

► Guide for Employment Impact Assessments in the Renewable Energy Sector

Strengthen2: Employment impact assessment to maximise job creation in Africa

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► Purpose of this guide

This guide presents how Employment Impact Assessment can be conducted to help inform and support decisions on renewable energy related investments that can maximize positive employment outcomes, i.e. more and better jobs, based on credible, decision-relevant evidence. This guideline is intended for the institutions and practitioners who plan, finance, design, implement, and evaluate renewable energy investments – along with the analysts supporting those decisions and processes.

► Executive summary

Renewable energy investments are frequently presented as job-creating interventions. Yet their employment effects are neither automatic nor confined to the number of workers engaged during construction and installation. Renewable energy investments influence employment through multiple channels and over different time horizons: they generate direct jobs during development, construction and installation, commissioning, and operations and maintenance; support indirect jobs through supply chains; and can stimulate induced employment through local consumption expenditure effects. Over time, they may also reshape labour-market opportunities more broadly by expanding access to reliable and affordable electricity, enabling enterprises to emerge, expand, and upgrade, and supporting growth in connected economic activities. Because these effects differ in form, timing, and visibility, they cannot be understood through construction-phase headcounts alone.

It is against this backdrop that Employment Impact Assessments (EmpIAs) have become an important tool for the ILO. An EmpIA helps convert broad expectations about “jobs” into evidence that can support real decisions: what employment is being generated, for whom, through which channels, under what conditions, and with what trade-offs. This matters not only for understanding employment quantity, but also for assessing job quality, inclusion, and labour standards; including in the renewable energy sector. Without such an assessment, renewable energy programmes often rely on partial signals. Employment creation may be overstated, differences across technologies and delivery models may remain obscured, and risks related to informality, wage compliance, occupational safety and health, or exclusion may remain invisible until they emerge as implementation or accountability problems.

This guide provides a practical framework for conducting EmpIAs in the renewable energy sector. It is intended for the institutions and practitioners who plan, finance, design, implement, supervise, and evaluate renewable energy investments, as well as for the analysts supporting those processes. Its central premise is that an EmpIA should begin with a clear decision-use purpose. This means establishing, from the outset, who will use the findings, which decision they are intended to inform, what employment effects are in scope, and what level of analytical depth is feasible within the available assessment window. On that basis, the guide sets out how to design an assessment, choose appropriate methods and indicators, collect and analyze evidence, and report results in a form that matches policy and project decision cycles.

The guidance also emphasizes that not every EmpIA needs to estimate every type of employment effect, nor apply every available method. What matters is that the assessment is fit for purpose, transparent about its assumptions and limitations, and proportionate to the context in which it is undertaken. In some cases, the priority may be an ex-ante job estimation, or to measure direct employment and job quality during implementation; in others, it may be to estimate indirect and induced effects, or to examine longer-term effects such as sustained operations and maintenance jobs and employment enabled through the productive use of energy. Across all cases, the objective remains the same: to produce credible, decision-relevant evidence that helps identify feasible improvements in design and delivery, clarify trade-offs, and strengthen accountability and learning across renewable energy projects, programmes, and portfolios.

A distinctive feature of the guide is its insistence that employment impacts should not be reduced to headline job numbers alone. A meaningful assessment must also consider who benefits, under what conditions, and with what implications for inclusion, resilience, and labour standards. This includes attention to issues such as wages, working time, occupational safety and health, social protection, formality, skills development, and the participation of women and youth. By making these dimensions visible, EmpIAs can support more informed decisions on procurement and contracting, subcontracting, localisation and supplier development, operations and maintenance models, skills and certification pathways, and complementary measures that can improve employment outcomes in practice.

Taken together, the guide seeks to make employment analysis in renewable energy investments more operational, more comparable, and more useful for action. It presents the EmpIA not simply as an analytical exercise, but as a practical instrument for improving project design, guiding implementation, supporting policy dialogue, and strengthening the accountability of investments that are often justified in employment terms.

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Acronyms and abbreviations

BoQ	Bill of Quantities
CAPEX	capital expenditure
EmpIA	Employment Impact Assessment
EPC	engineering, procurement and construction
FGD	focus group discussion
FTE	full-time equivalent
GMG	Green Mini-Grid
I-O	Input-Output
O&M	operations and maintenance
OPEX	operational expenditure
OSH	occupational safety and health
PUE	productive use of energy
PV	photovoltaic
RE	renewable energy
SAM	Social Accounting Matrix
SME	small and medium-sized enterprise
SMSD	Structural Model for Sustainable Development

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► 1. Introduction

Investments in renewable energy (RE) are increasingly central to development strategies because they can expand access to reliable electricity, strengthen energy security, and support growth compatible with climate and resilience objectives. They also have significant employment potential: globally, renewables employed 16.2 million people in 2023 (directly and indirectly), with particularly large workforces in solar PV (about 7.1 million jobs), hydropower (about 2.3 million direct jobs), and wind (about 1.5 million jobs)¹. Beyond the energy value chain itself, improved electricity services can enable enterprises to emerge, expand, and upgrade over time — supporting longer-run local employment effects.

Yet employment outcomes are not always “built in” to renewable energy investments. They depend on technology choices, delivery models, local supply-chain depth, skills availability, labour standards, and whether projects are deliberately designed to strengthen domestic value creation. Developed within the framework of the [STRENGTHEN2](#) project², this guideline responds to that reality: it helps governments, developers, financiers, and implementing partners systematically incorporate employment considerations into renewable energy investment decisions — so that job objectives are explicit, measurable, and actionable rather than assumed or an afterthought. In line with the framework used here, employment effects are understood as direct (jobs on project sites and in operating entities), indirect (jobs in firms supplying inputs and services), induced (jobs supported by additional spending from incomes generated), and long-term effects (including sustained operations and maintenance (O&M) jobs and employment enabled through productive use of energy and wider economic change over time)³.

An Employment Impact Assessment (EmpIA) provides the evidence base for integrating employment objectives into renewable energy investments. It links a specific policy, programme, or project to the scale, location, and nature of employment effects it is likely to generate in the case of an ex-ante assessment (or has generated in an ex-post assessment). It helps decision-makers identify practical levers — such as procurement and contracting choices, skills development, and local supplier upgrading — that can strengthen outcomes⁴. A credible EmpIA also depends on being explicit from the outset about purpose — whether it is primarily meant to inform policy direction and/or to strengthen programme and project design — so the assessment produces decision-relevant findings rather than narrowing into simple “jobs reporting”. Depending on when evidence is needed and which project or policy levers are still open EmpIAs can be conducted ex ante, during implementation, or ex post.

Following this introduction, the guideline is organized into four further chapters. Chapter 2 sets out how to design an EmpIA — how to select the right project(s), choose methods, and define indicators. Chapter 3 then explains how to conduct the assessment in practice, moving from evidence gathering to analysis of direct, non-direct, and long-term effects. Chapter 4 focuses on reporting results in a way that is transparent and usable for decisions. Finally, Chapter 5 concludes and dives deeper into the relevance of EmpIA findings in the renewable energy sector.

¹ International Renewable Energy Agency, & International Labour Organization. (2024). *Renewable energy and jobs: Annual review 2024*. <https://www.ilo.org/publications/renewable-energy-and-jobs-annual-review-2024>

² www.ilo.org/strengthen2

³ International Labour Organization. (2025). *Reference guide on employment impact assessment* (2nd ed.). <https://doi.org/10.54394/INYX6157>

⁴ International Labour Organization. (2025). *Reference guide on employment impact assessment* (2nd ed.). <https://doi.org/10.54394/INYX6157>

► 2. EmplA design

This chapter aims to guide the design of an EmplA for renewable energy investments. It sets out the key choices — framing (purpose, users, scope, timing, and depth), selecting the project or programme component to assess, choosing an appropriate methodology (or combination of methods), and defining the indicators for employment quantity and quality — so the assessment is feasible, credible, and decision-useful across RE technologies and delivery models.

A key element of EmplA is assessing the different types of employment effects. Definitions of the key types, direct, indirect, induced and long-term commonly used by the ILO are provided in Table 1.

► Table 1. Types of employment effects

Employment effect	Definition
Direct	Jobs created in the activity/sector that is directly affected by the intervention or spending.
Indirect	Jobs created in supplier industries because the directly affected sector buys more (or less) inputs.
Induced	Jobs created because incomes change, leading households to spend more (or less), which boosts demand across the economy.
Long-term	Jobs that arise over time from longer-run changes (e.g., sustained investment, productivity/capacity improvements, or structural shifts), beyond the short-run project/spending pulse.

