook lays the groundwork for ongoing cooperation among countries to identify, refine and develop indicators that advance just and inclusive energy transitions. Countries and organisations with well-established technical systems for data collection and monitoring policies can support others through capacity-sharing and knowledge exchange. Such an approach is crucial for enhancing mutual learning and scaling up results on just and inclusive energy transitions, at the pace and scale required to deliver global climate ambitions and strengthen energy security.

South Africa – Just Energy Transition Implementation Plan

Objective:

South Africa's Just Energy Transition Implementation Plan 2023-2027 is a comprehensive national framework designed to coordinate and track progress on the

country's decarbonisation goals targeting, in particular, the energy sector and the coal-dependent province of Mpumalanga, in a manner that delivers just outcomes for those affected by the energy transition.

The plan is led by the Just Energy Transition Project Management Unit, which tracks its progress by monitoring both immediate outcomes and longer-term impacts across six key portfolios: Electricity, Mpumalanga Just Transition (Mpumalanga being South Africa's most important coal province), New Energy Vehicles, Green Hydrogen, Skills, and Municipalities.

Selected indicators tracked

- Funds spent on Just Energy Transition Implementation Plan-related investments/activities
- Disaggregated numbers of beneficiaries from projects supported (gender, age, race)
- Number of jobs created or maintained from Just Energy Transition Implementation Plan investments, by gender
- Number of workers in all the priority sectors (energy, supply chains, tourism, agriculture) reskilled, upskilled, and/or retrained
- Levels of unemployment in Mpumalanga stabilised and dropping compared to national average
- Number and percentage of coal workers transitioned (retired, job numbers, and job types)
- Percentage increase in number of women and youth trained/employed
- Greenhouse gas emissions reductions achieved (Mt CO_2eq per annum) from Just Energy Transition interventions
- Emissions reduced or avoided from Renewable Energy electricity generation
- Energy consumption saved by energy efficiency measures (GWh/year)
- Hectares of land affected by coal mining rehabilitated

- Water made available from coal plant closures (million litres)
- Percentage of households in Mpumalanga accessing reliable electricity
- Multi-dimensional poverty levels improving in Mpumalanga
- Levels of respiratory illness (asthma, etc.)
- Percentage of households in Mpumalanga with working water services
- Extent of community involvement and ownership of community-based Just Transition interventions
- Public feel engaged in policy and collective action to implement Just Transition
- Public expressions of support for the Just Energy Transition Implementation Plan by the PCC, business, labour and civil society organisations
- All key government stakeholders endorse the Just Energy Transition Implementation Plan.

Evaluation methodology:

South Africa's Just Energy Transition Implementation Plan is monitored through a combination of qualitative and quantitative methods. These include:

- Real-time monitoring dashboards, drawing on national statistics and provincial data, including data from ESKOM (the country's electricity public utility), are used to provide transparent public reporting on key indicators, with quarterly progress reports published against short-term and medium-term outcome targets.
- The Just Energy Transition Projects Register (updated quarterly) provides a publicly accessible database tracking all projects funded under the plan, including their implementation progress, funding sources and outcomes. Disaggregated data collection is used to match projects with beneficiary outcomes.
- Surveys are used to measure changes in employment, income and outcomes as they relate to community development in affected areas, most particularly

in Mpumalanga's coal-dependent districts. Consultations are undertaken through multi-stakeholder forums to capture qualitative feedback.

Outcomes:

The Just Energy Transition Implementation Plan illustrates the effectiveness of a participatory, multi-stakeholder governance and transparent national monitoring system. Its initial tracking efforts have already demonstrated that international pledges to the Implementation Plan have grown from USD 8.5 billion in 2021 to USD 12.8 billion by June 2025. More than 2.6 GW of new renewable energy projects secured all their funding and are ready to start building. In Mpumalanga, more than 1 800 coal-sector workers (35% women) have enrolled in reskilling programmes, and six community-owned enterprises are operational.

Scotland – Measuring and Evaluating Success in the Scottish Just Transition

Objective:

To ensure Scotland's transition to a net-zero economy is inclusive, equitable, and evidence-based, this initiative establishes a national framework for monitoring and evaluating progress on just transition goals. Led by the Scottish Just Transition Commission, the framework aims to track social, economic, and workforce impacts, guide policy development, and support accountability through stakeholder engagement and transparent reporting.

The framework includes 61 indicators focused on actions such as avoiding the entrenchment of old injustices, addressing spatial injustice, increasing community ownership and production, empowering communities to act, strengthening democratic participation, and supporting the workforce.

Selected indicators tracked

- Gini coefficient (a measure of wealth inequality in the population) across all population subgroups currently experiencing inequality does not deteriorate from baseline (Annual change)
- Maintenance of environment: no further reduction in biodiversity, air quality, or water pollution for all localities
- Annual change in how local households' average disposable income compares to the national average, with reference to cost of living
- Reduced prevalence of fuel poverty
- Improved quality of life for marginalised groups
- Number of successful community participation requests (community engagement in decision making)
- Number of community or locally owned renewable energy installations/ operational renewable energy capacity in community and local ownership (in absolute numbers and MW)
- Enrolment rates in vocational programmes for affected areas
- Participation in adult learning in affected areas
- For affected groups, wage differences are on balance better or equal to previous work

Evaluation methodology:

To monitor implementation and assess effectiveness, the framework applies a combination of qualitative and quantitative methods. These include:

- Workshops to assess and refine priorities through stakeholder participation and deliberation.
- Document review analyses existing plans to track actions, responsibilities, and financial distribution.

- Stakeholder interviews gather diverse perspectives on needs, risks, and workforce implications.
- Data matching to align available indicators with goals and reveals geographic and data gaps.
- Analysis and reporting synthesise all inputs into a coherent, evidence-based framework.

Outcomes:

By monitoring developments with indicators on key socio-economic dimensions relating to workforce transitions, energy poverty, community ownership or spatial justice, the Scottish Just Transition Commission's framework ensures energy planning remains equitable, inclusive, and evidence based, reducing carbon emissions while increasing public confidence that the transition is fair for all communities.

Indonesia - Just Energy Transition Partnership (JETP)

Objective:

The Just Energy Transition Partnership (JETP) Indonesia is an agreement to mobilise USD 20 billion in public and private financing to support a just energy transition in Indonesia, with the objective of increasing the share of renewable energy to at least 34% of total power generation by 2030.

Through JETP, Indonesia is channelling new investments to help workers and communities affected by the country's coal phase-out. The JETP Taskforce, established to implement the initiative, tracks several key socio-economic indicators within its 2025 Comprehensive Investment and Policy Plan, which provides a detailed roadmap for Indonesia's clean energy transition.

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 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, such as through 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 facilitate 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 will be used to measure stakeholder satisfaction, quality of employment outcomes, and participation of marginalised groups.
- External evaluators will be engaged at key intervals to conduct independent reviews and assess progress against the nine Just Transition standards.

Outcomes:

As Indonesia progresses in implementing its JETP, systematically monitoring the programme's outcomes will help ensure investments to accelerate the country's energy transition also respond to several key socio-economic developments. This includes the creation of new jobs and skills development opportunities, the inclusion of marginalised groups, and the strengthening of local economies.

Lessons learned and key considerations

Insights drawn from international experience 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 coordination mechanisms.
- Measuring the number of ministries involved in energy planning, and the degree of integration of labour, health, or education goals in energy policies, is emerging as a useful indicator to track cross-sectoral coordination.
- 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.
- Monitoring the alignment between subnational planning inputs and national energy plans is key to drive effective implementation at the local level and that local priorities and equity concerns are effectively integrated.
- 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.

Suggested indicators and methodologies

Principle 1 - Energy Planning for Just and Inclusive Energy Transitions

Indicators	Evaluation methods
Number of national and regional energy planning strategies, energy planning bodies or advisory panels	Desk review of officially published national and regional energy plans and strategies; analysis of government and ministry websites for evidence of energy planning bodies or advisory panels; verification ministry/department websites and international energy databases (e.g., IEA, IRENA, SEforALL)
Number of energy policies/plans explicitly referencing principles of justice, inclusion and gender 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 references; cross-comparison over time
Assessment of inclusiveness and effectiveness of energy planning strategies, energy planning bodies or advisory panels	Qualitative assessment with stakeholder interviews 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

Indicators	Evaluation methods
Number of indicators tracking key just 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 interministerial engagement in just transition planning and implementation	Desk review of policy documents, mapping of participating ministries/agencies; mapping of interministerial committees/task forces and their mandates; analysis of cross-sectoral coordination mechanisms; stakeholder interviews, and scoring of interministerial involvement levels
Number of municipalities with just energy transition plans	Desk review of published municipal energy plans and transition strategies; verification via municipal websites and central registries
Level of resources and governance capacity allocated to formalised national government bodies responsible for just transition	Review of budget documents, staffing rosters, and authorising legislation, policy, or budget provisions for all designated national just transition entities (including external councils, task forces, and commissions), with quantitative reporting on allocated funding, staff, and legal mandates

PRINCIPLE 2 - ENDING 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.’[5]’

Around 750 million people still live without reliable access to electricity, 80% of whom are in sub-Saharan Africa. This lack of access to electricity can limit people’s access to other essential services such as healthcare, work and education. At the same time, 2 billion people still live without access to clean cooking technologies, a situation which carries severe health risks that disproportionately affect women and children. Even when energy and clean technologies are available, many low-income households cannot afford to use the amount they need to meet their needs.

Many countries already track energy poverty. In many countries, energy poverty is defined and measured based on households spending more than 10% of their income on energy. However, some stakeholders argue that energy poverty impacts a greater proportion of households and governments have begun to explore how to capture other dimensions such as people making trade-offs with other essential services and the extent of household vulnerability.

The case studies below show ways to measure and track access to electricity and energy poverty, including:

- **Nigeria Electrification Project**, tracking energy access and co-benefits for off-grid communities.
- **Portugal – National Energy Poverty Observatory**, using indicators to track progress towards the country’s national strategy to reduce energy poverty.
- **Barcelona – Energy Advisory Points**, where municipal one stop shops support the city’s holistic approach to tackle energy poverty.

[5] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **International Organisations – Tracking Access to Clean Cooking**, using indicators to analyse pathways to universal clean cooking access.

Emerging practices and approaches to track progress on ending energy poverty

Nigeria Electrification Project

Objective:

With more than 85 million Nigerians lacking electricity access, especially in rural areas, the Nigeria Electrification Project is one of the most ambitious off-grid electrification initiatives in sub-Saharan Africa. Led by Nigeria's Rural Electrification Agency with support from the World Bank and the African Development Bank, the Project was developed to respond to the country's electricity gaps with off-grid solutions (solar hybrid mini-grids, solar home systems, captive power plants etc.) and address broader socio-economic constraints faced by marginalised communities due to limited energy infrastructure.

The Project systematically tracks progress with a range of indicators that measure energy related issues as well as capture wider socio-economic co-benefits.

Selected indicators tracked

- Number of off-grid connections (households and micro, small, and medium enterprises)
- Female households and micro, small, and medium enterprises with new or improved electricity services
- Share of population with electricity access
- New renewable energy (solar) generation capacity installed and utilisation of power

- Percentage of income spent on energy (used to guide subsidy targeting)
- Cost per connection (pre- and post-subsidy)
- Electricity supply reliability (hours of supply per day) co-benefits: reduced diesel use, job creation (including women/youth), improved education outcomes, improved health outcomes

Evaluation methodology:

For ongoing monitoring and improvement, the Nigeria Electrification Project applied a combination of qualitative and quantitative methods. These include:

- Baseline/endline surveys tracking energy affordability, usage and gendered differentiated impacts
- Real-time dashboards to track installation progress and independent audits to check connections and service quality
- Geospatial tools for identifying unserved clusters and targeting subsidies
- Impact evaluations (including randomised controlled trials) to assess socio-economic impacts of electrification (income, education and health).

Outcomes:

The project aims to drive socio-economic development by bringing electricity to more than 3.5 million people, including 705 000 households, 90 000 micro, small, and medium enterprises, and 15 federal universities.

Portugal - National Energy Poverty Observatory

Objective:

The National Energy Poverty Observatory was established as part of Portugal's National Long-Term Strategy to Combat Energy Poverty 2023-2050. Co-led by several national agencies and institutions, the Observatory is designed to monitor the evolution of energy poverty in the country, by defining and updating energy poverty

indicators, proposing and evaluating public policies and coordinating with national and local stakeholders.

The Observatory measures energy poverty in Portugal through a series of core and complementary energy poverty indicators. The latter provides a broader context for energy poverty and supports targeted interventions. Each core indicator is accompanied by a reference value (current share of the population experiencing a certain energy poverty aspect) and national targets for improvement by 2030, 2040, and 2050.

Selected indicators tracked

- Percentage of population unable to keep their homes adequately heated
- Population living in dwellings not comfortably cool during summer, by gender
- Population living in dwellings with problems of leak, damp or rotten elements, by gender
- Family units whose energy expense represents more than10% of their total income
- Share of dwellings with energy class C or lower
- Percentage of energy consumption satisfied by local renewable energy production
- Percentage of population at risk of poverty, by gender
- Percentage of population with debts to public utility services, by gender

Evaluation methodology:

The Observatory uses mixed-method approaches, that include:

- Data collection from multiple Portuguese agencies (including national Directorate-General of Energy, the Portuguese Energy Agency and National Statistics Institute).
- Identify and monitor households in situations of energy poverty through the creation and application of periodic survey instruments collected at the local level (e.g. Lisbon's Energy and Environment Agency, Porto's Energy Agency).
- Review of National Energy Certification System to collect data on energy efficiency performance of buildings, thermal insulation quality etc.

Outcomes:

Based on data tracked by the Observatory, the National Long-Term Strategy to Combat Energy Poverty's 2030 targets includes reducing the portion of the population unable to keep their homes adequately heated from 17.5% to 10%, lowering the number of households living in dwellings not comfortably cool during summer from 35.7% to 20% and bringing down the share of dwellings with energy class C or lower from 69.5% to 50%.

Barcelona - Energy Advisory Points

Objective:

Spain has built on a sustained commitment to addressing energy poverty, first through the National Strategy 2019-2024 and now with the draft National Strategy 2025-2030. The formulation of the new strategy responds to the need for a coherent framework for action that integrates the responsibilities of the various public administrations and ensures the effectiveness of policies to combat energy poverty.