Source: Authors based on Miao et. al. 2024.

2.1 Framing, timing, and depth

Purpose and intended users

A practical starting point is to state clearly **why** the EmplA is being undertaken and **who** will use the results (i.e., government; public utilities/implementing agencies; developers and contractors (including engineering, procurement and construction (EPC) and O&M); and financiers and development partners). This determines what counts as decision-useful evidence, the appropriate scope and depth, and the feasible delivery timeline. Essentially, this framing should clarify whether the EmplA is intended primarily to inform public policy and investment choices and/or to strengthen programme and project design and delivery. More specifically, in the renewable energy sector, EmplAs are commonly carried out to inform decisions on:

- **Technology and configuration choices** (e.g., utility-scale versus distributed deployment; clustering versus dispersed sites; scale and phasing).
- **Procurement and contracting rules and templates** (including contract clauses and reporting/verification requirements).
- **Domestic value creation strategy** (what is realistically local versus imported, and where supplier upgrading is feasible).
- **Skills development and labour standards** (training/certification pathways; wage and occupational safety and health (OSH) compliance; subcontracting management).
- **Public investment policy and national programme design** (how public finance and risk allocation shape the renewables pipeline, and where employment objectives can be embedded upstream).

- **Access to energy and livelihood impacts** (how improved electricity services can enable firms to start, expand, and upgrade over time, supporting longer-run employment).
- **Just transition in the shift to renewables** (who benefits, where, and under what conditions — including implications for workers and regions linked to fossil value chains — anchored in decent work principles and social dialogue).

Where the EmpIA is expected to address employment beyond the project boundary, it is useful to be explicit about which effects are in scope and how they will be reported (e.g., direct, indirect, induced, and long-term effects, including sustained O&M and employment enabled through improved electricity services).

Assessment window

The assessment window is the period in the policy, programme, or project cycle when the EmpIA is carried out. It should be chosen so results are delivered in time to inform the relevant decision, and so there is practical capacity to collect and validate evidence. EmpIAs may be conducted **ex ante**, **during implementation**, or **ex post**, depending on when evidence is needed and which levers remain open. Under the ILO–EU STRENGTHEN2 project, renewable energy EmpIAs have been implemented ex ante, during implementation, and ex post. As a practical rule:

- **Ex ante:** Most appropriate for informing design, technologies, and procurement choices before deployment of the RE project — often through rapid modelling using project documents and budgets estimates.
 - Example: An ex-ante EmpIA of the SMART GRID project in Senegal illustrates rapid modelling at this stage (Sossa 2023).
- **During implementation:** Particularly effective to measuring delivery as it happens, where site access and administrative records exist and practices of the ongoing project can still be adjusted, or where future projects of a similar nature can be improved (e.g., recruitment, training, OSH, wage compliance, subcontracting).
 - Example: Employment Impact Assessment of the Green Mini-Grid (GMG) Facility
- **Ex post:** Best suited to validating results and extracting lessons for future projects, programmes, policies — often using quasi-experimental or spatial approaches once outcomes can be observed.
 - Example: STRENGTHEN2's EmpIA of the productive use of energy (PUE) under the Green Mini-Grid Facility in Kenya illustrates this approach (Oyuma & Game 2024b).

In renewable energy, it is also good practice to state which phases are covered (development, construction/installation, commissioning, O&M), since employment timing and occupational mix can vary significantly across phases.

EmpIA depth

The intended depth of the EmpIA should be defined early, because requirements are not standardized, they depend on timing, purpose, and the strength of accessible evidence. Where an imminent decision requires timely directional evidence, a rapid EmpIA may be appropriate. Where the aim is to standardize practices across a project pipeline, or where labour-market and community effects are material, deeper measurement and analysis is typically warranted.

In practical terms, financial, time and capacity resources and constraints will determine the depth of the assessment. Limited time, access, data availability, or counterpart engagement often necessitates short, tightly scoped EmpIA. Where there are resources and the decision involves multiple variables (as is often the case for larger projects, programmes, or portfolios), a more in-depth EmpIA can be more valuable.

2.2 Considerations for project selection

Project selection may be driven by different factors. Ideally it is a structured screening exercise of a relevant portfolio. But it may also be the case that a specific project is the starting point for the EmpIA as its scale or importance has already raised questions about its employment impact. Where there is a choice to be made between projects, the assessment window, will determine what is feasible: projects whose status does not align with the chosen window are unlikely to yield decision-useful evidence within available time, access, and resource constraints.

Within this framework, the considerations below provide a practical basis for deciding which project(s) to select for an EmpIA among possible candidates.

1) Project relevance and learning value

This criterion assesses the relevance associated with the project and the value of evidence an EmpIA could generate — i.e., where analysis is most likely to matter because decisions involve meaningful resources, risks, or missed opportunities, or findings could inform practice beyond a single site. It does not imply that only large projects are suitable; smaller projects may score highly where they are strategically important, piloting a new approach, or representative of a wider pipeline.

Key considerations

- **Strategic significance:** Clear links to national/sector strategies, investment priorities, and employment objectives (with citations where available).
- **Relevance and opportunity cost:** The resources and policy attention involved, including the potential cost of *not* using the investment effectively (e.g., missing a feasible opportunity to maximize employment and poverty-reduction benefits through design, delivery, or local sourcing choices).
- **Materiality (beyond size):** Not only the scale of financing, but also workforce intensity, public visibility, and political/safeguard sensitivity — factors that increase the value of credible evidence.
- **Replicability:** Where the project is representative of a larger pipeline, uses common templates, or could inform programme rules, or procurement approaches.
- **Sensitivity to choices:** Likelihood that employment outcomes vary materially across plausible design and delivery options (e.g., labour-based vs equipment-intensive methods; different construction technology options, packaging and procurement approaches; local content provisions), increasing the payoff to measurement and learning.

2) Feasibility and access to data

A strong candidate project to assess is one where required data and evidence can be accessed.

Key considerations: stable core project information (technology/configuration, sites, milestones/commissioning, delivery chain, scope changes); documentation to support attribution and mapping (specs, procurement packages, contracts/amendments, schedules/progress reporting); and method-specific data availability for:

- **Modelling using Input–Output tables / Social Accounting Matrices, or the Structural Model for Sustainable Development:** a sufficiently detailed project expenditure profile (CAPEX/OPEX by category and phase) that can be mapped to sectors, with realistic domestic vs imported shares; feasibility also depends on access to a reasonably up-to-date national Input–Output Table or Social Accounting Matrix, consistent sector employment and wage data to build coefficients, and a cost breakdown detailed enough to separate major procurement packages (e.g., labour/materials/equipment/services).

- **Direct measurement**

- **On-site (during implementation):** access beyond the owner to the delivery chain (EPC, key subcontractors, service providers, and O&M where relevant), and availability of payroll/rosters/timesheets/site registers plus basic worker attributes for disaggregation; practical field constraints are manageable (site security and HSE access, working languages, seasonality/weather constraints, and the ability to collect evidence without disrupting construction or operations).
- **Productive use of energy analysis / livelihood effects (ex post):** evidence of service improvement (access/reliability/affordability) and a feasible way to observe enterprise response (operator/user lists, identifiable productive users, and the ability to survey or engage enterprises).

3) Inclusion potential

Where the EmpIA focuses on “who benefits and under what conditions,” prioritize projects where distributional channels are observable, and levers exist to influence outcomes.

Key considerations: credible inclusion pathways (local hires, local SMEs, entry points for women/youth); observable job-quality risks (electrical safety, work at height, wage/working-time practices, informality in subcontracting chains, social protection); feasible levers (contract clauses/reporting, verification/supervision, training/certification, grievance mechanisms, supplier development); sufficient baseline labour-market/skills context to interpret findings.

4) Clarity of learning questions

Select projects that support two to four decision-linked questions that can be answered within the window.

Key considerations: questions tied to real decisions (e.g., packaging/subcontracting, O&M model, localization feasibility); measurable outcomes (headcount/FTE by phase and employer, job-quality indicators, SME participation, domestic/import shares, sustained O&M roles, enterprise jobs enabled where relevant); explicit scope boundaries to prevent creep.

Using the criteria above, it is possible to prioritize which candidate project is most suitable for an EmpIA. Moreover, because employment profiles differ across renewable technologies and delivery models, the following technology lens highlights specific considerations for solar PV, wind, and hydropower.

5) Technology lens for project selection

The most common RE technologies are solar PV, wind, hydropower. The scale at which each of these are deployed varies enormously, and each project will have its own characteristics. Nonetheless, a few high-level considerations for when considering each technology are provided below.

- **Solar PV.** Distributed PV often has short installation cycles; in rooftop and mini-grid programmes, construction employment may come over repeated short periods. Results are more robust where the EmpIA can observe and trace the locally delivered segments (installation, mounting/cabling, logistics and basic O&M), and where programme/contracting records make installer activity and local firm participation visible across multiple sites.
- **Wind.** Wind is typically staged during the construction phase, starting with the access infrastructure and foundations for the windmills, followed by their installation. Employment then shifts into long-term O&M. The case for selecting a project is stronger where EPC and O&M arrangements and staffing/training plans can be accessed. The O&M arrangements allow the EmpIA to assess whether there are credible pathways into sustained local service and employment roles beyond the construction peak.
- **Hydropower.** Hydropower is usually multi-year and multi-contractor, with employment heavily phased. The case for selecting a project is stronger where project documents and records enable phase-by-phase analysis (construction schedules, contractor/subcontractor lists, wage bills, bills of quantities and procurement records),

and where labour standards and recruitment dynamics — including accommodation and subcontracting practices — can be examined...

Having explored these considerations and selected the project to be assessed, the next step in the EmpIA design is to choose the methodology to measure or estimate the employment effects.

2.3 Methodology selection by project status, assessment purpose and data availability

There are multiple methodologies that can be used to carry out EmpIAs. For renewable energy projects, this guide highlights three core, complementary approaches that have been applied by the ILO. In practice, robust assessments often combine these methods, depending on the stage (ex ante, during or ex post) and the employment effects of interest.

Core methodologies used by ILO in renewable energy sector EmpIAs

A. Direct data collection and analysis

Direct data collection produces empirical evidence through primary data gathering. In renewable energy EmpIAs, it is typically applied in two modes: **during implementation**, to measure direct on-site employment and job quality in the delivery chain, and **ex post**, to assess local livelihood and productive-use effects once energy services are established.

On-site data collection

This approach is used during implementation to estimate the quantity and quality of **direct** employment associated with a renewable energy project, covering jobs linked to construction/installation and, where relevant, operations and maintenance. Evidence is typically drawn from project payrolls, site registers and contractor records, complemented by key-informant interviews (project managers, contractors, worker representatives, local authorities, training providers), short structured worker and employer surveys, and focused discussions with workers and supervisors. The aim is to quantify direct jobs (in headcount and FTE), track labour intensity by project phase, and assess job quality in practice (wages, contracts, working conditions, social protection, OSH, skills use, and gender/age patterns).

Ex-post data collection: Productive use of energy and local livelihood effects

This approach is used after service delivery is established to understand how improved access to renewable energy enables jobs and livelihoods beyond the project boundary, such as new or expanding enterprises using electricity. It typically combines enterprise and farm surveys (often drawing on operator or programme user lists), focus group discussions with entrepreneurs, workers and community members, and key-informant interviews with developers/operators and relevant local actors (financial institutions, business service providers, community leaders). The aim is to estimate employment supported through productive uses over time and to identify the conditions that shape those outcomes (reliability, affordability, appliance finance, skills, and market access).

Example: STRENGTHEN2's [EmpIA of the productive use of energy \(PUE\) under the Green Mini-Grid Facility in Kenya illustrates this approach](#)

Typical questions it can address:

- How many direct jobs were created during construction vs. operations and maintenance, and for how long?
- Who got the jobs (local/non-local, women/men, youth/adults), and in what occupations?
- What is the quality of jobs (contracts, wages, OSH, working conditions, skills use)?
- Which project practices (contracting, training, procurement, scheduling) explain differences in outcomes across sites/phases?

- After electrification, what kinds of enterprises expanded or emerged, and what jobs did that sustain over time?
- What factors shape local long-term impacts (tariffs, reliability, finance, business services, complementary infrastructure)?

B. Input-Output (I-O) / Social Accounting Matrix (SAM) multiplier analysis

Input-output (I-O) tables and Social Accounting Matrices (SAMs) are national-accounts frameworks that describe monetary transactions among sectors and institutions. When complemented with sectoral employment and wage information, I-O/SAM multiplier analysis can estimate in a disaggregated manner short-term employment effects (direct, indirect and induced) of investments through supply chains and spending linkages.

To explore this methods including its data requirements further please see: STRENGTHEN2's [Brief Review of Input-Output Approaches to Employment Impact Assessment](#) or page 28 of the [ILO Reference guide on EmpIA](#). For applied references of this method explore the [Employment impact assessment of the Ecler Ivoire project in Cote d'Ivoire](#) or the [Ex-ante Employment Impact Assessment of the SMART GRID project in Senegal](#).⁵

Typical questions addressed

- How many indirect jobs are supported in supplier industries by renewable energy investment spending?
- How many induced jobs arise from additional wage and profit income being spent in the economy?
- Which sectors capture the largest employment gains (e.g., construction, transport, services, manufacturing)?
- How do results change under different assumptions about local vs. imported content or domestic sourcing?
- What is the employment “multiplier” per unit of investment for different technologies (solar, wind, hydro), using consistent national accounts data?

C. Advanced economic modelling such as with the Structural Model for Sustainable Development (SMSD)

The Structural Model for Sustainable Development (SMSD) is a quantitative, sector-disaggregated, economy-wide simulation framework grounded in a structuralist approach. Each SMSD model is built on a Social Accounting Matrix (SAM) and complementary macro and labour data. It represents productive sectors (including renewable energy, grid and enabling supply chains), institutions (e.g., households, government, rest of the world), and labour categories (age, gender, skill/occupation, wages/earnings, and formality), alongside household groups (e.g., rural/urban and income strata).

The SMSD traces how large investments and policy packages propagate through production, incomes and spending, explicitly modelling price–quantity interactions, capacity constraints, and mark-up behaviour. In the renewable energy context, it is particularly useful because it can represent **capital accumulation in the energy system**: investment increases the capital stock in generation, networks and related infrastructure, which expands productive capacity, lowers energy supply bottlenecks, and changes relative prices and input costs across the economy. Over time, these changes can shift the sectoral composition of output (e.g., toward more energy-intensive manufacturing and services where electricity becomes more reliable/affordable), raise productivity, and alter the demand for different types of labour — affecting both the level and composition of employment (by sector, skill, formality, and household group).

In EmpIAs, the SMSD can be used ex ante, during implementation, or ex post to estimate:

- **Short-term employment effects** as an integrated economy-wide response to the investment shock combining the direct/indirect/induced components effects presented in Table 1 (Usually these effects cannot be separated when using the SMSD); and

⁵ All documents available at www.ilo.org/strengthen2.

- **Long-term (“capacity/permanent”) effects** driven by capital accumulation and structural change — where renewable energy and grid investment expands productive capacity, influences prices and competitiveness, and supports sustained employment growth beyond the construction period.

This makes the SMSD well suited for major energy-transition programmes where decision-makers need economy-wide estimates of output, prices, employment and job quality, household incomes, inequality/distributional outcomes, and the role of complementary policies (skills, industrial strategy, social protection) to support a just transition. The approach is flexible but data- and skill-intensive, requiring careful calibration, transparent assumptions, and specialized modelling expertise (the ILO guide notes it requires a computing platform, currently available in Wolfram Mathematica). See the [ILO Reference guide section](#) starting on page 34 for further details and/or explore the application the SMSD in STRENGTHEN2’s [Employment Impact Assessment of the Green Mini-Grid \(GMG\) Facility: Additional 20 Mini-Grid Sites in Turkana County, Kenya](#), and in the [Employment impact assessment of the Mozambique-Malawi interconnector project](#) as references.

Typical questions this methodology can explore:

- Under a national renewable energy pathway, how does employment change over time by sector and labour category (skills, gender, formality)?
- What are the economy-wide effects on prices, wages, household income, and inequality?
- What are the likely winners and losers across household groups, and what does that imply for a just transition?
- How do results differ across alternative policy packages (e.g., investment scale, financing approach, complementary industrial policies)?
- What long-term “capacity/permanent” employment effects emerge from capital accumulation and structural change?