Accordingly, these strategies establish effective mechanisms for multidisciplinary and multilevel action and coordination, where regions and cities play a key role in reducing the effects of energy poverty. This is reflected in several measures of the new strategy, such as Measure 10 on inter-administrative coordination and Measure 11 on the launch of support programmes for the establishment of Energy Advisory Points.

In this context, in 2017, to protect the energy rights of residents and guarantee the application of the laws that prohibits companies from disconnecting vulnerable households from electricity and gas supply, the City of Barcelona established Energy Advisory Points in each district. These advice points help people exercise their energy rights, reduce energy costs and understand how to use energy effectively. Several indicators are collected through the thirteen Energy Advisory Points and help inform Barcelona's holistic approach to tackle energy poverty.

Selected Indicators tracked

- Number of people assisted by Energy Advisory Points, by demographic groups
- Percentage of assisted individuals in social vulnerability situations, by demographic groups
- Households assisted behind on paying utility bills
- Total supply disconnections (electricity, gas, water) prevented since programme inception
- Estimated total savings on energy bills generated by advice
- CO_2 emissions prevented annually through energy efficiency interventions
- Long-term unemployed people trained & employed as energy agents
- Inadequate temperature in cold/hot months
- Lack of heating/air conditioning
- Delays in payment of bills

Evaluation methodology:

A mixed-methods approach combining quantitative tracking and qualitative assessment methods is used to track progress:

- Continuous quantitative data collection via administrative records at each Energy Advisory Point in order to capture service delivery (e.g. number of people assisted, prevented cut-offs, bill savings).
- Regular performance reviews with monthly monitoring of intervention metrics, service coverage, and protection measures.
- Citizen satisfaction surveys and targeted interviews with marginalised groups are undertaken to gather qualitative data.

Outcomes:

- Between its launch in 2017 and 2024, the Energy Advisory Points have served a total of over 237 000 people, corresponding to 87 350 homes, supporting people to cut their energy consumption and bills and switch to renewable energy.
- The Energy Advisory Points have prevented over 196 000 power, water or gas supply cut-offs between 2017 and 2024, and helped residents save over €721 000.
- Barcelona has now trained around 300 home care workers each year to identify situations of inadequate thermal comfort in homes.

International Organisations – Tracking Access to Clean Cooking

Objective:

Today, 2 billion people worldwide (approximately 25% of the global population) still do not have access to clean cooking. In sub-Saharan Africa, the number of people without access to clean cooking has continued to grow in recent years, reaching approximately 1 billion people today, or around 80% of all households. This lack of access to clean cooking contributes to approximately 815 000 annual deaths in Africa alone.

In response, the Clean Cooking Alliance, the International Energy Agency, as well as the other co-custodians responsible for tracking progress on Sustainable Development Goal 7 (SDG7), are promoting access to clean cooking in Africa and

beyond through multiple means, including by tracking its key dimensions and a pathway that would allow the continent to achieve universal access by 2040. The other co-custodians include International Renewable Energy Agency, United Nations Statistics Division, the World Bank, and World Health Organization.

Selected Indicators tracked

- Access to clean cooking (percentage and total numbers)
- Rate of access to clean cooking per country
- Fuels used for clean cooking access (e.g. LPG, electricity, bioenergy)
- Clean cooking policy framework developments
- Tracking of investment in Africa's cooking sector

Evaluation methodology:

International organisations use a variety of methods and tools to monitor current as well as future clean cooking developments, including:

- Geospatial tools based on mapping of all existing clean cooking-related infrastructure.
- Self-reported policy and financial commitments' updates by governments and organisations.
- Cross checking of data, against other public records (e.g. OECD's Development Assistance Committee).
- Household surveys and censuses (e.g. "Core Questions on Household Energy Use" conducted by World Bank and World Health Organisation).

Outcomes:

The SDG7 custodian institutions are raising the profile of the issue on the global agenda through multiple means including, the publication of the annual Energy

Progress Report, tracking progress on clean cooking access among other topics and providing reliable data, trends and needs.

At the IEA's 2024 Summit on Clean Cooking in Africa, 12 African governments announced policy pledges, with both public and private sectors committing USD 2.2 billion, of which USD 470 million has been disbursed to date. Additionally, 10 of the 12 participating countries have already announced or introduced new policies in line with their summit pledges.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards ending energy poverty.

- Key energy poverty determinants such as household income levels, energy prices, housing quality and energy efficiency, and other demographic characteristics, should be tracked regularly to assess the risk factors and conditions that may cause households or specific communities to fall into energy poverty.
- Tracking energy poverty requires an understanding of its multidimensional nature. Indicators such as reduced respiratory illness and thermal discomfort, improved school attendance, reduced households' emissions from improved energy efficiency, or increases in women's employment, entrepreneurship and leadership can offer insights into the daily lives of groups affected by energy poverty.
- Tracking energy poverty properly must reflect these different aspects – availability, accessibility, affordability, consumption, and end uses of energy - and requires an adjusted approach depending on national and local contexts.
- When collecting information to track energy poverty, the people reached through online surveys (who are often younger, more educated, and higher-income) can be very different from those reached at, for example, one stop shop information points in town centres (which may reach more lower-income, less educated, elderly, or unemployed groups).

- Good policy requires responsive and dynamic monitoring systems to inform design and implementation. Spatial and demographic analysis, such as geospatial mapping, census data and household surveys, can help identify high-risk and unserved groups.
- Designing surveys using more subjective questions, based on people's reflections about their lived experiences, is often an effective way to help identify those experiencing energy poverty or related hardships.

Suggested indicators and methodologies

Principle 2 — Ending Energy Poverty

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 where needed.
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 (i.e. outreach of solutions to marginalised neighbourhoods or rural communities lacking formal connections)	Remote sensing, census and implementation data
Percentage of energy infrastructure (generation, transmission, distribution) by ownership type (public, private, community, cooperative) ***(to understand underlying structural causes of energy poverty alongside indicators measuring symptoms)***	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

PRINCIPLE 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[6]''

Energy policies have wide-reaching consequences for communities and a broad set of stakeholders are affected by energy-related decisions. Ensuring these different perspectives are taken into consideration requires adapting means of communication to local context and sharing information in a transparent manner. Collaboration between levels of government is also key to increase the effectiveness of participatory processes.

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.

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.

[6] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

The case studies below highlight ways to measure broad participation of different stakeholders, the quality of communication of these processes and how they reflect in policy outcomes, including:

- **South Africa - Dipaleseng Just Energy Transition Project**, which tracks progress on participatory transition planning in coal reliant territories.
- **Canada – Sustainable Jobs Act** which monitors ongoing social dialogues and engagement with different stakeholders in the country's clean energy transition.
- **Pakistan – The Network of Consumer Protection**, which fosters engagement of consumers in the country's clean energy developments.
- **Indonesia - Regional Consultation Forums**, which is considering indicators to track multistakeholder collaboration in coal producer regions.

Emerging practices and approaches to track progress on social dialogue and stakeholder participation

South Africa - Dipaleseng Just Energy Transition Project

Objective:

The Dipaleseng Just Energy Transition Project, led by Indalo Inclusive, a South African non-profit organisation, aims to support the development of community-owned enterprises and businesses in the Dipaleseng municipality in Mpumalanga, one of the country's regions with coal power stations scheduled to be decommissioned by 2030.

The project is based on a structured three-phase approach — awareness-building, innovation co-creation, and enterprise incubation — supported through educational workshops, stakeholder mapping, participatory design sessions, and local innovation platforms. This participatory approach aims to place workers, youth, women, and small businesses at the heart of co-designing the region's post-coal economic future. The project uses a wide range of indicators to monitor participation, including crosscutting indicators and phase specific ones.

Selected indicators tracked

- Percentage of participants reporting increased understanding of climate change and just transition concepts
- Stakeholder mapping and power dynamics (identifying who is involved and understanding their influence)
- Inclusion of youth and gender perspectives in enterprise design
- Number of enterprises legally registered and in early operation phase
- Number of stakeholder groups engaged across wards (coverage)
- Participation disaggregated by gender, age, socio-economic status (inclusiveness)
- Use of local languages and inclusive communication formats (accessibility)
- Evidence of sustained engagement

Evaluation methodology:

To collect data the project uses a mixed methods approach, using both quantitative and qualitative collection methods, which include:

- Desktop reviews complete initial stakeholder mapping, using census statistics and records to identify key groups and needs.
- An analysis of attendance registers is monitors participation and captures demographic information.
- Anonymous questionnaires following workshops help to understand changes in community perceptions.
- Focus groups sessions and one on one interviews are conducted with subgroups (e.g. youth, women) to understand barriers to participation and explore project benefits.

- Interactive group methods allow participants to express how they wish to be engaged and what procedural justice means to them.

Outcomes:

The project has already shown positive results demonstrating how participatory planning and co-design can be operationalised and monitored in practice. Preliminary results include:

- More than 130 community members have already taken part in the co-creation process, and 138 attended awareness workshops.
- 85% of all community members who attended the workshops reported increased understanding of climate change and just transition opportunities.
- 76% of community members felt they had actively contributed to the co-design of community innovations.
- Six community-owned enterprises have been legally registered and are in their early operational phase.
- Due to its success, the project model is being replicated in 13 additional municipalities across Mpumalanga, as well as in Komati, the site of a recently decommissioned major coal-fired power station.

Canada – Sustainable Jobs Act

Objective:

Putting people and communities at the centre of government decision making and investments is key to Canada's approach to an inclusive clean energy transition. The Government of Canada's Sustainable Jobs Act supports this approach and has established the Sustainable Jobs Partnership Council, a tripartite advisory body that facilitates social dialogue among government, employers, labour, and key stakeholders from diverse regions and communities. This council, together with the Sustainable Jobs Secretariat, ensures engagement with affected stakeholders, including Indigenous and minority groups, to inform decision making and investments.

Canada has developed indicators to assess the success of the act's stakeholder engagement aims.

Selected indicators tracked

- Number of regions engaged through Secretariat and Partnership Council activities
- Number of stakeholder and partner groups from which an individual or an organisation provided a submission to the Secretariat
- Percentage of Indigenous groups and communities and Official Language Minority Communities within a 250km radius of engagement activity that are engaged
- Percentage of stakeholders and partners that are satisfied following participation in a Secretariat or a Partnership Council engagement activity

Evaluation methodology:

To monitor these indicators, Canada will use a mixed-methods evaluation approach, including both quantitative and qualitative tools:

- Surveys conducted to measure level of satisfaction following participation in an engagement activity.
- Analysis of administrative data (e.g., attendance tracking) to measure participation levels and participant demographics.

Outcomes:

The anticipated outcomes from the approach are:

- Canadians will have a mechanism to provide input regarding the energy transition.
- Canada's sustainable jobs approach will acknowledge local realities and reflect the needs and experiences of partners and stakeholders from a variety of backgrounds and experiences.

- Meaningful and effective social dialogue and engagement will inform and guide Canada's fulfilment of its sustainable jobs commitments.

Pakistan – TheNetwork for Consumer Protection

Objective:

TheNetwork for Consumer Protection in Pakistan, a member organisation of Consumers International, is empowering consumers to effectively use redress mechanisms in the energy sector. As it recognises that Pakistan's rapidly expanding renewable energy market often lacks adequate consumer protection frameworks, the initiative has involved a multi-channel consumer engagement campaign. This includes actions to educate the public on solar energy tariffs and promote the benefits of energy efficient products. The campaign also advocates (through the media and directly to policymakers) for fair renewable energy policies that harness solar energy opportunities to mitigate high consumer electricity costs and improve access to clean energy.

Selected indicators tracked

- Media reach of consumer advocacy messages
- Attendance at public events
- Participant awareness of key campaign messages
- Policymaker responses to direct contact
- Direct impact on policy decisions

Evaluation methodology:

To monitor its effectiveness, the project used a mixed-methods approach combining quantitative and qualitative tools:

- Consumer surveys were conducted before and after campaign events to evaluate changes in knowledge retention and to understand consumer behaviour.
- Project output tracking was undertaken through media monitoring and documentation of public engagement events.
- Stakeholder mapping and follow-up interviews with policymakers helped provide evidence of policy influence and advocacy outcomes.
- Focus group discussions with participants were held with participants to gather qualitative feedback on relevance and effectiveness of campaign activities.

Outcomes:

The initiative achieved the following results:

- Increased consumer understanding of energy bills; including how to identify and seek redress for unfair practices in the energy sector.
- Raised consumers' profile to halt a proposed reduction of solar buyback rates and keep solar energy financially feasible for consumers.
- Achieved a constitutional amendment recognising the right to a sustainable and clean environment as a fundamental right.

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 multistakeholder 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), which is active in Indonesia with support

from the German Society for International Cooperation (GIZ) and the European Commission.

GIZ Indonesia has proposed some potential indicators to assess the impact of the RCFs and to the success of their forthcoming action plans.

Selected indicators tracked

- Percentage of participants from vulnerable groups in the Regional Consultation Forums (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 will be developed 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 (like 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 will be consolidated into a unified database to facilitate cross-region comparison and evidence-based decision making.
- Key indicators and progress updates will be made publicly accessible through an open-access data visualisation platform, to enhance accountability and stakeholder engagement.

Outcomes:

GIZ Indonesia hopes the two Regional Consultation Forums as part of the wider IKI-JET project could result in:

- The inclusion of all relevant stakeholders, including affected coal workers, local citizens and indigenous groups, marginalised groups and local micro, small and medium enterprises, in discussions and recommendations regarding the economic transformation of the regions away from coal.
- The development of regional action plans, supported by investment, to promote economic diversification in the region and create new sustainable local jobs.
- Coordinated efforts to monitor and evaluate the economic transformations of the regions, with a monitoring system for the implementation of the action plan to be developed in 2026.

Lessons learned and key considerations

International experience has helped identify key considerations when tracking progress towards promoting social dialogue and encouraging meaningful and effective stakeholder participation in decision-making processes related to energy transitions.

- 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, and funding made available to support the participation of affected or marginalised groups.

- The accessibility of these processes can be assessed by looking at whether engagement platforms are available in different languages, offered through multiple formats, and reach remote or underrepresented groups. While methods are often harder to compare across settings, the ones presented in the case studies can offer context-specific insights into the quality of engagement.
- 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.