Considerations for selecting and combining methods

There is no single “best” methodology for Employment Impact Assessments (EmpIAs). The right choice is usually a combination of methods that fits the decision to be informed, the stage of the project or programme, the **intended depth of the assessment**, and the data and analytical capacity available.

The selection should be guided by four questions:

1. **When** will the EmpIA be carried out, ex ante, during implementation, or ex post? Not all methodologies can be applied at all stages.
2. **Which employment effects** need to be examined, short-term direct, indirect, and induced effects, and/or long-term?
3. **How large** is the investment or programme?
4. **What data, technical tools and analytical capacity** are realistically available?

Table 2 summarizes how the three core methodologies relate to these four questions. It indicates at which stage each method can be used, which employment effects it can cover, the typical scale of intervention for which it is proportionate, and the level of data and analytical capacity it requires.

► Table 2. Summary of methodologies by timing, employment effects, scale and capacity

Methodology	Timing of the assessment	Employment effects primarily covered	Typical investment scale / use case	Data and analytical capacity requirements
Direct data collection	During: core method for direct employment Ex post: core method for local long-term effects related to the productive use of energy.	Direct: Preferred source for actual jobs and job quality Long term: Local effects such as sustained O&M jobs and productive use of energy by enterprises	Any size, but particularly small and medium projects/ programmes and local impact studies (e.g. mini-grids, rooftop schemes, O&M, PUE assessments)	Data: access to project records, sites, workers, firms and communities Capacity: low to medium – survey design, basic statistics and qualitative methods
Input-Output / SAM multiplier analysis	Ex ante, during, ex post	Short-term employment effects: Direct - Modelled (second best, when direct measurement is not possible) Indirect Induced	Medium to large projects and sector or national investment plans where short-term direct, indirect and induced employment effects are needed	Data: recent I-O table or SAM, sector employment data, detailed project cost breakdowns Capacity: medium – quantitative skills and familiarity with national accounts
SMSD	Ex-ante, during, ex-post	Direct / Indirect / Induced: Combined short-term employment effects, usually at a more aggregate level than I-O/SAM and without clear separation of the three components Long-term: economy-wide structural and distributional effects over the medium to long term	Large, strategic investment programmes and policy packages at the core of the energy transition, where just transition and structural change are central questions	Data: SAM, macroeconomic and labour data, parameters from previous studies Capacity: high – specialized modelling skills, software and time for calibration and interpretation

Source: Authors.

Having reviewed the methodologies typically used in Renewable Energy EmpIAs, it is useful to turn to the indicators that can be reported to capture the magnitude, distribution, and timing of employment effects — and to better understand the pathways through which investments in renewable energy influences jobs over the short and longer term.

2.4 Indicator framework: quantity, quality, and renewable-energy-specific metrics

A clear and consistent indicator framework is essential for making Employment Impact Assessments (EmpIAs) comparable across projects, technologies and countries. This guideline proposes a minimum core set of indicators and disaggregations that should be used in all renewable energy EmpIAs, as well as additional renewable-energy-specific metrics that can be added where data allow.

Employment quantity: headcount and FTE

- **Types of employment effects**

Depending on the scope and methodology of the EmpIA, estimates of employment quantity may cover some or all effects, ranging from short-term effects (direct, indirect, induced) to longer-term capacity effects. Each EmpIA should state explicitly which effects are included and, wherever the method allows, present results separately for each type.

- **Headcount and/or full-time equivalent (FTE)**

It is recognized that **employment quantity** can be described in two complementary ways: the **number of individuals engaged** and the **total volume of labour delivered**. For this reason, it is recommended that employment effects are reported in both:

- **Headcount** – the number of individuals who worked on the project, regardless of their hours worked. This shows the reach of employment.
- **Full-time equivalents (FTEs)** – the total volume of labour expressed in standard full-time job units. This is commonly used as the primary reporting metric because it allows like-for-like comparison across projects with different durations and contract patterns. An FTE converts total hours worked into a common “full-time” unit, using a weekly full-time hours standard that is typically defined in each country (for example in labour legislation or official labour statistics) and is often 40 or 48 hours per week, depending on the national context:

$$\text{FTE} = \text{Total hours worked} / \text{Standard full-time hours}$$

Where possible, EmpIA reports present main results in FTEs (with headcount as a complement) and briefly explain large gaps (e.g., short contracts, seasonal spikes, reliance on part-time work).

Selected job quality indicators

Beyond the number of jobs, EmpIAs should capture who benefits and under what conditions. As a minimum, all direct employment results (and, where possible, indirect, induced and long-term effects) should be disaggregated by:

- **Gender/sex** (women/men; and other identities where data permit)
- **Formality status** (formal vs informal, using national definitions such as written contract and social-security enrolment)

- **Age group** (e.g. 15–24, 25–54, 55+)
- **Skill level / occupation** (e.g. low/medium/high-skilled or occupational categories)

Where data allow—especially for direct jobs—also report enhanced quality indicators:

- **Wages and earnings** (average/median by occupation and key disaggregations; benchmark to minimum wage and relevant comparators)
- **Employment relationship and working time** (contract type/duration; full-time/part-time; overtime incidence)
- **Occupational safety and health (OSH)** (OSH systems and training; accidents/illnesses where available)
- **Social protection** (coverage by social insurance/pensions; access to key benefits)
- **Skills development** (numbers receiving on-the-job training, structured training, and/or formal certification; disaggregate training by gender and age where feasible)

Depending on the context, EmpIAs may also track:

- **Disability inclusion**
- **Location** of jobs (urban/rural, project area vs. other regions)
- **Job security** (probability of contract renewal, turnover)
- **Participation in collective representation** (unions, worker committees)

Renewable-energy-specific metrics

Alongside the core employment quantity and quality indicators, renewable energy EmpIAs can add a small set of RE-specific indicators to show **where jobs occur in the value chain and when they occur over the asset lifecycle**—and to make results comparable across projects using the **same** technology and delivery model.

- **Jobs by phase and value-chain segment (headcount and FTE):** Report employment by phase — manufacturing/assembly (where domestic), construction/installation, grid connection and commissioning, operations and maintenance (O&M), and end-of-life activities (repowering/refurbishment, decommissioning, recycling). Where feasible, also report FTEs by employer type (project owner, EPC, main contractors, subcontractors, local SMEs). This breakdown matters because job profiles differ by technology: solar PV often concentrates work in installation/commissioning and local services; wind places more weight on civil works, erection and specialized O&M; hydropower is typically dominated by long civil works during construction, followed by smaller but stable O&M and environmental management.
- **Normalised indicators (for within-technology benchmarking):** Use a small set of ratios — FTEs per MW installed, FTEs per million US\$ invested, and (for operating assets) FTEs per GWh generated in a typical year. These are designed for comparisons within a technology and configuration (e.g., utility-scale PV vs utility-scale PV), not for ranking fundamentally different technologies.
- **Localisation and supply-chain origin (RE lens):** EmpIAs analysis typically focuses on local employment creation and also accounts for what percentage of key supplies and services is imported versus sourced domestically. In renewable energy, making this explicit is particularly useful because import dependence strongly shapes which job-bearing segments can realistically be local — often installation and O&M in solar PV, selected fabrication niches in wind where they exist, and the local versus non-local workforce mix in hydropower construction and O&M.
- **Productive use of energy and local economic effects (where relevant):** For access- and service-oriented projects and decentralized systems, track the number and type of enterprises enabled or expanded by improved electricity or heat (e.g., agro-processing, irrigation, cold storage, services, digital activities), the FTEs supported in those enterprises (by gender, age and formality), and simple performance proxies where available (e.g., operating

hours, output, turnover) linked to improved energy services. This is particularly relevant for mini-grids, stand-alone systems and rooftop PV, but can also apply to small hydro directly serving local enterprises.

- **Circular-economy employment (where relevant and feasible):** Where activities exist or are planned, report FTEs in repair, refurbishment, repowering, dismantling and recycling, including the role of local workers/firms and any training or enterprise-support measures. For solar PV this may include modules, inverters and batteries; for wind, blade repair and component refurbishment plus repowering; for hydropower, turbine/generator modernization and long-term reservoir and sediment management.

With the indicator framework in place, the focus now shifts to how an EmpIA is actually carried out in practice — moving from a designed approach (project, effects, indicators, and methods) to implementation through context review, targeted data collection, analysis/modelling, and decision-oriented recommendations.

► 3. Conducting the assessment

Once the EmpIA has been designed — the project or programme selected, the timing agreed, the employment effects and indicators defined, and the method chosen — the next step is to implement the assessment. This section explains how to move from a design on paper to evidence that can inform real decisions on renewable energy investments and labour market policies.

In practical terms, conducting an EmpIA involves four core tasks:

- **Literature and context review** – understanding what is already known about renewable energy and jobs, and about the country's socio-economic and labour market context.
- **Targeted data collection** – collect method-specific datasets required for the methods chosen (on-site measurement, and/or modelling).
- **Analysis and/or modelling** – quantify direct, indirect, induced and (where feasible) long-term effects using the selected methods, and translate results into decision-relevant findings.
- **Formulating conclusions and recommendations** – list key conclusions and develop recommendations based on the findings, tailored to the needs and decision points of different stakeholders (e.g., government, funders, contractors, communities).

These steps are connected and iterative. The literature and context review guide what methods could be appropriate, what data are needed. Preliminary analysis may reveal gaps that require going back to project documents, statistics or stakeholders. The aim is to produce credible, country-specific evidence on employment impacts, not only generic “jobs per megawatt” figures.

In addition, it is important that there is ongoing **liaising and coordination with stakeholders** to keep them informed on progress, obtain relevant data and project information, respond to any queries and anticipate any questions and concerns.

3.1 Literature and context review

A short, focused desk review should give the EmpIA team a shared understanding of: (i) what is already known about employment impacts of similar RE projects/policies, (ii) the country's socio-economic and labour-market context, (iii) how the project/programme fits within that context, and (iv) the main evidence gaps to target in data collection and modelling. The review can be organized around three areas:

1) Evidence on renewable energy and jobs

Review existing EmpIAs and comparable studies (national, regional, international) on employment by project phase, job profiles/skills, and job-quality issues (e.g., informality, OSH, gender, social protection). Note where evidence is missing, outdated, or not comparable to the local cost and labour-market context.

2) Country context and labour-market profile

Summarize key socio-economic conditions, the energy/infrastructure situation, labour-force demographics, employment structure (including informality), job-quality norms, and skills supply for relevant occupations—highlighting gaps in recent, disaggregated labour-market data and evidence from past infrastructure/energy projects.

3) Project and policy setting

Review relevant national strategies and regulations (energy/RE, industrial/local content, employment/skills/just transition, labour law) and core project documents (feasibility, ESIA, designs/procurement, contracts, cost structure). Flag unclear

workforce expectations by phase, missing or vague local content/training/inclusion measures, and any misalignment between project documents and national policy.

This way, the literature and context review becomes a launchpad for the rest of the assessment: it anchors the EmpIA in the reality of the country and its labour force, and it gives a clear roadmap of what still needs to be learned before robust conclusions can be drawn.

3.2 Targeted data collection: sites, suppliers and context

Following the literature and context review, this section moves from “**what we know**” to “**what we still need**”: the specific data required for each **EmpIA** method, where it can realistically be obtained, and the practical considerations that determine data access and quality.

On-site / direct data collection

Data sources required

Anchored in administrative project evidence, this approach can rely on the following sources:

1. **Contractor and subcontractor employment records:** Payrolls, timesheets, human resources registers and/or site registers (ideally **monthly**, by contract package and work phase). Coverage should extend beyond the project owner to the **engineering, procurement and construction (EPC)** contractor, main contractors, subcontractors, and on-site service providers (for example: security, catering, cleaning, transport, logistics).
2. **Occupational safety and health (OSH) evidence (renewable energy-relevant):** Incident and accident logs/registers, plus evidence of OSH systems and practices (inductions, toolbox talks, permits to work). Pay particular attention to electrical safety, work at height, lifting/rigging, and confined-space risks where applicable.
3. **Training and skills documentation:** Training plans, attendance lists, induction records, certifications/competency evidence (for example: electrical authorisations, working-at-height, turbine-specific training). Focus on what training **actually occurred**, not only what was planned.
4. **Worker survey (short instrument):** Demographics and job-quality variables (hours, pay/earnings where feasible, contract type, social protection, OSH conditions/training, recruitment channel).
5. **Employer survey and interviews (short instrument):** Recruitment channels, subcontracting depth, use of local labour and **small and medium-sized enterprises (SMEs)**, inclusion measures, work organization and staffing changes by phase, and how specialist roles are filled (local versus imported expertise).
6. **Focus group discussions (FGDs):** With workers (and where relevant, nearby communities) to surface access barriers and issues that administrative records often miss (women, youth, local workers, informal arrangements, accommodation/ transport issues, grievance channels). Mixed methods are often complementary for deeper insight.
7. **Project planning documents:** Bill of quantities (BoQ), work programme/schedule, and contract packaging—mainly to interpret labour peaks, align employment to phases, and ensure coverage across packages (civil works, electrical, mechanical, grid connection, commissioning, O&M).

Practical considerations

- **Work with an in-country consultant/team.** Improves access negotiation, language coverage, and site-entry compliance, and helps manage contractor relationships without disrupting works.

- **Negotiate access early (and protect confidentiality).** Agree confidentiality terms and clarify that outputs are reported in aggregate (not compliance enforcement). Access to payroll/site records is often the binding constraint.
- **Map all employing entities from the start.** Owner/EPC, main contractors, subcontractors, and on-site service providers. Assign a focal person in each entity to supply records and clarify definitions (who counts as “on-site”, treatment of temporary/casual labour, etc.).
- **Use one standard template across all entities.** Capture headcount and hours worked by month (or quarter) with consistent disaggregation — especially gender — so the dataset flows directly into the indicator framework.
- **Triangulate systematically.** Reconcile contractor records with worker surveys, employer interviews, and BoQ/schedule timing — especially where casual/day labour or short-duration specialist teams are under-recorded.
- **Close discrepancies deliberately.** Where gaps are large, follow up with the relevant employer and document the reason (subcontracting gaps, missing service providers, short contracts, peak-period labour spikes).
- **Sampling must reflect the project structure.** Multiple packages/subcontractors and distinct phases; otherwise, you measure “one contractor at one moment” and report it as “the project.”
- **Enumerator profile matters.** For large sites, use a dedicated team that speaks the working languages, includes women enumerators (to interview women workers safely), and is trained on confidentiality and renewable energy OSH/site-entry protocols.
- **Do not disrupt works.** Schedule interviews around shift patterns, avoid high-risk operations, and align with health, safety and environment rules and personal protective equipment requirements.

Ex-post direct data collection: productive use of energy and local livelihood effects (where relevant)

Data sources required

- **Developer/operator data:** lists of connected or targeted productive users, tariffs/charges and payment modalities, consumption data where available, and any productive-use promotion/financing schemes.
- **Enterprise and farm surveys:** small businesses and farms using electricity productively (equipment, cold chain, processing, irrigation, services).
- **Key informant interviews:** operators, local authorities, business associations/cooperatives, women/youth groups, local finance providers.
- **FGDs and observation:** to surface constraints and detect unpaid work, real appliance use patterns, and safety practices.

Practical recommendations

- **Enumerator profile:** comfortable discussing income non-threateningly; able to work in low-literacy contexts; trained to recognize unpaid/family labour; gender-balanced team.
- **Minimize bias and burden:** keep tools focused; emphasize confidentiality (not taxation/enforcement).
- **Distributional coverage:** deliberately include women, youth and marginalized groups in sampling and FGDs; report results with clear disaggregation.
- **Attribution realism:** avoid attributing all livelihood changes to energy access alone; present ranges and narrative explanations where multiple factors matter. This aligns with the broader point that monitoring helps interpret contribution versus impact pathways.

Input-Output / Social Accounting Matrix (I-O/SAM) multiplier analysis

Data sources required

- **Most recent national Input-Output (I-O) table or Social Accounting Matrix (SAM)** with documentation (base year, sector detail, treatment of imports, household representation in the SAM).
- **Sector employment and compensation data** consistent with the table's sector classification (to construct employment and wage coefficients).
- **Project expenditure breakdown mapped to sectors:** phase-specific **capital expenditure (CAPEX)** and **operational expenditure (OPEX)**, informed by BoQs, contracts and financial plans; ideally separable into labour, materials, equipment, and services, and major procurement packages.
- **Domestic versus imported shares** for major items (critical to avoid overstating local impacts), plus price/wage indices if project-year values must be expressed in base-year terms.