Suggested indicators and methodologies

Principle 3 — Social Dialogue and Stakeholder Participation

Indicators	Evaluation methods
Percentage of clean energy policy documents negotiated or endorsed through formal tripartite structures	Review of co-authorship/participation in drafting of policy texts; validation and verification with employer organisations/federations and trade unions/confederations
Number of participatory engagement activities held (consultations, workshops, forums, co-design sessions) for energy sector policy development processes	Review of national and subnational planning processes; documentation of engagement activities (e.g., invitations, minutes, recordings); triangulation with stakeholder representatives and independent observers; analysis of

	methodology for type of engagement activity
Percentage of stakeholders and partners that are satisfied following participation in an engagement activity	Post-activity stakeholder satisfaction surveys complemented by qualitative feedback analysis (e.g. open comments, interviews)
Number of stakeholder groups actively participating in energy sector policy development processes	Stakeholder mapping; regional outreach records; diversity assessments of groups invited and participating; qualitative records of stakeholder roles and levels of engagement
Number of individuals actively participating in development of energy policies/programmes, by gender, age, socio-economic status	Disaggregated data on individuals submitting written consultations; attendance logs from consultation events; data sources may include participant registration data, sign-in sheets; participant surveys; structured demographic surveys; qualitative interviews and levels of engagement
Share of participants from marginalised groups in stakeholder consultations	Analysis of outreach efforts to target groups; comparison against national/regional demographic baselines
Percentage of materials about energy transition projects available in multiple languages and communication formats accessible to all (considering language, literacy, and ability)	Availability audits of multi-lingual translated materials; systematic reviews to ensure materials are accessible, following legal or recognised standards; user feedback

PRINCIPLE 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.[7]"

As energy transitions bring about significant change, they present an opportunity to improve outcomes for those who are on the margins of energy systems. Energy policies can contribute to enhancing livelihoods and extending protections for those in precarious situations, such as informal workers, platform and gig workers, who tend to experience poor working conditions, low wages and a lack of coverage by social protection measures. Creating socio-economic opportunities for groups that may be impacted by energy transitions, especially workers displaced due to sectoral transformations, is also important to ensure energy transitions contribute to reducing current inequities rather than exacerbating them.

Tracking progress on this principle requires data tools and indicators to help identify the groups that are currently marginalised and those who may be at risk in the future, and to monitor the effects energy policies have on them. This includes indicators that track outcomes related to decent employment such as wage levels, healthy and safe working environments, access to education and better quality of life more broadly.

The case studies highlighted here focus on identifying existing coverage of social protection measures for different groups and assessing the effectiveness of those measures.

- **Poland - Regional Observatory of the Transition Process in Silesia,** which monitors the effectiveness of social protection measures in the country's most coal-dependent region

[7] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **India - Self-Employed Women's Association (SEWA) Initiative for Informal Women Salt Workers**, which tracks improvement in their living conditions after transitioning from diesel to solar pumps.

Emerging practices and approaches to track progress on social protection

Poland - Regional Observatory of the Transition Process in Silesia

Objective:

Silesia is Poland's most coal-dependent region, where 80% of the country's mining workforce is located. Co-led by the Silesian Regional Authorities and co-financed by the European Regional Development Fund since 2022, the Regional Observatory of the Transition Process (ROTP) in Silesia monitors the implementation of social protection measures outlined in the 2021 Social Contract for the Mining Industry between the Polish government and mining trade unions. The Social Contract sets out the specific timetable for discontinuing hard coal mining at each production unit by the end of 2049 and ensures social protection for mine workers, including options to relocate to operational mines, receive an early retirement package equal to 80% of their salaries, or choose to leave mining with a one-time severance payment of PLN 120 000 (approximately EUR 26 800) alongside retraining opportunities. Several indicators are tracked as part of the ROTP in Silesia through multi-stakeholder engagement.

Selected indicators tracked

- Number of early retirees receiving special early retirement payments, by gender
- Number of publicly funded retraining and upskilling programmes implemented in the Silesia region, by gender
- Number of affected workers enrolled, successfully completing retraining, and re-employed in other sectors, by gender
- Number of new jobs created in green and innovative sectors through Just Transition Fund investments
- Budgetary allocations and expenditures on social protection funds for transition-affected communities
- Percentage of affected workers accessing and using career counselling and mental health support services, by gender
- Social satisfaction with support and retraining programmes
- Ongoing regional stakeholder engagement and satisfaction levels

Evaluation methodology:

A mixed-methods approach combining quantitative tracking and qualitative assessment methods is used to monitor outcomes, including:

- Administrative data collection from social security agency records, pension benefit claims, and mining company employment databases to track early retirement uptake and severance payments.
- Regional employment service data collection from county labour offices to document enrolment in vocational training, job placement rates, and redeployment outcomes for affected workers.
- Stakeholder engagement workshops organised regularly with regional authorities, employers, trade unions, non-governmental organisations and

universities, among others, to validate data and gather qualitative feedback on social protection programme effectiveness.

Outcomes:

Between 2021 and late 2023, the ROTP tracked the following social protection outcomes in Silesia:

- More than 2 900 coal workers in Silesia accessed mining leave/early retirement support following mine closures.
- More than 4 250 individuals received one-time severance payments under the Social Contract.
- As of late 2023, around 110 publicly funded retraining and upskilling programmes were implemented for affected workers.
- Approximately 3 100 coal sector workers enrolled in retraining initiatives, of whom about 1 480 completed courses and 670 secured re-employment in new sectors such as renewables, logistics, or services.
- About 44% of the identified affected workers had accessed career counselling services and 25% made use of mental health support.

India - Self-Employed Women's Association (SEWA) Initiative for Informal Women Salt Workers

Objective:

The Self-Employed Women's Association (SEWA) represents low-income women workers in the informal sector across the globe. One of its projects in India has been to facilitate the switch from diesel to solar powered pumps for thousands of informal women salt pan farmers to reduce their operational costs, increase their income and improve their health. In addition, the programme trains women to install and maintain solar technologies to provide them with additional income in the off-season and socio-economic mobility pathways in higher-skilled jobs.

Selected indicators tracked

- Increase in income from salt production since solar pumps replaced diesel pumps
- Increase in income for women from solar technician services, including passive income earned from operating solar panels in the off-season
- Reduction in operational costs
- Percentage of participants investing additional income into children's education and healthcare
- Percentage increase in savings since start of the project
- Increase in salt price resulting from increased collective bargaining power since start of the project
- Duration of payback period of loan from savings on diesel
- Increase in production of salt due to operational capacity expansion (ability to acquire more solar pumps)
- Tonnes of CO_2 saved each year from transition to solar pumps

Evaluation methodology:

Progress was tracked using a combination of qualitative and quantitative methods, including:

- Surveys of participants including reported income, expenditure, fuel consumption and share of income spent on improving healthcare, education and quality of life.
- Modelling and calculations of pay-back periods to justify innovative financing schemes.
- Registrations of solar technicians and training participants.

Outcomes:

- Currently, 7 000 solar pumps have been installed, increasing participating salt pan workers' income by about USD 730 per season. 70% of participants have invested some of this new income in the education and healthcare of their children.
- The transition from diesel to solar pumps has reduced operational costs by 60% on average.
- More than 1 000 women have benefited from additional income (USD 35-40/year) through carbon credits which is partly used to repay loans used to purchase the pumps.
- Some women have been able to expand their operations through quick payback of initial loans, leading to increased salt production and overall income and savings. This is contributing to improve their overall quality of life.
- The project has avoided 100 000 litres of diesel consumption, leading to better health for workers who are less exposed to localised air pollution.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards social protection.

- The effectiveness of social protection measures is assessed not only in terms of their coverage but also their accessibility. It includes factors such as whether eligible individuals can easily understand and apply for programmes, and the removal of barriers that may prevent marginalised groups, such as informal workers, from accessing support. Disaggregated data is key to help assess coverage gaps for different stakeholder groups 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, such as by supporting the adjustment of benefit levels or eligibility criteria in response to

energy price volatility, plant closures, or extreme weather events that increase household vulnerability.

- Monitoring social protection in the context of energy transitions requires coordination across agencies responsible for energy, labour, housing, and social policy. In some countries, this has been operationalised by linking social registries with employment records or monitoring energy usage data to better identify households at risk of exclusion and track the uptake of social measures.
- Developing indicators for women workers and their participation in energy-related industries, along with indicators that track their barriers to participation, can be effective in monitoring progress on equal access and women's economic inclusion, as well as in measuring improvements in their children's health and education outcomes.

Suggested indicators and methodologies

Principle 4 - Social Protection

Indicators	Evaluation methods
Change in unemployment rates in affected regions, by gender	Comparative labour force surveys before/after transition measure; regional employment statistics
Number of early retirees getting extra support payment, by gender	Social security agency records; pension benefit claims data

Indicators	Evaluation methods
Number of publicly funded retraining or upskilling programmes in transition areas, by gender	Review of government and local authority programme records; inventories of funded retraining or upskilling initiatives in transition areas, and analysis of administrative data or official programme registries; verification through regional employment agencies and implementation partners
Number of affected workers retrained or re-employed in other sectors, by gender	Skills training enrolment and completion records; job placement service data
Social funds for affected regions/communities, by gender	Budgetary allocations; fund distribution monitoring; impact evaluations
Percentage of affected workers with access to and use of career and social supports (e.g., career counselling, mental health counselling, etc), by gender	Review of employer, government, and local authority records; inventories of career and social support funding initiatives in transition areas; analysis of administrative data or official programme registries; verification through regional employment agencies and implementation partners

Indicators	Evaluation methods
Proportion of informal energy sector workers transitioned into formal employment in clean energy, by gender	National informal labour registry updates; income tax records; enterprise registration data

PRINCIPLE 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.[8]"

Clean energy transitions provide policy makers and international stakeholders with significant opportunities 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 ensures 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.

The following case studies highlight ways to monitor the integration of gender and youth perspectives into energy planning and policies, providing examples that can be adapted for other groups. These include:

- **Kenya – Gender Mainstreaming National Energy Policy**, a set of gender-disaggregated indicators that ensure gender sensitive energy planning.
- **Equality in Energy Transitions Initiative – Equal by 30 Campaign**, a self-assessment tool that helps countries track key indicators relating to gender equality.
- **Consumers International – Global Consumer Protection and Empowerment Index**, a means to track the inclusion of consumer interests and organisations in national policy processes.

[8] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **SDG7 Youth Constituency – Tracking Youth Engagement**, a set of indicators to track meaningful youth engagement in clean energy transitions.

Emerging practices and approaches to track progress on policy inclusiveness

Kenya - Gender Mainstreaming National Energy Policy

Objective:

Starting in 2006, the Ministry of Energy partnered with ENERGIA, Practical Action Kenya, East African Energy Technology Development Network and the University of Nairobi to promote gender mainstreaming in the energy sector. A Gender Audit of Energy Policy assessed organisational structures, gender-energy context, national policy, energy access for development goals, and funding for gender-responsive interventions, which revealed gender-blind policies and a lack of gender-disaggregated data.

This assessment prompted a coalition of Kenyan civil society organisations and international NGOs to support the Ministry of Energy in developing a new set of gender-disaggregated indicators to design and monitor more inclusive policies improving gender equity outcomes in clean energy transitions.

Selected indicators tracked

- Percentage of women and men with access to electricity and clean cooking solutions
- Share of women-headed households connected to the grid or benefiting from off-grid solutions
- Energy expenditures as a percentage of household income, analysed by gender of household head

- Representation of women in technical and leadership roles within energy institutions
- Participation of women, youth, and marginalised groups in energy entrepreneurship
- Uptake and impact of gender-focused programmes, such as the “Solar Mama” training initiative
- Gender-differentiated health impacts from indoor air pollution and clean cooking adoption
- Women's time savings from improved energy technologies and efficiency measures
- Educational outcomes for girls linked to household electrification and lighting access

Evaluation methodology:

Mixed-methods approaches are used to develop the initiative’s gender sensitive indicators, including:

- Data collection from national surveys and administrative records, which were integrated into sectoral dashboards and performance reviews.
- Qualitative data collection from focus group discussions and participatory rural appraisals, which helped develop an understanding of key contextual barriers and of the differentiated gender impacts of specific energy programmes.
- Periodic gender audits are used to assess the degree of mainstreaming in policies and projects, and in order to support policy adjustments.

Outcomes:

- The data from collected indicators was used by the Ministry of Energy as part of its national energy planning process, most specifically with its National Energy Policy 2025 – 2034 (2024), Energy and Gender Policy (2019) and

National Cooking Sector Study (2019), and to help build institutional capacity for gender-sensitive energy projects.

- The Ministry of Energy appointed a Gender Focal Point to lead gender mainstreaming efforts across the institution.
- An Energy Sector Gender Committee was established in 2021, comprising of Semi-Autonomous Government Agencies, civil society, and the Council of Governors, to implement the energy sector's gender policy.

Equality in Energy Transitions Initiative - Equal by 30 Campaign

Objective:

The Equal by 30 campaign, led by Canada as part of the Equality in Energy Transitions Initiative, a technology collaboration programme jointly under the International Energy Agency and the Clean Energy Ministerial, empowers private and public sector organisations to commit to equal pay, equal leadership and equal opportunities for women and marginalised people in the energy sector by 2030.

In 2023, Equal by 30 published a self-assessment tool to help signatories assess their workplace's progress on inclusion, diversity, equity, and accessibility. The tool provides a framework for measuring gender equality through internal actions and commitments; identifying gaps in leadership, pay and opportunities; and creating action plans to improve gender outcomes in energy organisations.

Selected indicators tracked

- Percentage difference in average salary, by gender
- Percentage of women in senior leadership
- Existence of an anti-harassment policy, followed by qualitative data on its utility

- Employee-reported disparities (i.e. gaps or unequal treatment reported by employees in the workplace, particularly related to gender)
- Percentage of candidate shortlists (e.g. for jobs, promotions, leadership roles, or board appointments) with gender balance
- Percentage of employees with diversity, equality, and inclusivity training
- Percentage of women enrolled in training or promotion-track programmes
- Percentage of managers trained in inclusive supervision (this involves unconscious bias, prevention of discrimination and harassment, etc.)