Where to find I-O tables and SAMs

Usually these can be obtained via the national statistical office (national accounts), central bank, ministry of finance/planning, and sometimes universities or research institutes working with development partners. Start with the national accounts teams and request the table **plus metadata**.

Key considerations for credible results

- **Be explicit about assumptions and limits.** The I-O/SAM multiplier approach relies on assumptions such as fixed technical coefficients and no supply constraints, and results can therefore **overestimate employment effects** in some contexts.
- **Use primarily for short-run insights** unless you have strong justification and adjustments for structural change.
- **Handle “job quality” carefully.** Multiplier analysis often provides limited direct insight into job quality and may assume jobs resemble the sector average; if job quality is central, plan complementary primary data collection.

Advanced economic modelling like with the Structural Model for Sustainable Development (SMSD)

Data sources required

- A country-calibrated **Structural Model for Sustainable Development (SMSD)** (or equivalent) grounded in a base-year SAM and behavioural parameters.
- A SAM with sufficient detail for energy transition questions (construction, manufacturing, transport/logistics, energy supply chains), labour accounts by type, and household groups. The SMSD can represent labour types (including gender and formality status) if the data support it.
- A time-profiled investment and O&M path: annual spending by category and phase (CAPEX and OPEX), with domestic/import shares.
- Financing assumptions and scenarios: domestic versus external financing, taxes/transfers, tariff and subsidy assumptions where relevant, and complementary policy packages.

- Labour market information aligned to the model: employment/earnings by sector and labour category (skill/formality; ideally gender and age).

Key considerations

- **Confirm early whether a usable and recent model for the country exists.** If not, SMSD could be considered.
- **Data coherence is decisive.** The model's scope and credibility depend strongly on the quality and internal consistency of the underlying data package.
- **Scenario design carries most of the value.** Keep assumptions explicit, bounded, and decision-relevant; avoid assumptions that are unrealistic or too ambitious.
- **Keep boundaries clear.** Document what is measured directly on-site versus what is modelled economy-wide, and what is out of scope, to avoid double counting and misinterpretation.

3.3 Analysis and modelling

This section provides concise guidance on how to analyse and present employment effects once the indicators and methods have been selected. The objective is to produce results that are internally consistent, transparent, and clearly linked to the project and country context.

Structure the analysis by effect type and method

Not every EmpIA will analyze all employment effects. Begin the results chapter with a short statement that specifies **which effects are analyzed in this EmpIA**. Then structure the results section around the effects that are in scope.

For each effect type **included**, state:

- The **method(s)** used (on-site data, I-O/SAM, SMSD, qualitative);
- Whether results are measured, modelled, or a combination.

Use the indicator framework consistently

All results should follow the indicator framework defined in Section 2.4:

- Report employment mainly in **FTEs**, with headcounts as supporting information. Explain large differences (e.g. short contracts, seasonal work, high turnover).
- Present intensity indicators wherever possible: **FTEs per MW installed**, **FTEs per million invested**, and (for operating assets) **FTEs per GWh generated** in a typical year.
- For direct employment — and where data allow for other effects — cross-tabulate job numbers with key quality and inclusion dimensions (gender, age group, formality, skill/occupation), and report enhanced indicators where feasible (wages, working time, OSH, social protection, training/skills).
- Relate results explicitly to renewable-energy-specific characteristics (technology and configuration, phase mix, localisation and supply-chain origin) so differences in employment performance can be traced back to practical design and delivery choices.

Be explicit about assumptions and uncertainty

Because EmpIAs often combine observed data with model-based estimates, key assumptions and uncertainties must be summarized clearly:

- List the main assumptions behind multipliers and models (employment coefficients, domestic/import shares, induced-effect parameters, key SMSD behavioural assumptions).

- Note data gaps and how they were handled (extrapolation across sites or contract packages, use of national averages, proxy expenditure profiles, sample sizes).
- Where important effects cannot be quantified reliably, discuss them qualitatively rather than producing precise-looking numbers.

Compare results with the broader context

Regardless of the method, the key task is to **interpret results in light of the national context** — not just to report numbers, but to understand what they mean in this country, for this technology, at this time. Based on the method chosen, teams should systematically ask:

- **Does the structure of the results make sense?**
 - Are the main sectors where jobs appear consistent with the economic structure and the type of renewable energy project (e.g. civil works for hydro, construction and local services for most RE, specialized technical roles for wind, installers and local SMEs for solar)?
 - Are the magnitudes plausible compared to past projects or studies in similar contexts?
- **How do results relate to informality and labour market segmentation?**
 - Is the share of informal employment (directly and in affected sectors) broadly consistent with national patterns, or does the project appear to reinforce (or not) informality beyond what is typical?
 - Are there clear differences between groups (women/men, youth/adults, local/non-local, permanent/temporary) that mirror known labour market segmentation?
- **What do results imply for education, skills, health and social security?**
 - Given national data on education and skills, are the jobs created likely to be accessible to the local workforce, or mainly to better-educated or external workers?
 - In the sectors and occupations where jobs increase, what are typical OSH and health risks, and how strong is enforcement?
 - What is the usual social security coverage (pensions, health insurance, unemployment protection) for these sectors and employment statuses? Are most of the new jobs likely to be covered or unprotected?
- **Gender and age patterns**
 - Do the employment effects reproduce existing gender segregation (e.g. men in technical and construction jobs, women in lower-paid services), or do they show progress relative to national averages?
 - Are young workers gaining meaningful opportunities, or are most new jobs going to older and already-employed groups?
- **Alignment with national strategies and just transition goals**
 - Do the patterns of job creation and job quality support national objectives on employment, skills development, gender equality, OSH and social protection, including just transition and SDG commitments?
 - Where they do not, which complementary measures (training, stronger labour inspection, inclusion measures, social protection, SME and finance support, care policies) would be needed?

A short comparative paragraph for each major result helps answer two questions: (i) are patterns broadly consistent with what is known about the country and the renewable energy sector; and (ii) if not, what might explain the difference — and does that point to a risk, a good practice, or a design choice worth scaling.

The next step is to translate these context-specific findings into recommendations that fit the project's decision windows and the mandates of the actors who can implement them.

3.4 Conclusions and recommendations

Recommendations are developed by interpreting EmpIA findings in the local context — labour market conditions, availability of renewable-energy skills, local contractor and supplier capacity, and the reality of labour and OSH compliance — so they can distinguish structural constraints (e.g., limited domestic supply chains) from delivery choices (e.g., procurement, subcontracting, O&M strategy) and remain feasible. They are most useful when they convert results into decision-ready actions tailored to the actors who can implement them (government/regulators, financiers, project owners/EPCs, contractors, local SMEs, training providers, and communities). In practice, recommendations tend to be strongest when they:

- **Identify what drives outcomes:** technology/configuration (e.g., utility-scale vs rooftop solar; onshore vs offshore wind), scale and siting (including remoteness and grid-connection needs), phase mix (construction vs long-term O&M), procurement packaging and subcontracting, and domestic vs imported sourcing (equipment, specialist services, civil works).
- **Clarify what can still change and how and when:** levers available ex ante vs during implementation vs ex post (contract management, workforce planning, apprenticeship/certification pathways for electricians/technicians, supplier development for local installers and O&M providers, and decisions that shape O&M staffing models and localization over the asset life).
- **Set out realistic options vs the status quo:** what improves under feasible alternatives — e.g., procurement packaging that increases local SME participation, targeted training tied to commissioning and O&M roles, or stronger local service-provider networks — and what is likely if current practice continues (jobs quantity, quality, inclusion).
- **Flag key risks and mitigations:** informality, wage/working-time issues, OSH risks (electrical safety, work at height, lifting operations), low social protection, and exclusion of women/youth — paired with practical measures (contract clauses, supervision and reporting, worker voice/grievance channels, site facilities, targeted recruitment and retention supports).
- **Capture learning for a pipeline:** updates to repeatable tools — tenders and contract templates, minimum labour/OSH requirements, reporting formats for headcount/FTE and job quality by phase, contractor qualification criteria, and monitoring systems — to strengthen outcomes across future RE projects and across end-of-life activities (repowering, decommissioning, recycling) where relevant.
- **Connect to just transition priorities:** clarify how project choices affect distributional outcomes (who gains/loses, and where), and identify complementary measures — reskilling and certification pathways, social protection links, and support for affected workers/communities — to ensure the shift to renewables improves job quality and inclusion rather than reproducing existing vulnerabilities.

► 4. Reporting results: decision-ready outputs

EmpIA reporting is most effective when it packages evidence and recommendations in formats that match how renewable energy projects and programmes make decisions — balancing auditability for technical audiences with clarity for management, financiers, and policy stakeholders. The right mix of outputs depends on the EmpIA's purpose, audience, decision window (ex ante, during implementation, ex post), and analytical depth, and reporting tends to work best when it is proportionate rather than one-size-fits-all.

In many renewable energy EmpIAs, dissemination works well through a small set of complementary products, for example:

- **Technical report (reference product):** a record of what was measured and/or modelled, key assumptions (e.g., full-time hours standard, import shares, coefficients), limitations, and interpretation of findings in the country and labour-market context, with results clearly tagged by technology, configuration, phase, and geography.
- **Decision brief (policy/management note):** a short synthesis of headline results and what they imply for project design and delivery (procurement/contracting, localisation and supplier development, skills and training pathways, O&M strategy, OSH and labour compliance), including what is realistically adjustable and the main trade-offs.
- **Presentation package:** a concise deck to support stakeholder discussion, validate interpretation, and translate agreed recommendations into responsibilities, timelines, and follow-up indicators across the delivery chain (owner/EPC, contractors, training providers, regulators, financiers).

Where an EmpIA is rapid or primarily model-based, reporting can be lighter, with emphasis on assumptions, sensitivity, and clear interpretation. Where it includes primary verification (e.g., direct employment measurement, job quality, inclusion, localization/supply-chain mapping, or productive-use effects), fuller documentation typically strengthens credibility, supports replication, and enables learning across a pipeline or portfolio.

For templates, suggested structures, and illustrative examples from ILO and STRENGTHEN2 practice, see Annex 2.

► 5. Closing: making EmpIA findings usable in renewable energy projects

This guide positions EmpIA as a decision-and-learning instrument for renewable energy (RE): a way to convert investment into measurable employment value — more jobs, better jobs, and fairer access — by tightening the feedback loop between evidence and delivery. It sets out when EmpIA can be applied (ex-ante, during implementation, ex post), what to measure (direct, indirect/induced, and longer-term effects), how to assess employment quality (wages, working time, formality, OSH, social protection, inclusion), and how to build a credible evidence base (project administrative data, lean employer/worker instruments, and modelling where appropriate) that supports real course-correction.

Undertaking EmpIAs is especially relevant in RE because employment outcomes vary a lot as they are unusually sensitive to technology and configuration, lifecycle timing, and supply-chain structure. Jobs concentrate differently in solar PV, wind, and hydropower; they peak sharply during construction and commissioning, then shift to smaller but more durable O&M teams; and they are shaped by import intensity for core equipment, the depth of subcontracting, and the availability of certified electrical, mechanical, and safety-critical skills. These features mean that many decisions such as procurement approach, contractor eligibility and requirements, localization and supplier development strategy, training and certification pathways, O&M contracting models, and end-of-life planning — can materially change both the volume of work (FTE) and the quality and distribution of employment⁶.

Used well, EmpIA raises the employment return on investment by distinguishing where job creation is real versus assumed, where job quality falls short of decent-work expectations, and which constraints are binding (skills bottlenecks, local firm capacity, contracting incentives, OSH management, social protection coverage). That evidence supports targeted adjustments: aligning training to occupations that will actually be hired (and to the project schedule), structuring procurement so local SMEs can participate where technically feasible, tightening OSH controls in highest-risk tasks (electrical work, work at height, lifting operations), and designing O&M and repowering strategies that build stable local capabilities rather than one-off construction peaks⁷.

The cost of not doing EmpIA is not just informational — it is economic and political. Without it, projects can optimize for megawatts while leaving employment outcomes to chance: headline “jobs” claims can mask short-duration work, import leakage can silently displace domestic employment, job-quality failures can concentrate in subcontracting layers, and exclusion can persist because recruitment pipelines and workplace conditions were never designed to include women and youth. At portfolio scale, these missed opportunities compound, weakening credibility and leaving “just transition” commitments underpowered.

A strong EmpIA is proportionate to project scale and risk, explicit about assumptions and uncertainty, anchored in verifiable project evidence, and focused on decisions that can still make a difference. It closes with a small number of high-leverage measures — skills and certification pathways, inclusion provisions, OSH and social protection improvements, supplier development and localization choices, contracting/procurement adjustments, and (where relevant) end-of-life and circular-economy planning — paired with a lightweight monitoring set so learning is carried forward into future tenders, programmes, and investment plans.

⁶ International Renewable Energy Agency, & International Labour Organization. (2024). *Renewable energy and jobs: Annual review 2024*. International Renewable Energy Agency.

⁷ International Labour Organization. (2025). *Reference guide on employment impact assessment* (2nd ed.). <https://doi.org/10.54394/INYX6157>

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► Annexes

Annex 1. Strengths and limitations of employment impact assessment methodologies

On-site / direct data collection

Pros	Gives the most direct evidence on jobs actually created on site.
	Captures both job quantity and job quality, not just headcounts.
	Can show who benefited, including women, youth, local workers, and different occupations.
	Helps identify wages, hours, contract type, social protection, OSH conditions, and skills development.
	Can detect issues that records miss through worker surveys, interviews, and focus groups.
	Useful for monitoring implementation and adjusting project design while works are still ongoing.
	Allows triangulation between payrolls, site records, worker surveys, and employer interviews.
Cons	Can only be used for assessment taking place during implementation or immediately after completion, because once time passes, workers disperse, employment records become harder to access or verify, and recall becomes less reliable.
	Resource-intensive and time-consuming, often requiring local consultants, enumerators, and site access arrangements.
	Sampling can be difficult if the project has multiple sites, phases, packages, or subcontractors.
	Mainly captures direct employment effects and is weaker for other types of employment effects.

Input-Output modelling

Pros	The input-output table and social accounting matrix are relatively simple to use.
	They are available for most countries and thus widely applicable. And they are the basis for more advanced modelling methods, such as computable general equilibrium models.
	The underlying assumptions are easy to understand.
	When the necessary information is available, both methods are useful for analyzing other nonemployment-related effects (such as CO2 emissions and water requirements) and to understand the main interactions in an economic structure.
Cons	The analysis and the results provided are usually static.
	Because the construction of an input-output table and social accounting matrix is resource-intensive work, some of the data sets are usually outdated, especially in developing countries.
	Due to some of the assumptions implicit in the methodology, in particular that there are no supply constraints and that there are fixed technical coefficients (technological relationships), the results tend to overestimate the employment effects.
	In some cases, the sectors included in the matrix can be highly aggregated, with a wide variety of economic sub-activities aggregated in a single sector, which could distort results if the specific intervention analyzed is very specific and delimited.
	The methodology provides little insight into the quality of jobs created; typically, it is assumed that jobs created will be, on average, similar to the employment structure in a sector as a whole, so firms will not change the composition.
	The Leontief model is dual, so the price system is assumed to be independent of the quantity model. This feature means that price and demand shocks cannot be analyzed simultaneously.

Structural Model for Sustainable Development (SMSD)

Pros	The structural model for sustainable development strikes the balance between the complexity needed to capture real economy phenomena and the parsimony needed for its applications and the interpretation of results.
	Because it is a full macroeconomic simulation model, with extensive price and quantity interactions, it is potentially more realistic and able to answer more complex questions, when compared to the input-output and social accounting matrix multiplier analyses.
	It is flexible enough to adapt to any social accounting matrix, including publicly available ones, and to address a range of policy and development questions.
	It is a tool that puts employment and job quality, social and environmental effects and policy consistency on centre stage.
	It allows the construction of user-friendly interfaces that suit the capacity of the end-users.
Cons	The application and comprehensiveness of the structural model and the scope of analysis depend on the quality of the underlying data. Thus, data processing and production can be a demanding task for more complex analyses.
	As with other macro and sector-disaggregated models, technological change is difficult to estimate and to incorporate without relying on strong assumptions. There can be uncertainty over some estimated parameters, and sensitivity analysis may be needed.
	The sectors included in social accounting matrices can be highly aggregated, with a variety of economic sub-activities aggregated in a single sector. This can bias the results if the analysis is on specific sectoral interventions and no further disaggregation is possible.
	Because it is a quantitative simulation tool, it requires interventions (a policy or investment) to be fully quantified and translated into an analytical scenario that can be included in the model.
	The analytical structure of the model shares some elements with the input-output and social accounting matrix analyses as well as with the computable general equilibrium models. Yet, the full model and its behaviour depart from those standard approaches, and the interpretation of its results requires some model-specific knowledge.
	The model requires a computing platform, and it is currently available in Wolfram Mathematica language. Computing efficiency and accuracy will depend on the programming and software used.