Evaluation methodology:

To support progress tracking, the Equal by 30 Self-Assessment Tool enables users to develop and assess indicators using both qualitative data and quantitative insights. For example, organisations can:

- Establish baseline metrics that incorporate both statistics and the lived experiences of individuals within their country or organisation. These metrics should capture the varied experiences of individuals across gender, race, and other dimensions of identity, thereby offering a more accurate reflection of workplace diversity and inclusion.
- Monitor indicators and assess outcomes through measurable data and qualitative feedback. Organisations may consider engaging with workplace colleagues to understand how initiatives are being received.
- Use these insights to tailor future programming, drawing on both numerical data and qualitative perspectives.

Outcomes:

The Equal by 30 Self-Assessment Tool is driving institutional commitments on gender equality, improving data transparency on pay, and identifying leadership disparities. Its framework can help countries and organisations adopt inclusive workplace policies and practices, supported by metrics that are increasingly attentive to

intersectionality and the nuanced realities of diverse workforces, leading to a more sustainable energy sector where no one is left behind.

Consumers International – Global Consumer Protection and Empowerment Index

Objective:

The Global Consumer Protection and Empowerment Index, developed by Consumers International, measures the degree to which countries protect and empower their consumers through a range of policies, networks, institutions, and other measures. While cross-sectoral, this Index tracks, across 80 economies, dimensions relating to energy access, consumer awareness, stakeholder voice recognition and policy inclusion.

Selected indicators tracked
• Access to public services distributed by social group • Existence of law on consumer protection • Designation of consumer protection authority/agency with enforcement powers • Energy access rates • Existence of constitutional, statutory and/or policy guarantees for public access to information • Availability of information on environmental impact of energy-related products, durability, provisions for redress and repair provided in standardised way at the point of sale. • Funding provided to consumer organisations, regulators or government bodies to deliver consumer education • Consumer awareness of their consumer rights

- Existence of laws protect consumer's privacy in relation to online transactions and personal data protection

Evaluation methodology:

The index was compiled during a one-year period of research using a mixed methods approach, including:

- Data collection of 61 quantitative measures from international organisations data sources (World Bank, WHO, WEF, OECD, among others).
- Data collection and analysis of 39 qualitative measures collected from The Consumers International Expert Assessment Survey, conducted online with 122 experts across 80 countries.
- Expert inputs and guidance from two advisory groups: an expert group comprising subject matter experts across stakeholder groups, and the Consumers International Members Advisory Group of global consumer advocates.

Outcomes:

The benchmarking results of the index highlighted significant opportunities to advance consumer rights and policy inclusiveness in energy and other sectors and its findings have already been used to inform national debates on sustainable consumption. The index also found the 'digital divide' in consumer protection is significant; where rapid development in technology and innovation may disadvantage many consumers, particularly in low-income countries and sub-Saharan Africa, which is likely to have consequences for clean energy developments as these increasingly rely on digitalisation.

SDG7 Youth Constituency – Tracking Youth Engagement

Objective:

SDG7 Youth Constituency, the energy working group of the UN's Major Group for Children and Youth, has outlined their proposal on how to track youth engagement in clean energy transitions, highlighting the role of young people as essential innovators, entrepreneurs and advocates in the energy transition.

Selected indicators proposed

- Percentage of national energy policies that reference youth engagement
- Percentage of youth (under 35) on national energy advisory boards or committees
- Number of youth-led clean energy projects funded per year
- Number of youths participating in certified clean energy training programmes
- Percentage of youth who feel heard in energy decision-making
- Number of energy policies/programmes directly co-designed or led by youth groups
- Number of youth-led clean energy startups launch and scaling
- Percentage increase in youth holding formal leadership positions in major energy institutions
- Youth employment rate in specific green energy sectors
- Percentage of public and private energy transition funds explicitly allocated to youth-led and youth-focused initiatives

Evaluation methodology:

SDG7 Youth Constituency proposed data could be gathered from sources including:

- Review of national policy documents, SDG reports, policy analysis and youth group impact reports could support indicators on inclusion of youth perspectives in energy policies.
- Review of reports from UN, donors, national grant programmes, youth organisations, and international energy agencies could help track investment in youth programmes.
- Documentations from NGOs, university programme records, youth organisations, international energy agencies, training follow-up surveys and labour market data could support monitoring issues relating to training and capacity building.
- Surveys and reports by youth organisations, media monitoring or public engagement metrics could support tracking of advocacy and perceived recognition.

Outcomes:

SDG7 Youth Constituency stressed tracking youth involvement and investment ensures youth participation does not go unmeasured or is seen as only symbolic, which discourages young practitioners. By measuring the inclusion of, influence of and investment in youth, progress can be monitored to deliver meaningful engagement of young people in just and inclusive energy transitions.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key methodological considerations for tracking progress toward inclusive energy systems. These include embedding intersectional perspectives, such as gender, age, ethnicity, disability, income, and housing status, in policy design, implementation, and monitoring. It also facilitates the distribution of energy-related costs and benefits in a way that is equitable, transparent, and responsive to energy needs across different population groups. Tools and methods include:

- 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.
- Cross-referencing datasets, such as considering building stock age when analysing energy expenditure or heatwaves risk with household composition, can allow governments to better identify specific risks and unmet needs in certain areas (e.g. overcrowded homes with young children in heatwave-prone areas), subject to transparent data governance frameworks that ensure informed consent, privacy protection and independent oversight of data integration mechanisms.
- National and regional surveys that include questions on thermal comfort in winter and summer, indoor air quality, and energy affordability can help track how enhanced energy services impact health, well-being, and productivity. When disaggregated, these data can reveal differential impacts across groups, such as single mothers, elderly residents, and persons with disabilities, who may be more sensitive to poor indoor conditions or face higher energy-related stress.
- Using multiple qualitative and quantitative methods can help ensure programmes better reflect population needs and capabilities. For example, distributional impact assessments can help quantify how price reforms affect different population segments, like how a gas price hike disproportionately affects people in poorly insulated homes. Participatory methods, such as focus groups, can be used to capture lived experiences that standard surveys may miss.
- Cities and subnational governments have an important role to play in providing localised and disaggregated data that can help close data gaps. Similarly, in addition to their role in policy co-design and oversight, civil society organisations, particularly those working with Indigenous, disabled, or migrant populations, are increasingly recognised as essential for closing data gaps and reaching communities that are often excluded from official datasets. For

example, these organisations may conduct door-to-door interviews to collect information on unregistered households in informal settlements.

Suggested indicators and methodologies

Principle 5 - Policy Inclusiveness

Indicators	Evaluation methods
Percentage of women in leadership positions at all levels of decision-making in political, economic and public life	National public service datasets; company board reports; review of published organisation charts, leadership lists, appointment bulletins.
Percentage difference in average salary, by gender, race, ethnicity in energy sector	National employment and wage surveys; gender pay audits
Percentage of national energy policies and programmes that explicitly address gender differences, diversity, differentiated gender impacts and barriers for marginalised groups	Content analysis of policy documents and explicit references to gender considerations, age, disability, education, ethnicity, economic status, geography, language, race, religion and sexual orientation and mitigation of social barriers to inclusivity; review of existence of gender impact assessments or dedicated gender/diversity objectives in energy institutions
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
Percentage of national energy policies that reference youth and/or women engagement	Content analysis of policy documents; youth and gender stakeholder review
Percentage of youth on national energy advisory boards or committees	Review of membership organisational charts of national energy advisory boards; analysis of age-disaggregated participation data; interviews or surveys with board secretariats to validate youth representation
Number of energy policies/programmes co-designed by youth groups	Programme records; documentation of co-creation workshops; stakeholder process audits

PRINCIPLE 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.[9]"

As energy transitions progress, public and private actors have an important role to play in ensuring policies and projects do not impede on rights, and many countries have policies and programmes to ensure such rights are upheld during transitions. Some projects, for example, may be developed on lands owned by communities, including Indigenous Peoples, whose inherent and legal rights must be observed and embedded into project design and implementation.

For workers around the world, who are experiencing significant changes to jobs in the energy sector and beyond due to energy transitions, it is important there are mechanisms to ensure their rights are upheld (e.g. collective bargaining agreements, freedom of association for workers). Depending on how risks presented by energy transitions are managed by public and private actors, clean energy infrastructure projects can either represent a risk to the rights of those affected or a significant opportunity to enhance their socio-economic conditions.

The following case studies highlight ways to monitor and evaluate the respect of rights as they relate to different issues. These include:

- **Australia – First Nations Clean Energy Strategy**, where key indicators are used to reform the country's energy system while ensuring respect for First Nations peoples' rights and interests.
- **International Trade Union Confederation - Workers' Rights Index**, which uses indicators to monitor workers' rights in 151 countries.

[9] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **Nepal Electricity Authority** - Gender Equality and Social Inclusion Strategy, which upholds the rights of communities impacted by energy infrastructure development.
- First Nations Major Projects Coalition – Tracking Indigenous Rights and Meaningful Participation in Clean Energy Developments, which is proposing a set of indicators to advance Indigenous equity in the clean energy sector.

Emerging practices and approaches to track progress on respecting rights

Australia - First Nations Clean Energy Strategy

Objective:

Launched in December 2024 by the Australian Department of Climate Change, Energy, the Environment and Water, the First Nations Clean Energy Strategy is a national framework, developed in collaboration with First Nations people and organisations, to direct investment, shape policy, and support First Nations people to self-determine how they engage in and benefit from Australia's clean energy transition.

A number of indicators are used to inform the focus areas of the strategy, which recommends the future development of an implementation plan and associated evaluation framework, as well as an annual progress report to track and publicly report on the rollout of the strategy's objectives.

Selected indicators tracked
• Number and proportion of First Nations households with access to reliable, affordable electricity • Rates of energy disconnections among First Nations households, especially with pre-payment meters (frequency and duration)

- Proportion of households in remote and very remote First Nations communities using pre-payment electricity meters
- Share of income spent on household electricity by First Nations people, by remoteness
- Overcrowding rates in First Nations housing, especially in remote communities, and their impact on energy usage/costs
- Number and proportion of First Nations homes upgraded for energy efficiency and climate resilience
- Percentage of First Nations households benefitting from solar installations (e.g. rooftop solar)
- First Nations employment rates in the clean energy sector (including estimated workforce needs)
- Capital investment allocated to First Nations-led community, and housing clean energy projects
- Estimated proportion of new national clean energy infrastructure projected to be sited on land recognised as First Nations Estate

Evaluation methodology:

The evaluation methods used to collect data for these indicators, from different sources across Australian government institutions include different quantitative and qualitative approaches, including:

- A review of national census data and administrative records, used to provide robust demographic, housing, and employment information.
- Data on energy usage and disconnection logs from utilities, used to monitor electricity access and reliability, particularly for households with prepaid meters.

- Tailored surveys and targeted studies were undertaken on issues such as the impacts of extreme heat, energy costs, and housing conditions in remote communities to capture lived experiences and seasonal variations.
- An analysis of financial and investment datasets was used to track capital flows into First Nations-led clean energy projects, while geospatial mapping is used to identify overlaps between recognised Indigenous land and clean energy infrastructure development.

Outcomes:

The First Nations Clean Energy Strategy makes clear the need for targets, measurements and regular public reporting, co-designed with First Nations communities. These elements are essential to ensure meaningful engagement and respect for Indigenous rights as part of Australia's clean energy transition. The Australian Government is now working on reforming the country's energy system along the strategy's key principles by developing an implementation plan in collaboration with states and territories.

International Trade Union Confederation - Workers' Rights Index

Objective:

The International Trade Union Confederation (ITUC) Global Rights Index aims to increase visibility and transparency around workers' rights globally. Launched in 2014, it evaluates 151 countries based on their adherence to international labour standards, particularly civil liberties, the right to form and join trade unions, the right to collective bargaining, and the right to strike.

The Index uses 97 indicators to track key elements of workplace democracy, grouped into thematic areas including civil liberties and rule of law, collective bargaining, the right to strike, trade union formation and activity, discrimination and exclusion, and due process and legal remedies.

Selected indicators tracked

- Violation of trade unionists' basic freedoms (freedom of movement; rights of assembly and demonstration; freedom of opinion and expression)
- General prohibition of the right to establish and/or join trade unions
- Attacks against trade unions' and trade unionists' premises and property
- Serious obstacle to exercising the right to collective bargaining
- Excessive prerequisites required for exercising the right to strike
- Interference of employers and/or authorities during the course of strike action allowed under the legislation (including back-to-work orders, hiring of workers during a strike, requisitioning orders)

Evaluation methodology:

To evaluate impact and track progress, the Index applies a combination of qualitative and quantitative methods. These include:

- Legal analysis of national legislation and case law to identify countries where workers are at risk of state repression for exercising labour rights.
- Questionnaires submitted to national trade unions to capture country-level violations not reflected in legislation.
- A rating scale based on compliance with ILO Conventions (1-5+ scoring) to allow for cross-country comparison of freedom to organise and protest.
- Desk-based review of documented violations to understand de facto and de jure limits on union formation.

Outcomes:

The ITUC Global Rights Index has established a standardised approach for monitoring labour rights, which has revealed a long-term trend in the global deterioration of workers' rights. The 2025 edition highlights continued disparities between

international labour standards and their implementation across various national contexts and identifies key areas for improvement.

Nepal Electricity Authority - Gender Equality and Social Inclusion Strategy

Objective:

Since 2020, the Nepal Electricity Authority has formally integrated a Gender Equality and Social Inclusion (GESI) strategy into its energy operations and protocols. This organisational policy is designed to protect and promote community rights in all infrastructure development activities, particularly those of affected groups, such as women and Indigenous Peoples, most likely to be excluded from decision-making and benefit sharing.

This strategy includes the formation of a grievance redress committee at the start of each major land acquisition and infrastructure development effort. The committee includes representation from project managers, local governments, and mandated representation of women and excluded groups. A number of indicators are collected to ensure the strategy's effective deployment.