Annex 2. Reporting and detailed guidance

This annex provides more detailed, optional guidance for teams producing EmpIA deliverables. The level of detail included should be calibrated to the depth of the assessment and audiences' needs.

- **Full EmpIA report (reference document)**

The full report is the primary reference product. It should provide sufficient detail to distinguish **what was measured versus modelled**, explain how results were derived, and set out implications for renewable energy investment decisions.

A practical structure is:

1. Introduction

The introduction is typically kept short and decision-oriented:

- **Context:** key labour market conditions (unemployment/underemployment, informality, women/youth participation) and the energy context (access and reliability gaps, generation mix, grid constraints, regional disparities).
- **Project essentials:** name/objectives; technology and configuration (solar PV, wind, hydropower; utility-scale versus distributed); capacity (MW), location, timeline; budget/funders; implementing agency and developers; delivery approach (EPC and O&M arrangements, contract packaging, subcontracting).
- **Policy relevance:** alignment with national energy/renewable energy strategy and cross-cutting priorities (employment/skills, gender and inclusion, occupational safety and health, local small and medium-sized enterprises, just transition, climate objectives).
- **Why the EmpIA now:** the decision point supported (for example procurement and contracting strategy, localisation feasibility, operations and maintenance model, programme scale-up) and the effects covered (direct, broader ripple effects, longer-term/local effects), including the main job-quality dimensions assessed.
- **Methods snapshot and data:** one paragraph on methods used and main data sources.
- **Roadmap:** one short paragraph on the structure of the report.

2. Project background

This section should include only what is needed to interpret employment results:

- **Objectives and results chain:** the main pathways through which the renewable energy investment could affect jobs (during works and beyond).
- **Funding, partners, and governance:** key actors and delivery arrangements.
- **Scope and geography:** sites/areas, technologies and configurations, and target populations.
- **Timeline and phases:** development → procurement → construction/installation → commissioning → operations and maintenance (and end-of-life activities where relevant).
- **Design and delivery choices that shape jobs:** contract packaging, subcontracting structure, localisation and supplier development, inclusion measures, occupational safety and health and training approach.
- **Expected beneficiaries:** workers, suppliers, and communities around the sites and service areas.

3. Methodology

Methods should be explained in plain language, with technical detail moved to annexes where needed:

- **Approach and methods:** which methods were used and why they fit the learning questions, timing, and available data.
- **Methods by effect type:** what measures direct jobs; what estimates broader ripple effects (if included); what assesses longer-term/local effects such as the productive use of energy (if included).

- **Data sources:** project documents and site records; surveys/interviews/focus groups (if used); national statistics; modelling inputs.
- **Assumptions and limitations:** key definitions (for example full-time equivalent, local/non-local), headline assumptions, and the main constraints affecting interpretation.

4. Results

Results are typically strongest when presented clearly and linked to actionable renewable energy decisions:

- **Employment impacts:** construction/installation versus operations and maintenance; direct versus broader effects (if included); short-run versus longer-run (if included). Full-time equivalents should be the main unit, with headcount and/or job-years used where helpful, and with clear time windows and phases stated.
- **Job quality and inclusion:** gender/youth participation, formality, wages/hours, occupational safety and health, skills/training – highlighting what differs materially from typical local conditions.
- **Sectoral dynamics and local linkages:** which sectors and business types gained most (for example construction inputs and services during works; installation, logistics and local services; enterprises using improved electricity after commissioning) and what this implies for local sourcing and capability constraints.
- **Interpretation (“so what?”):** how the magnitude and pattern of effects relate to the local labour market and economy, and how impacts differ by technology, configuration, siting, and delivery model (EPC and O&M arrangements; packaging/subcontracting choices).
- **Data visualization:** benchmark tables; bar charts (project versus national/sector/region); stacked bars (composition by gender/age/sector); wage distribution plots versus minimum wage/reference wages; and maps showing where jobs, contractors, or connected enterprises concentrate.
- **Benchmarks and uncertainty:** comparable intensities (per MW, per unit of spending, per GWh) where valid; key assumptions stated; main uncertainties summarized.

5. Conclusions, recommendations and proposed actions

This section should close with decision-ready implications tied to timelines:

- **Main takeaways:** the most decision-relevant findings (employment quantity, job quality, inclusion, sectoral/spatial patterns).
- **Recommendations:** what should change (or be defended) in technology and configuration choices, contracting/packaging, localisation and supplier development, operations and maintenance models, inclusion requirements, occupational safety and health/training, and local small and medium-sized enterprise measures.
- **Action plan by actor:** a short set of implementable actions, with responsible parties (energy ministry/regulator, utilities, developers, EPC and O&M contractors, training providers, financiers), timing (this cycle versus next), and a small set of indicators to track follow-through.

6. Annexes

Annexes are typically used for:

- Methodological detail and robustness checks (including sensitivity tests where relevant).
- Additional tables/figures/maps.
- Supplementary data (for example expenditure breakdowns, mapping tables, survey instruments, and expanded descriptive statistics).

Illustrative STRENGTHEN2 renewable energy EmpIA outputs (examples that can be consulted as references):

- Employment impact assessment of the Green Mini-Grid (GMG) Facility, Kenya
- Employment impact assessment of the productive use of energy (PUE) of the Green Mini-Grid (GMG) Facility, Kenya
- Employment impact assessment of the GMG Facility: additional 20 mini-grid sites in Turkana County, Kenya

- Employment impact assessment of the Ecler Ivoire project in Côte d'Ivoire
- Ex-ante employment impact assessment of the SMART GRID project in Senegal
- **Policy brief / decision note (condensed product)**

The policy brief condenses the EmpIA into a small set of messages and options. It should answer: **What was learned, and what should change in how renewable energy investments are designed and delivered?**

A suggested structure is:

- **Title + 4 key messages** (jobs, job quality, inclusion, risks, most effective levers).
 - **Why this matters now** (the decision window: upcoming procurement, technology and configuration choices, O&M contracting, financing approval).
 - **What the EmpIA covered** (effects included/excluded; timing; methods in one paragraph).
 - **What was found** (top-line full-time equivalents/headcount; who benefited; job-quality highlights; productive-use/livelihood findings if assessed).
 - **What it means for renewable energy design and delivery** (3–6 concrete actions, each with “who does what”).
 - **Assumptions, limitations and next steps** (what is robust, what is indicative, what should be monitored).
- **Presentation and stakeholder validation package**

Results are typically strengthened when presented to stakeholders who shape renewable energy employment outcomes – energy ministries and regulators, utilities and implementing agencies, developers and contractors, social partners, local authorities, affected communities, and (where relevant) financiers. The purpose is to surface operational realities and build shared ownership, so results are used.

A practical session format

- Start with the **decision questions**: what choices are coming up – at policy, budget, programme or project level (for example investment allocations, procurement and contracting rules, localisation strategy, training and certification pathways, supervision and occupational safety and health enforcement).
- Present **headline findings** (not every table): direct jobs and job quality; sectoral/local linkages; broader and/or longer-term effects that were assessed.
- Use structured prompts to turn findings into action:
- Do the patterns align with local labour supply, contractor practice, and delivery constraints?
- Who benefits and who is left out (women, youth, local small and medium-sized enterprises) – and what barriers are binding?
- What risks could undermine outcomes (occupational safety and health, informality, wage compliance, import leakage, skills bottlenecks)?
- What can realistically be changed now (contract clauses, packaging, supervision, training, grievance/occupational safety and health systems), and what requires the next budget/procurement cycle?

Close with an action ownership plan

- Agreed actions are captured, owners assigned (which institution does what), timing specified (this cycle versus next), and **2–5 indicators** identified to track follow-through – so the EmpIA becomes a living input to renewable energy policy and delivery rather than a one-off report.

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