Selected indicators tracked

- Number of jobs generated and percentage of total jobs created for men, women and excluded communities, during project implementation
- Number of households headed by men, women and excluded communities connected with electricity and level of electricity usage in these
- Number of energy-based enterprises established or trained and percentage of total that are owned or operated by women and by excluded community representatives

- Participation of women, men and excluded communities in the grievance redress committees, community meetings, public consultations, and trainings
- Percentage of women represented in electricity user groups, committees, cooperatives, utility management, energy board, and other decision-making bodies
- Percentage of families from socially excluded categories among the displaced/affected households who have received compensation
- Percentage of women headed households among displaced/affected households who have received compensation
- Percentage of households where both spouses as well as all adult family members have been informed about the compensation amount and mode of payment
- Percentage of men and women among those affected who have received financial awareness training

Evaluation methodology:

The Nepal Electricity Authority applies a combination of qualitative and quantitative methods to monitor implementation of the GESI and community rights protection, including:

- Baseline and endline surveys are used to assess changes in community awareness, women's participation, and rights recognition before and after project interventions.
- To monitor the establishment and effectiveness of the grievance redress committees, a tracking system records complaint submission rates, resolution timeframes and levels of satisfaction among different demographic groups. This also evaluates the committee's composition to ensure mandatory representation of women and excluded communities.

- Trained GESI focal points are conducting field visits to evaluate the implementation of consultation processes, assess compensation mechanisms, and better understand the quality of community engagement quality through interviews with affected households and in order to verify awareness of rights and access to redress mechanisms.
- Administrative data collection tracks funding allocated for GESI activities, training completion rates for staff and contractors, and compliance with GESI operational guidelines across all project phases.

Outcomes:

The Nepal Electricity Authority GESI strategy, and monitoring to improve its effective deployment, has been beneficial in increasing community trust and public acceptance of new infrastructure development, especially thanks to the establishment of culturally appropriate and gender inclusive redress mechanisms. The implementation of compensation mechanisms for women's unpaid labour and the securing of land ownership rights for both women and men has addressed historical inequities in infrastructure development. These outcomes show how the principles of the GESI strategy can change new infrastructure development from a possible source of conflict with local communities into an opportunity for advancing gender equality and social inclusion while respecting fundamental rights.

First Nations Major Projects Coalition – Tracking Indigenous Rights and Meaningful Participation in Clean Energy Developments

Objective:

The First Nations Major Projects Coalition (FNMPC), a 170+ collective group of First Nations from across Canada advancing Indigenous participation in and ownership of major natural resource and infrastructure projects in their territories, has outlined their proposal on how to track Indigenous ownership opportunities and leadership in clean energy projects, as well as Indigenous clean energy capacity and job training.

Selected indicators proposed

- Number of clean energy projects with 50% or more Indigenous ownership
- Percentage increase of clean energy projects with 50% or more Indigenous ownership
- Number of Indigenous loan guarantee programmes to back Indigenous investment in clean energy projects
- Number of Indigenous loans and grants programmes specific to Indigenous clean energy investment
- Tonnes of greenhouse gas emissions diverted over the last year from Indigenous-led clean energy projects
- Number of Indigenous-led clean energy startups launched
- Number of Indigenous-specific capacity building programmes (national and sub-national)
- Number of Indigenous individuals on the boards of clean energy projects
- Number of Indigenous clean energy job training programmes
- Number of Indigenous individuals participating in certified clean energy training programmes
- Number of Indigenous individuals redeployed/re-employed to clean energy projects from jobs lost in declining fossil fuel sectors

Evaluation methodology:

These indicators could be collected through a mixed-methods approach, which could include:

- Data collection and review of government programme records and financial institutions to track funding mechanisms specifically designed for Indigenous participation.

- Review of clean energy project disclosures and administrative records from clean energy companies, including governance bodies, to evaluate representation in leadership.
- Review of documentation from training providers and Indigenous organisations, vocation education institutions and labour market data to support capacity building and workforce development indicators.
- Impact assessment and project reporting to evaluate greenhouse gas emission reductions from Indigenous-led clean energy projects.
- Documentation of experiences through interviews and surveys to understand barriers, co-benefits and paths to leadership.

Outcomes:

The FNMPC expects that tracking these key issues could improve the visibility of major gaps in Indigenous equity as they relate to clean energy related ownership, employment and education. This would help strengthen the evidence base for future policy and support advocacy efforts targeting First Nations as clean energy transitions progress.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards respecting rights in energy transitions.

- Different sources for tracking can be relevant depending on the availability of data. Data collection can be done through legal reviews, inspections, or audits linked to energy projects and labour conditions. Civil society groups, trade unions, and Indigenous organisations can be important in tracking land use, safety, or access to benefits, especially where government presence is limited.
- Where possible, rights-tracking mechanisms can benefit from collaborative approaches with communities whose data and lands are involved, such as including them in the design and governance of monitoring systems.

- Disaggregated data, by location, gender, disability, income, and employment status, can be used to identify where rights risks may be concentrated, such as in areas with informal settlements, remote communities, or precarious employment.
- To improve awareness of how different population groups are affected by energy policies and projects it can be helpful to link administrative datasets, including land tenure records, labour inspections, and grievance mechanisms. This approach can be complemented by supply chain due diligence that extends beyond immediate project sites to encompass mining, construction, and subcontracting activities, following established OECD and UN Guiding Principles Frameworks for Responsible Business Conduct[10][11].
- Tracking efforts need to reflect local conditions and ensure data is used responsibly. Where information and data relate to sensitive issues (e.g. land use, labour practices, or access to benefits), many initiatives are introducing safeguards, including informed consent procedures, anonymised reporting, and recognition of Indigenous data governance to support trust and accountability.

Suggested indicators and methodologies

Principle 6 - Respect Rights

Indicators	Evaluation methods
Number of stakeholder consultations on new energy projects with associations representing workers, women, marginalised groups and Indigenous communities when relevant	Analysis of participation records disaggregated by gender, ethnicity, disability, and income; inclusion audit of consultation events; gender/social inclusion evaluation reports; NGO observation records

[10] United Nations Office of the High Commissioner for Human Rights (OHCHR) (2011). Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework.
[11] OECD (2018). OECD Due Diligence Guidance for Responsible Business Conduct. OECD Publishing, Paris.

Percentage of energy workforce covered by collective bargaining agreements or labour protections	Trade union membership statistics; collective bargaining coverage data from national labour ministries or statistics agencies; workplace surveys on awareness and application of protections
Percentage of workers in the energy sector covered by implemented labour rights protections	Analysis of collective bargaining coverage data; labour inspection reports; company disclosure of workplace policies; administrative records from relevant ministries or sectoral organisations; review of government restrictions, licensing or registration constraints; labour court decisions and international complaints (e.g., ILO cases)
Percentage of energy projects with formal Free, Prior, and Informed Consent (FPIC) agreements with Indigenous communities when relevant	Review of project approval and permitting documents; verification of FPIC compliance using international standards; third-party FPIC audit reports; interviews with Indigenous representatives
Number of grievances reported and resolved related to clean energy projects	Number of grievances reported and resolved related to energy projects
Existence and use of grievance redress mechanisms in energy projects affecting Indigenous lands	Review of operational grievance mechanisms (OGMs); analysis of submitted complaints, resolution timeframes, and outcomes; user satisfaction surveys and community perception studies

Health and safety incident rate, by gender, race, ethnicity in energy sector	Workplace safety incident data disaggregated by gender; data from occupational health and safety authorities; reporting systems within energy firms or labour inspectorates

PRINCIPLE 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.[12]"

While global investment in clean energy continues to grow, many people still live on the margins of the energy system, without access to affordable, reliable electricity or clean cooking technologies. Innovative clean energy technologies and business models, such as mini-grids and pay-as-you-go solar systems, are increasingly used to reach underserved populations and help low-income households. In order to ensure investments in energy are addressing issues of energy access and affordability, it will be essential to understand how different financing mechanisms are distributed and recognise the barriers some governments, communities and people may face in accessing financing. As discussed earlier, many dimensions impact energy affordability and energy poverty, and it is important to track indicators that are able to capture the complex components of financing and other solutions that may influence access to these resources.

[12] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

The following case studies highlight ways to monitor and evaluate investments responding to energy affordability and energy poverty. These include:

- **California – Greenhouse Gas Reduction Fund**, which tracks how carbon tax revenues are used to benefit disadvantaged populations in the state.
- **The Netherlands – Energy Aid**, which monitors the socio-economic outcomes of the country's policies on energy poverty and affordability.
- **Brazil – Observatory for the Eradication of Energy Poverty**, which uses a unified national database to track energy poverty.
- **United Kingdom – Warm Homes Plan**, which evaluates the effectiveness of this programme designed to reduce energy bills for low-income households.

Emerging practices and approaches to track progress on investing in affordable and reliable solutions for just and inclusive energy transitions

California – Greenhouse Gas Reduction Fund

Objective:

California's Greenhouse Gas Reduction Fund was launched in 2012. This cap-and-trade programme includes a legal requirement that at least 35% of all funds are dedicated to projects benefiting socio-economically deprived communities most affected by pollution.

The California Air Resources Board (CARB), in collaboration with implementing agencies, leads the programme's oversight and public reporting efforts. Annual reports are published to illustrate how this carbon tax's revenue is deployed to benefit priority populations in the state, using several indicators to monitor and evaluate the effectiveness of the fund.

Selected indicators tracked

- Share of carbon auction revenue directed to disadvantaged or low-income communities
- Number of households receiving home energy efficiency upgrades or rooftop solar installations
- Number of jobs created in local clean energy and construction sectors tied to funded projects
- Change in household energy burdens (share of income spent on energy) among funding recipients
- Cumulative greenhouse gas emissions reductions attributed to funded projects
- Number of affordable housing units constructed or upgraded due to funding
- Public health co-benefits, such as reductions in air pollutants and respiratory illnesses
- Participation of community-based organisations in funding allocations

Evaluation methodology:

Several evaluation methods are used through a multi-agency effort (e.g. Housing and Community Development, Energy Commission), which include:

- A series of annual cap-and-trade auction proceeds reports, that detail expenditure and benefits, disaggregated by project, geography, and community characteristics.
- CalEnviroScreen, a geospatial screening tool that ranks areas by cumulative pollution and socio-economic burden, is used to target the fund's investments.
- Data is collected at the project level, with analysis using emission savings modelling and a cost-effectiveness assessment.

- Community engagement protocols to ensure meaningful input on programme design, especially in priority populations.
- On the ground surveys and interviews of project beneficiaries are undertaken to better understand their impacts on energy costs, job quality, and housing stability.

Outcomes:

As of November 2023, California's carbon revenue recycling programme has helped reduce CO_2 emissions by more than 109 million tonnes while having 76% of its revenue dedicated to projects such as affordable housing and clean energy solutions targeted at low-income households. Projects include residential energy efficiency, public transportation improvements and rebates for electric car purchases, as well as funding for solar energy communities.

The Netherlands — Energy Aid

Objective:

Following the 2021 energy crisis, the Dutch government released dedicated financial support to municipalities through a nationwide network of local "energy aid" providers (Energyhulp). These providers are local energy coaches and fixers, who act as trusted intermediaries to provide tailored advice to households directly in their homes, help them adopt small actions to save energy (e.g. LED bulbs, radiator foils, draught-proofing measures) and direct them to existing public subsidies for inefficient appliance replacement and home retrofits.

The Netherlands Enterprise Agency, a government agency under the Dutch Ministry of Economic Affairs and Climate Policy, in collaboration with the Dutch Organisation for Applied Scientific Research, have been monitoring the socio-economic effects of the Energy Aid schemes and other policies on energy poverty and affordability in the country.

Selected indicators tracked

- Share of households in energy poverty
- Average reduction in energy bills and share of disposable income spent on energy
- Reductions in energy (gas/electricity) consumption and CO_2 emissions per household
- Annual count of households supported by energy coaches/fixes and appliance replacement schemes
- Energy label improvements and number of homes insulated or retrofitted
- Local job creation and training for energy advisors and fixers
- Improvements in health and well-being (reduced pharmaceutical/medical usage)
- Disaggregated data on marginalised groups reached

Evaluation methodology:

Several quantitative and qualitative methods were used to collect relevant data, including:

- Statistics Netherlands uses microdata, difference-in-differences models, and tracks changes in energy use/cost, health expenses, and medication usage among supported vs. control households.
- Surveys and interviews were completed to document the experiences of households, and the perception of social cohesion and mental well-being after benefiting from the Energy Aid programme.
- A national Energy Poverty Monitor dashboard is used to collect data about visits via municipalities and local energy aid providers, measures installed, and follow-up actions.

- The national grant reporting system is used to track how funds are allocated, such as those of the national insulation programme, integrating these with public health and housing databases.

Outcomes:

Initial results from tracking these outcomes have illustrated the benefits of these energy poverty schemes including:

- As of 2023, more than 1 300 households in the main pilot cities had benefited from the energy aid programme, with 75% of participating households coming out of energy poverty after the interventions
- Between 2021 and 2023, households in energy poverty reduced their annual gas consumption by more than 10% and their electricity use by about 8%, leading to annual energy bill being reduced by about €215 per year
- Statistically significant improvements were observed in relation to well-being, with drops of 18% in pharmaceutical spending, 32% in asthma medication use and 53% in rheumatoid medicine in supported households
- Qualitative findings also reported improved thermal comfort, reduced social isolation, and an increased engagement in neighbourhood life.

Brazil - Observatory for the Eradication of Energy Poverty

Objective:

In Brazil there are 164 000 households with no electricity access, 1.4 million households without full-time electricity access and 2.2 million low-income families that receive a discounted social electricity rate but still have to limit their usage to a bare minimum.

Co-led by the Energy Research Office, the Ministry of Mines and Energy, and the Inter-American Development Bank, the Brazilian Observatory for the Eradication of Energy Poverty was launched in 2024 to address energy poverty in the country with a unified database of energy poverty indicators, as well as an interactive analysis and monitoring panel.

This Observatory provides a detailed list of 260 energy poverty indicators, vulnerability indicators, socio-economic determinants, as well as additional statistics and their geographic aggregates.

Selected indicators tracked

- Percentage (and total number) of population with electricity access
- Share (and total number) of population lacking connection to the grid
- Quality of electricity access (ownership rates of food refrigeration, modern cooking and IT equipment)
- Socio-economic determinants, such as gender and age distributions, as well as ethnicity, education level, profession, etc.
- Vulnerability indicators: average regional temperatures, Human Development Index, average tariff for low-income residential consumers with and without tax, average regional temperature
- Additional Household characteristics such as family income, monthly per capita household electricity consumption for domestic use, etc.

Evaluation methodology:

To identify the most critical areas as well as possible gaps, understand local nuances and target interventions more effectively and fairly, mixed-methods approaches are applied. These include:

- Surveys carried out by the Brazilian Institute of Geography and Statistics
- Data collection and mapping, measuring electricity access, usage patterns, socioeconomic conditions and household characteristics
- Data harmonisation and merging into a single database
- Data visualisation through an open-access platform (usage of interactive boards, regional, urbanisation, income, and meteorological trends), allowing the exploration of causes and patterns of energy poverty.

Outcomes:

The project aims to map and consolidate information to build indicators that contribute to the design, evaluation and improvement of public policies aiming to combat energy poverty, with a focus on the socio-economic development of marginalised populations.

By using more than 260 metrics based on 40 different databases, the OBEPE offers a multifaceted lens for analysing the complexity of energy poverty in its various geographical and socioeconomic dimensions.

United Kingdom – Warm Homes Plan

Objective:

In 2024, an estimated 11% of households (2.73 million) lived in fuel poverty in England alone under the country's Low Income Low Energy Efficiency metric[13]. Established by the UK's Department for Energy Security and Net Zero in 2025, the Warm Homes Plan is the government's strategic policy designed to upgrade and decarbonise up to 5 million homes by 2030 while reducing fuel poverty.

Delivered and overseen by the Department for Energy Security and Net Zero, with responsibilities shared broadly across local authorities in England, the Warm Homes programme supports the deployment of energy efficiency initiatives, including buildings energy retrofits and low-carbon heating systems, through targeted grant funding prioritising low-income households and territories with the least efficient housing stock. The scheme's outcomes are evaluated through a number of indicators assessing both its environmental and socio-economic impacts.

[13] The UK's Low Income Low Energy Efficiency (LILEE) metric defines a household as fuel poor if they are living in a property with a fuel poverty energy efficiency rating of band D or below and, when they spend the required amount to heat their home, they are left with a residual income below the official poverty line.

Selected indicators tracked

- Number of homes upgraded to Energy Performance Certificate (EPC) Band C or above
- Number of fuel poor households supported, as defined by the Low-Income Low Energy Efficiency (LILEE) metric
- Value of average annual energy bill reduction per upgraded household
- Total funding allocated and number of grants delivered, by scheme
- Carbon emission savings achieved through retrofits
- Number of social and private housings receiving low-carbon heating systems (e.g. heat pumps) and insulation
- Percentage of supported homes off the gas grid or in lower council tax bands
- Number of jobs created or sustained in the residential retrofit supply chain
- Percentage of residents reporting improved health, wellbeing, or comfort after installation

Evaluation methodology:

A mixed methods approach is used by UK institutions to evaluate the effectiveness of the Warm Homes Plan:

- Regular data collection is undertaken by the Department for Energy Security and Net Zero, which tracks the number of upgrades, bill savings, fuel poverty numbers, carbon savings, and funding allocations.
- Resident and local authority surveys are undertaken to assess health, comfort improvements, process satisfaction, and accessibility, with results triangulated against energy performance databases and fuel poverty metrics.

- Qualitative and quantitative process evaluations of major funding streams are undertaken and include interviews, focus groups, and analysis of stakeholder feedback.
- The annual *Fuel Poverty Statistics Report*, published by the Department for Energy Security and Net Zero, publicly tracks progress on the country's Low Income Low Energy Efficiency metric and bill reduction impact across all delivery schemes.

Outcomes:

- In 2025-2026 alone, the programme will be upgrading up to 300 000 homes, which is more than double the number of home upgrades delivered in 2024.
- The Government has committed an initial £3.4 billion over the next 3 years towards heat decarbonisation and household energy efficiency, with £1 billion of this allocated to 2025/2026.
- £1.8 billion has been allocated under the Warm Homes Plan to support fuel poverty schemes, helping over 170 000 households reduce their energy bills.
- £1.29 billion has been allocated to the Warm Homes: Social Housing Fund and £500 million to the Warm Homes: Local Grant, which are to be delivered from 2025 until 2028 by eligible social housing landlords and Local Authorities.
- Evaluations of previous similar schemes demonstrated substantial positive outcomes, such as the 2021 Social Housing Decarbonisation Fund, whose evaluation found 82% of households were fuel poor before installations, and 18% and 22% of residents reporting their physical and mental health respectively had improved after interventions.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards inclusive investment in affordable and reliable clean energy solutions.

- Tracking investment in inclusive solutions requires monitoring who benefits, not just how much is spent. Developing indicators to monitor the distribution

of energy funds across specific groups, such as low-income households, women-led businesses, informal settlements, or SMEs, can help monitor who receives benefits.

- Many countries are using a mix of financial instruments, such as grants, concessional loans, guarantees, and commercial credit, to fund clean energy investments. Disaggregated tracking of this mix (e.g. reporting by finance type and recipient group) can help assess whether public support is targeted to reduce upfront costs for low-income groups or avoid unaffordable debt for vulnerable countries.
- Some countries are monitoring the evolution of tools that help citizens apply for and use financial support. For example, one-stop shops in several European Union member states provide a single-entry point for households and small businesses to get advice, check eligibility, and access clean energy renovation financing.
- In some cases, administrative records are combined with surveys or interviews to understand who is accessing financing, which groups are left out, and the barriers applicants may face, such as lack of digital access or literacy, language barriers, or complex paperwork.

Suggested indicators and methodologies

Principle 7 - Invest in Affordable and Reliable Solutions for Just and Inclusive Energy Transitions

Indicators	Evaluation methods
Share of households in energy poverty measured using national poverty and affordability thresholds; home performance indicators (e.g. standard of insulation, heating system types) or	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; affordability threshold

Indicators	Evaluation methods
thermal comfort, by gender (for heads of households)	analysis aligned with national poverty standards
Share of disposable income spent on energy and change in energy bills over time, by population segment and by gender (for 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

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

PRINCIPLE 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.[14]”

To ensure clean energy transitions can create benefits and mitigate harm, planning processes, inclusive stakeholder consultations and robust monitoring mechanisms are essential. Some policy approaches are large scale, such as holistic plans to transition a sector. Other are smaller, more targeted interventions to help increase energy access or to provide clean cooking technologies. By strengthening the reliability of energy systems and enhancing the resilience of supply chains, including those critical to the provision of critical minerals and materials, projects not only support secure access to clean energy technologies for communities, but also contribute to long-term national energy security.

Developing indicators to ensure these energy solutions are sustainable, beneficial and do not create risks for communities, is essential for their long-term success and effectiveness.

The following case studies illustrate ways to track the local benefits of clean energy transition policies. These include:

[14] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **Spain - Just Transition Agreements**, where indicators are used to monitor local socio-economic developments in the country's affected territories.
- **Kazakhstan – DAMU Entrepreneurship Development Fund**, which tracks local value creation from a financing mechanism empowering small and medium enterprises to adopt clean energy technologies.
- **Germany – Investment Act for Coal Regions**, tracking regional economic development according to different coal phase out scenarios and respective compensative investment measures.
- **Senegal - Foyré Rewbé programme**, which monitors women entrepreneurs' economic empowerment and their effectiveness in providing energy access to last-mile consumers.

Emerging practices and approaches to track progress on implementing secure and sustainable solutions

Spain - Just Transition Agreements

Objective:

Spain's Just Transition Agreements are designed to promote economic diversification and context-specific development plans consistent with the socio-economic context of 15 designated territories affected by the closing of coal mines, thermal power plants and nuclear power plants. These Agreements are reached through General Action Protocols signed between the national and regional governments.

Several indicators are being collected by Spain's Just Transition Institute to track local socio-economic developments in the 15 zones undergoing transition processes in the country.

Selected indicators tracked

- Number of local jobs committed by supported business projects, by gender
- Number of local jobs projected by supported municipal and infrastructure projects
- Number of local jobs projected by supported renewable energy, hydrogen and storage projects
- Number of people that have received training, by gender
- Number of training courses taught
- Number of business projects supported
- Number of municipal and infrastructure projects supported
- Number of renewable energy, hydrogen and storage projects supported in just transition areas
- Aid granted for business projects
- Aid granted for municipal and infrastructure projects
- Aid granted for renewable energy, hydrogen and storage projects
- Megawatts of renewable capacity tendered considering socioeconomic benefits at the local level
- Hectares of land restored

Evaluation methodology:

To evaluate the results achieved by these General Action Protocols in just transition areas, the following qualitative and quantitative methods are used:

- Administrative databases are used to track progress on job creation, business projects, infrastructure projects, training course enrolment, restored hectares and MW of renewable capacity tendered.

- Audits of public funds and regulatory compliance reviews monitor the allocation of transition funds and validate adherence to local, national and EU requirements for regional aid and public procurement.
- The Just Transition Institute conducts participatory sessions with diverse local stakeholder groups to validate data and collect qualitative information about some of the socio-economic impacts of the implemented interventions.

Outcomes:

Based on official data from the Just Transition Institute, the main results achieved between 2019 and June 2025 in the just transition areas targeted for infrastructure development, business support, training initiatives, environmental restoration projects and cultural promotion include:

- More than 2 700 jobs committed by supported business projects, over 270 projected jobs by supported municipal and infrastructure projects, and more than 4 200 jobs projected by supported renewable energy, hydrogen and storage projects
- 253 new business projects supported, 514 social, digital and environmental infrastructure projects supported, and 100 energy projects supported
- More than 170 individuals retrained or supported in entrepreneurship since 2023, with a total estimate of 840 by mid-2026.
- More than 3 700 MW renewable capacity tendered (or in process) considering socioeconomic benefits at the local level
- €102 million in aid granted for business projects, €260 million for infrastructure projects, €1.576 billion for energy projects in just transition zones and €191 million for environmental restoration of mines
- Nearly 3 500 hectares under environmental restoration programmes
- Dozens of cultural/social projects in every zone, including care facilities, coworking hubs, art programmes, and public space reuse.

Kazakhstan – DAMU Entrepreneurship Development Fund

Objective:

Since 2017, Kazakhstan's DAMU Entrepreneurship Development Fund is supporting secure and sustainable energy solutions by empowering small and medium enterprises (SMEs) to implement renewable energy and energy efficiency technologies, while promoting inclusive growth and minimising negative environmental impacts. The Fund prioritises local value creation, gender inclusion, and resource efficiency, with the goal to deliver lasting socio-economic and environmental benefits for communities.

As part of its support package, the fund encourages SMEs to adopt sustainable business practices and provides preferential conditions and support to entrepreneurs, especially SMEs, to improve their access to finance. A number of indicators have been used to track the fund's economic and local value creation, environmental performance and social benefits.

Selected indicators tracked

- Contribution of SMEs to national GDP
- Share of SMEs supported by the fund
- Number of new projects (including modernised or expanded SMEs)
- Volume of revenue generated by supported enterprises per year
- Number of women supported by the fund
- Annual CO_2 emissions reduced by supported "green" projects
- Energy savings achieved from supported projects
- Compliance with national environmental standards by funded SMEs

Evaluation methodology:

Tracking is done with both statistical data and qualitative insights, including:

- Analysis of the enterprises' financial performances by tracking annual revenues and productivity growth, as well as measuring increases in taxes paid by supported SMEs as an indicator of broader economic contribution.
- Monitoring value creation of SMEs, most specifically job creation and employment quality over time, disaggregated by sector and gender.
- Environmental progress is tracked through a review of funded projects' energy savings, CO_2 emission reductions and adherence to national environmental standards.
- Data collected about the total distribution of loans and subsidies, including participants profile.
- Survey and stakeholder feedback interviews were conducted to gather satisfaction data from SMEs about the fund activities and services.

Outcomes:

The DAMU Fund illustrates how national finance instruments can be used to promote secure and sustainable energy solutions at the local level, linking SMEs funding support to socio-economic and environmental goals. Initial results from the fund's outcomes include:

- 50 local SMEs focused on green initiatives were supported by the fund, mobilising USD 13 million of investment and reducing CO_2 emissions by 1.1 million tonnes over the projects' lifecycles.
- Projects that helped upgrade existing energy systems, local public infrastructure and home comfort benefitted more than 300 000 people, nearly half of which were women.
- The fund's objective is to have SMEs contribute 40% of the GDP by the end of the decade and create more than 120 000 jobs by the end of 2025. In 2023, it had already exceeded its initial job creation target nearly sevenfold.
- The programme has launched an online distance learning platform to support greater financial inclusion of aspiring and current entrepreneurs. Nearly 30 000 participants have registered since its launch.

Germany – Investment Act for Coal Regions

Objective:

In order to mitigate the socio-economic impacts of its coal phase-out policy, Germany set up a broad just transition strategy for affected regions. The Investment Act for Coal Regions finances investments to ensure these regions remain, or become again, attractive places for companies, workers and residents under the new transformative conditions. The ultimate goal is to achieve regional GDP and labour market performance comparable to a scenario without coal phase-out.

German institutions use a range of indicators to assess the effectiveness of these measures in coal regions.

Selected indicators tracked

- National and regional investment activity
- GDP on regional and sub-regional level as well as municipal tax income
- Number of former coal workers retrained or re-employed in new sectors
- Change in regional unemployment rates in government assisted regions
- Regional migration and job placement rates following transition
- Changes in employment participation of women and migrants in transitioning areas

Evaluation *methodology:*

To monitor outcomes and guide policy adjustments, several evaluation methods were used, including:

- Scenario analysis of GDP and labour markets under different coal phase-out tracks.
- Assessment of direct, indirect and induced costs of coal phase-out scenarios.

- Isolation and clustering of support measures to determine causal effects.
- Use of GDP, labour market, and social benefit data to track programme uptake and employment trends.
- Comparisons between coal regions and non-assisted regions, using difference-in-differences and event study evaluation methods.
- Detailed microeconomic case studies to forecast long term macroeconomic effects.
- Thematic economic analyses of the regional contributions of research, development and investment subsidies.

Outcomes:

Initial results from tracking these outcomes have illustrated positive impacts, including:

- More than 1 300 investment projects worth €29 billion launched (input indicator).
- Stable unemployment rates in assisted coal regions, with rising employment and high demand for skilled labour.
- Regional and sub-regional GDP performance equal or superior to comparable regions without support.
- Accelerating regional investment, start-up activity, and innovation, although municipal tax income has yet to show improvement.

Senegal - Foyré Rewbé programme

Objective:

Over the past decade, the Foyré Rewbé programme has been working to empower women economically in last-mile communities throughout Senegal as leaders, entrepreneurs, and workers in the clean energy sector by promoting inclusive energy markets and ensuring gender-responsive energy and climate policies. The initiative is implemented by Mercy Corps in collaboration with the ENERGIA International Network on Gender and Sustainable Energy.

The programme builds women's entrepreneurship in last-mile clean energy supply and productive value chains, and creates jobs and skills for youth in the energy transition. It strengthens women's leadership and resilience to influence energy markets, through grassroots women's organisations, including the more than 500 000 members of the National Network of Rural Women Organisations (RNFR/S) and The Network of Women Farmers of the North (REFAN). It facilitates tripartite agreements among microfinance institutions, renewable energy companies and women's agricultural cooperatives to improve women-led enterprises' access to finance. Business development services include assessing energy and equipment needs, preparing business plans, and evaluating investment profitability to support credit applications.

Indicators are collected to help ensure a collective and mutual accountability of (and to) stakeholders, partners, managers and donors.

Selected indicators tracked

- Number of women entrepreneurs supported through training, mentoring and market linkages (energy enterprises and productive use of energy)
- Number of women entrepreneurs in business showcasing 10% average growth in sales over past year
- Number of women's enterprises successfully accessing capital from by formal/ informal (micro) Finance Institutes
- Number of consumers in last-mile communities reached with energy-enabled services and products
- Number of women entrepreneurs successfully adopting at least one resilience measure (formalisation of business/ registration/ digitalisation for of business)
- Number of young men and women employed in renewable energy companies and enterprises

- Number of instances of Women's Associations being consulted and contributing to national and sub-national level energy sector discussions
- Number of women entrepreneurs supported by the programme that report being able to take decisions on how to spend income from their business

Evaluation methodology:

A mixed-methods approach combines quantitative and qualitative tools to assess track progress, including:

- A result assessment framework is used to track progress based on gender-responsive indicators and targets.
- Baseline surveys categorise participating businesses and ensure a tailored mentoring approach.
- Needs assessments with women entrepreneurs inform the development of training modules, ensuring relevance to their specific skills and educational backgrounds.
- Mentors (short-term support, up to six months) for established businesses, and long-term support (12 months or more) for start-ups and businesses facing challenges routinely collect and update data on women's business plans and performance, which is entered into an online system monitoring result assessment framework outcomes.
- Annual surveys are conducted at both the entrepreneur and consumer levels. In addition, focus group discussions and key informant interviews with ecosystem actors, such as microfinance institutions, companies, and governments, are carried out to triangulate information (for instance on loans and repayment experiences).
- Outcome harvesting is used to understand qualitative changes in gender attitudes at the policy and institutional level, and stories of change are collected at the women's entrepreneur level.

- An external impact assessment has been conducted on a statistically significant sample of women entrepreneurs.

Outcomes:

The programme illustrates how women entrepreneurs can be a powerful force for expanding equitable access to energy resources, especially in the last mile. This can also create more opportunities for women to overcome multiple challenges and contribute to their own, their families' and their community's development. In the last two years, outcomes in Senegal through this programme include:

- 6 236 women entrepreneurs supported through training, mentoring and market linkages (energy enterprises and productive use of energy).
- 1 075 women entrepreneurs in business showcased a 10% average growth in sales over the past year.
- 4 072 women entrepreneurs received access to capital from formal/informal (micro) finance institutes.
- More than 1 million consumers in last-mile communities reached with energy-enabled services and products.
- 3 770 women entrepreneurs successfully adopted at least one resilience measure (formalisation of business/registration/digitalisation of business).
- 1 447 young men and women employed in renewable energy companies and enterprises.
- 5 578 women entrepreneurs supported by the programme reported being able to take decisions on how to spend income from business.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards secure and sustainable energy solutions at the local level.

- Indicators can measure both local benefits created from clean energy projects and indicators around avoided harm. Benefits can include the number of jobs

created within the municipality, the percentage of procurement contracts awarded to local suppliers, or the share of installed energy capacity under community or municipal ownership. Avoided harms can include monitoring environmental indicators such as biodiversity presence near project sites, water and soil quality, and land conversion in or around high-value ecosystems.

- In culturally sensitive contexts, monitoring efforts also consider whether projects respect local land tenure systems, spiritual or cultural sites, or traditional land uses. This is assessed through indicators such as the inclusion of land rights in project documents, the documentation of consultations with affected communities, and the integration of traditional knowledge in impact assessments.
- Addressing data gaps and underreported risks is key to effectively monitoring local outcomes over time. Civil society organisations are helping close these data gaps by conducting local interviews, gathering locally filed complaints, and compiling community proposals related to land use or project impacts.

Suggested indicators and methodologies

Principle 8 - Implement Secure and Sustainable Solutions

Indicators	Evaluation methods
Number of local jobs created in areas where clean energy transition policies are implemented, by gender	Labour market impact assessments at project and regional level; company-reported employment data disaggregated by gender; cross-validation with labour ministry or employment agency statistics; retraining records cross-referenced with job placement data; follow-up surveys with former employees

Number of people retrained or supported in entrepreneurship in affected communities, by gender	Training and entrepreneurship programme participation data; certification and graduation records; business support service usage logs
Environmental restoration and rehabilitation in transition areas	Remote sensing (e.g., satellite imagery) to track reforestation, revegetation, or land rehabilitation; comparison of land use data over time using GIS tools; site-specific restoration reports
Change in local air quality index (PM2.5, PM10)	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 (CBAs) signed	Legal and regulatory review of signed CBAs; centralised registry of CBAs; validation through community consultations and agreement implementation tracking

PRINCIPLE 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.[15]"

Clean energy transitions can provide opportunities for local economic development. However, it is important to ensure countries and regions where resources are located can benefit in terms of revenue, job creation and broader socio-economic development. There are particular risks in areas where critical mineral resources are located, where previous experiences have often resulted in the lack of benefits created for local communities.

Setting up tracking mechanisms for the exploitation of critical mineral resources can help ensure labour rights are respected, local environmental degradation is prevented and the fair distribution of socio-economic costs and revenues. Creating opportunities for local revenue generation and business growth can also support countries in using clean energy transitions to reshape global supply chains and lead to fairer market dynamics. Developing indicators to track supply chain implications in local, national and international contexts can help ensure clean energy transitions provide benefits for all communities.

The following case studies highlight existing tracking mechanisms to monitor the local benefits of clean energy transition policies. These include:

[15] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **Business and Human Rights Resource Centre - Transition Minerals Tracker,** which tracks risks associated with the mining operations of major clean energy companies.
- **European Commission - Critical Raw Materials Act**, which uses indicators focused on sustainability, high social and environmental protection, transparency, and traceability.

Emerging practices and approaches to track progress on sustainable and inclusive economic growth for all

Business and Human Rights Resource Centre - Transition Minerals Tracker

Objective:

Amid rising global demand for clean energy technologies, the Transition Minerals Tracker, developed by the Business and Human Rights Resource Centre**,** monitors the sourcing of key minerals essential to the transition (e.g., lithium, cobalt, nickel). The initiative aims to improve transparency and accountability across global supply chains by tracking environmental, social, and governance (ESG) risks linked to mining activities in high-extraction regions, especially in emerging and developing economies.

The tracker uses 65 indicators grouped into thematic areas including environmental impact, community rights, labour conditions, governance and transparency, and security risks in conflict-affected zones.

Selected indicators tracked

- Water pollution and contamination incidents
- Air quality violations or emissions breaches
- Lack of wage parity for contract vs. permanent workers
- Unsafe work conditions reported
- Cases of forced or violent displacement
- Freedom of association violations reported (prevention of union activities or collective bargaining)
- Suppression of media and unlawful arrests reported
- Lack of transparency in reporting or access to information
- Presence of security forces at mining sites leading to abuse

Evaluation methodology:

The Transitions Minerals Tracker uses a combination of qualitative and quantitative methods, including:

- Continuous monitoring of publicly reported allegations from news outlets, NGOs, community submissions, company disclosures and court documents linked to tracked companies.
- Desk research is used to complete comprehensive annual updates and for verification.
- An indicator-based mapping is used to provide quantitative breakdown of abuse types (e.g. water pollution, forced labour) and detect trends over time.
- Stakeholder anonymisation takes place throughout the data collection process to protect personal data and prevent retribution.

Outcomes:

The tracker has become a resource to inform investors seeking responsible sourcing of critical minerals. By collecting and publishing evidence of both positive and negative local impacts from the activities of more than 250 of the most important companies in the clean energy sector, the tracker is encouraging companies to strengthen protections for local workers and communities.

European Commission - Critical Raw Materials Act

Objective:

Adopted in 2023, the EU's Critical Raw Materials Act was designed to ensure a secure, sustainable and responsible supply of critical minerals required for clean energy technologies. The Act calls for ethical sourcing, transparent supply chains, and adherence to social and environmental standards.

The Act tracks where and how materials are extracted, processed and recycled. Requiring transparency on these stages help make visible who benefits along the chain, identify gaps and risks, foster accountability and support recycling and circularity.

Selected indicators tracked

- Share of EU's annual demand for critical raw materials supplied through extraction, processing, and recycling activities within EU member states, rather than from imports
- Recycling rates of critical minerals
- Diversity of supply chain partners (not more than 65% from a single country)
- Share of large companies sourcing critical raw materials that conduct a supply chain audit every two years to ensure traceability

- Percentage of material with certification/ethical sourcing (tracking only promoted by the Act)

Evaluation methodology:

To monitor implementation and attainment of objectives, the Critical Raw Materials Act relies on a combination of evaluation methods, including:

- Creation of the European Critical Raw Materials Board, composed of Member State and Commission representatives, to implement the Regulation and evaluate progress.
- Regular quantitative tracking of extraction, processing, and recycling capacities against benchmark targets using practical tests and scenario modelling exercises to look for potential risks or gaps in supplies.
- Mandatory and voluntary company-level supply chain audits, focusing on traceability, risk mapping, and with an assessment of sourcing practices against ESG standards.

Outcomes:

The European Critical Raw Materials Act sets a series of clear goals to boost local production, recycling and processing of key minerals within the EU, while reducing over-reliance on any single foreign supplier. While these benchmarks are designed to build Europe's own capacity, the Act also places strong emphasis on promoting international collaboration and supporting environmental protection as well as economic and social development in supplying partner countries.

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.

- 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.
- Efforts are also being made to track how benefits are distributed across groups and regions. Examples include monitoring the number of community benefit-sharing agreements, wage levels among supply chain workers, and the existence of formal mechanisms for consultation and consent with affected communities. These efforts also include disaggregating indicators by gender to monitor women's participation, pay equity and leadership roles in mining and processing jobs, to ensure benefits are shared fairly.
- To capture a more complete view of supply chain outcomes, countries are also expanding the range of indicators used to assess social and environmental outcomes. These include tracking life-cycle greenhouse gas emissions, water use, and material intensity associated with critical-mineral processing, formalisation rates in artisanal mining, auditing working conditions in key sectors, and identifying supply chain actors contributing to local development investments.
- Clean energy supply chains span multiple sectors, from extraction to manufacturing to trade. To monitor their full impact, countries are working to coordinate data across domains. This includes linking trade and investment statistics with environmental and labour data, integrating company disclosures with licensing systems, and applying environmental monitoring near extraction or processing sites. In addition, monitoring technology transfer and skills development, such as tracking training hours, certification rates, and local research and development spending, can provide valuable insights into how supply-chain investments contribute to building long-term domestic capacity and expertise.

- Some countries are also proposing tools such as supply chain traceability reports, human rights impact assessments, and certification schemes aligned with international standards, such as the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals[16]. These efforts are complemented by regional initiatives, such as the European Union's Critical Raw Materials Act, which seeks to improve the traceability of critical raw material supply chains essential to the clean energy transition.
- Monitoring systems increasingly combine third-party assessments with information from workers and communities. Independent audits are being 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.
- Tracking resilience in the face of geopolitical or market shocks is increasingly taken into consideration, with monitoring systems tracking aspects such as diversification of supply sources and levels of critical-mineral stockpiles to safeguard clean-energy supply chains.

Suggested indicators and methodologies

Principle 9 - Sustainable and Inclusive Economic Growth for All

Indicators	Evaluation methods
Percentage of mining or processing projects with transparent human rights impact assessments or equivalent	Analysis of public disclosures from companies (e.g., ESG/sustainability reports); third-party audit verification

[16] OECD (2016), OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, OECD Publishing, Paris.

Recycling rates of critical raw materials	National or industry-level waste tracking and reporting systems; input-output material flow analysis; facility-level recycling performance audits
Compliance with environmental safety standards	Regulatory enforcement records; inspection and compliance reports from environmental protection agencies; review of legal cases or fines related to violations
Rate of biodiversity loss in extraction or production zones	Satellite remote sensing and GIS to track habitat loss and land degradation; ecological field assessments for species diversity and abundance
Water quality levels in regions surrounding extraction or processing facilities	Data from water monitoring stations (surface and groundwater); regular sampling and laboratory testing for contaminants; comparison against national water quality standards
Existence of a responsible sourcing policy aligned with international norms	Corporate policy review; benchmark comparison with OECD Due Diligence Guidance or other international standards; third-party ESG audits
Percentage of cross-border critical mineral supply agreements and partnerships incorporating transparency and ESG standards	Review and analysis of annual bilateral/multilateral agreements with documented ESG compliance mechanisms and transparency reporting requirements

PRINCIPLE 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.[17]"

While employment growth in clean energy continues to outpace that of fossil fuels, there is uncertainty about whether these jobs will provide opportunities for decent work, offering good wages and conditions. As energy transitions continue, there are also concerns that the current labour and skills shortages will grow. Some of the current global energy workforce may be supported through upskilling and reskilling initiatives, empowering them to take on emerging roles in the clean energy sector. At the same time, new workers will need tailored training to ensure they are equipped with the specific skills that are increasingly in demand. Ensuring new jobs in clean energy are decent jobs is crucial to attract new workers to the sector and to facilitate just transitions for workers from transitioning industries.

Tracking developments in employment, from job losses and gains, to quality of jobs, training opportunities and union membership, 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.

The following case studies highlight ways to track developments in employment and skills development in the context of clean energy transitions. These include:

[17] G20. (2024, October 4). Voluntary G20 Principles for Just and Inclusive Energy Transitions.

- **South Africa Presidential Climate Commission - Framework for a Just Transition**, which measures progress on jobs and training against the country's key just transition policies.
- People's Republic of China (hereafter "China") – An Index for a Just Transition in Coal Regions, which tracks energy transition workforce pathways in the country's coal provinces.
- **Canada – Science and Technology Internship Program - Green Jobs**, which tracks youth participation in the natural resources sector.
- **IEA Clean Energy Labour Council – Tracking Quality Jobs and Workforce Development,** which proposes a set of indicators to monitor labour issues in the context of clean energy transitions.

Emerging practices and approaches to track progress on quality jobs and workforce development

South Africa Presidential Climate Commission - Framework for a Just Transition

Objective:

With up to 150 000 direct jobs depending on the coal mining industry in the country, the South Africa Presidential Climate Commission's monitoring, evaluation and learning framework provides evidence to measure progress and to influence strategies, policies and enablers for a successful transition of the workforce and the country's economy.

The framework deals with all aspects of the transition, one of which is quality jobs and workforce development and uses a broad range of indicators for monitoring the country's just transition.

Selected indicators tracked

- Net just transition-related sector employment rate increases (new jobs vs losses) meet or exceed the national employment rate increase
- Decrease in the difference in employment rates by race and gender in just transition sectors
- Number of jobs created or maintained through just transition-related projects
- Estimated demand for new types of jobs and work opportunities related to the just transition
- Number of workers in all just transition priority sectors reskilled, upskilled and/or retrained
- Percentage of technical vocational education and training graduates and trainees from just transition-related offerings in employment 6 months after training
- Number of graduates in just transition priority sectors
- Number of people benefiting from re-skilling and trainee support
- New educational offerings relevant to the just transition
- Number of individuals receiving labour market support packages

Evaluation methodology:

The framework outlines four broad types of activities to evaluate and measure progress for the respective indicators. These activities are defined by purpose, frequency and who tends to engage them, rather than by method or source, including:

- Institutional monitoring and reporting using data from quarterly and annually reported performance information or data from government agencies.

- Decentralised monitoring and evaluation including deep studies, anecdotal evidence as part of scanning the environment and the views of community members, and frontline service delivery monitoring.
- Planned deeper studies and periodic assessments with evaluations, research, narratives and case studies that can be sector-specific, regional or national, exploring learning questions and introducing innovative evaluation and learning methods.
- In addition to proactive studies, reactive monitoring and evaluation including rapid studies with community consultations to resolve issues promptly.

Outcomes:

Implementation of the Just Transition Framework is ensuring greater coordination and transparency as it invites application from actors across government, industry and civil society. It is helping cultivate a culture of learning, adaptive policy management and shared responsibility as South Africa undergoes its energy transition.

China – An Index for a Just Transition in Coal Regions

Objective:

In the context of China's dual carbon goals, peaking carbon emissions before 2030 and reaching carbon neutrality by 2060, regions heavily dependent on the coal industry will experience extensive economic and societal impacts. The transformation will be largest in provinces such as Shanxi, Shaanxi and Inner Mongolia, where large workforces are employed in the coal industry. Case studies and pilot programmes have been developed in coal regions to quantify and assess the costs of such a transition. Indicators have been developed to advise policymakers of the optimal rate at which to phase out coal in order to maximise social, economic and environmental benefits.

One example is a supported project that developed a Just Energy Transition Index (JETI), that compares Shanxi's transition progress with that of five coal regions in Europe. It

offers actionable insights into supporting coal workers and communities, with a focus on employment and economic diversification strategies.

Selected indicators tracked

- Coal production and consumption (e.g. share of coal in primary energy production, consumption and heating)
- Renewable energy development (rate of growth in wind and solar capacity)
- Energy structure and efficiency (energy intensity and end-use electrification)
- Carbon emissions and air quality
- Economic development and economic structure (GDP per capita, service sector contribution to GDP, etc.)
- Social development, including employment, social security, income, education levels and health
- Policy support, including carbon targets, pricing mechanisms and action plans
- Investment, R&D and FDI as a share of GDP
- Business environment, including transport infrastructure, per capita logistics and public-private relations

Evaluation methodology:

Evaluation methods used in this study include:

- Data collated from Shanxi, along with five coal regions in Europe, with the study assessing and comparing the progress of the six regions' transitions at both regional and national levels.
- Data sources include official statistics from each region assessed, databases from international organisations such as the IEA and ILO, legislative

documents from each region's respective government organs and academic studies.

- It uses five key dimensions (energy, emissions abatement, economy, social development and transition momentum) and 36 individual indicators to shed light on each region's transition readiness, progress and specific challenges that lie ahead.

Outcomes:

By comparing regions, the Just Energy Transition Index was able to demonstrate that by integrating just transition principles into national and regional policy frameworks, China can balance economic, social and environmental priorities as it moves away from coal, striking the balance between economic resilience, growth and sustainable, inclusive development. The results of this project are being used to encourage policymakers to incorporate just transition considerations into nationwide policy.

Canada – Science and Technology Internship Program - Green Jobs

Objective:

Launched in 1997, as part of Canada's Youth Employment and Skills Strategy (YESS), the Science and Technology Internship Program (STIP) – Green Jobs creates jobs and skills training opportunities for youth (aged 15-30) in Canada's natural resources sector including energy, forestry, mining and critical minerals, clean technology and earth sciences. By funding employers in the natural resources sector to de-risk hiring, STIP – Green Jobs supports youth, including young people experiencing barriers to employment, to successfully transition into the workforce through hands-on work experience, skills development, training for up to 12 months and creates jobs that have positive environmental outcomes. The programme collects disaggregated data to assess its effectiveness in supporting workforce development in the natural resources sector.

Selected indicators tracked

- Number of jobs created in the natural resources sector
- Number of training opportunities created in the natural resources sector
- Percentage of placements in each natural resources sector (i.e., energy, forestry, mining, earth sciences and clean technology)
- Percentage of youth employed post-placement
- Percentage of youth who report they gained new skills through their placement
- Total number of youth served
- Percentage of women served
- Percentage of Indigenous youth served (First Nations, Inuit, and Métis)
- Percentage of visible minorities youth served (terminology from Canada's Employment Equity Act)
- Percentage of youth with disabilities served
- Percentage of youth from Northern and remote communities served

Evaluation methodology:

The programme operates on a fiscal year calendar and uses several data sources to evaluate results, including:

- Quarterly reports on key performance indicators from funding recipients.
- Annual reports summarising quantitative and qualitative results.
- Questionnaires completed by youth participants at the beginning and end of their placements.
- Horizontal evaluations every five years for the Youth Employment and Skills Strategy (YESS).

Outcomes:

By tracking these indicators, the STIP – Green Jobs programme demonstrates how it is responsive to skills and labour shortages in the natural resources sector. With an average of 80% of youth finding full-time employment after participating in the programme, the programme's approach to providing hands-on work experience and skills training opportunities is creating pathways to full-time work and labour market participation. The results from the 2025 horizontal YESS evaluation indicate the horizontal initiative is increasing the employment levels of youth post-placement, which leads to higher earnings after the programme. These results enable the programme to make evidence-based improvements to ensure it remains responsive to the needs of both employers in the natural resources sector, and to youth, especially youth from marginalised groups and young people experiencing barriers to employment.

IEA Clean Energy Labour Council – Tracking Quality Jobs and Workforce Development

Objective:

Members of the IEA Clean Energy Labour Council, which brings together trade union representatives from across the globe, have outlined their proposal on indicators to track workforce transformation and skills development in clean energy transitions, during a dedicated labour and trade union workshop on Indicators for Just and Inclusive Energy Transitions.

Selected indicators proposed
• Number of jobs lost in declining sectors, by gender • Percentage of impacted workers who access training or reskilling programmes

- Average duration of unemployment following job loss due to mine/plant closure
- Percentage of impacted workers successfully transferred into new employment
- Provision of social protection coverage for displaced workers
- Number of jobs created linked to just transition policies and plans, by gender
- Data on the type and quality of new jobs (wage, contract type, skills level, social protection etc)
- Confirmation of respect of ILO international labour standards (trade unionisation rates, existence of social dialogue, collective bargaining coverage) in newly created jobs
- Availability of public and private investment mobilised in transition regions to support workers (new job creation, career advice, training opportunities, social protection etc)
- Existence and quality of economic diversification plans in affected regions (number of new jobs created, quality of the new jobs etc)
- Number of contracts awarded locally for renewable energy projects
- Workers and communities' satisfaction index on the transition process
- Confirmation of worker and trade union participation in the design and implementation of energy transition plans (level and quality of engagement)
- Percentage of worker representatives and trade union recommendations integrated into final transition plans
- Existence of regular monitoring reports with worker and trade union participation

Evaluation methodology:

Data could be gathered and monitored by:

- Labour force surveys and administrative employment data to track job losses in carbon-intensive sectors, job creation in transition-linked industries, and re-employment rates of displaced workers.
- Questionnaires for workers and trade unions and structured interviews to assess changes in income, contract quality, access to social protection, and perceptions of job security and satisfaction.
- Impact evaluations (including randomised controlled trials) to assess the effectiveness of reskilling programmes, wage subsidies, and job placement services on employment and income recovery.
- Integrated data systems and longitudinal tracking that combine tax, social insurance, training, and employment data to monitor individual worker trajectories over time.
- Open-access data dashboards maintained by national authorities or Just Transition Commissions to publicly report on key indicators such as job creation, reskilling participation, and union involvement.
- Public investment tracking and budget analysis to monitor the volume and allocation of transition-related investments, including those seeking to provide workforce support, retraining, and regional diversification.

Outcomes:

Trade unions hope that tracking these outcomes on energy transition policies and plans could:

- Monitor how energy transitions affect workers including whether they are being supported into new decent jobs.
- Gather information on the number and quality of new local jobs to ensure new decent jobs are created and that energy transitions are just transitions.
- Help assess whether training provisions are accessible and facilitate job to job transitions for impacted workers.

- Demonstrate whether workers and trade unions have been included in the process and whether their views and demands have been considered.

Lessons learned and key considerations

Insights drawn from international experience have helped identify key considerations when tracking progress towards creating quality jobs and enabling workforce transformation linked to energy transitions.

- Tracking labour outcomes in the energy sector requires coordinated data systems and sector-specific indicators. Data on energy-related employment, training, and labour conditions can be fragmented across ministries, particularly between labour, education, and energy sectors.
- 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.
- Cities and civil society organisations working directly in local contexts can play an important role in helping close data gaps and bring worker perspectives into energy-related labour monitoring systems.
- 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.
- Coordination between 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 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.
- In some countries, national or regional just transition task forces with participation from labour, education, and energy actors have been proposed. These platforms can be used to improve data sharing across institutions, and to align labour and skills policies with energy transition goals. Tracking outputs, such as joint strategies, monitoring frameworks, or coordinated funding programmes, can help assess their role in implementation.

Suggested indicators and methodologies

Principle 10 - Quality Jobs and Workforce Development

Indicators	Evaluation methods
Net change in total employment numbers in energy and related sectors (by sector and occupation), by gender	Sector-specific labour force surveys; social security exit records; union data on job displacement; employment databases disaggregated by sector and job type; job classification using ILO or national standards; job quality assessments including wages, contracts, benefits

Indicators	Evaluation methods
Percentage of new jobs meeting decent work criteria (including wage levels, contract type, safety standards and union representation), by gender	Analysis of labour market and employment survey data; wage and contract audits: union membership statistics; cross-analysis and tracking compliance with ILO decent work indicators
Percentage of workers in clean energy and related sectors with access to core employment benefits (e.g., health coverage, retirement plans, paid leave, job security), by gender	Analysis of employer surveys and HR records; labour force and household surveys with benefit-related modules; union and collective agreement data; national employment standards compliance audits; sectoral studies on employment conditions
Median wage of clean energy and related sector jobs compared to national/regional median wage	Labour force surveys disaggregated by sector and occupation; review of national wage databases; sectoral employment reports from ministries or industry associations; comparative analysis of median wages across sectors and regions; adjustments for full-time/part-time status and contract type to ensure comparability
Number of new clean energy jobs in management, technical and administrative, by gender, age, race and ethnicity	Labour force surveys disaggregated by age and sector; employment records from clean energy firms; national employment observatories or youth employment trackers; disaggregated company HR records; employment equity reports; labour ministry gender audits in the energy

Indicators	Evaluation methods
	sector; compliance monitoring of gender quotas where applicable
Number of jobs created linked to just transition policies and plans	Cross-analysis of employment growth data and documented just transition policy implementation timelines; project-level employment logs; public reporting by ministries
Percentage of impacted workers successfully transferred into new employment, by gender	Post-training job placement data; longitudinal labour tracking; administrative follow-up through employment agencies or social security reintegration programmes
Percentage of impacted workers who access training or reskilling programmes, by gender	Vocational education and training programme enrolment data; administrative data from reskilling initiatives; targeted beneficiary tracking from transition-affected sectors
Percentage of fossil fuel sector workers who successfully completed recognition-of-prior-learning assessments for clean energy jobs, by gender	Analysis of administrative data from certification bodies, training institutions and energy sector employers tracking completion rates of recognition-of-prior-learning assessments by sector origin and destination; annual surveys of transitioning workers
Number of publicly funded vocational and technical clean energy training programmes	Education ministry budgets and programme portfolios; inventory of certified training providers; review of national workforce development strategies

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 - Members of the Global Commission

The Global Commission for the People-Centred Clean Energy Transitions was convened by the Executive Director of the IEA, Dr Fatih Birol, in January 2021.

Co-Chairs

Teresa Ribera Rodriguez

Executive Vice-President for Clean, Just and Competitive Transition, European Commission

Alexandre Silveira de Oliveira

Minister of Mines and Energy, Brazil

Members

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Deputy Prime Minister and Minister for the Ecological Transition and Demographic Challenge, Spain

Rachel Kyte

Special Representative for Climate, United Kingdom

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Minister for Climate, Energy and Utilities, Denmark

Dan Jørgensen

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