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BRIEF

# POWERING WOMEN'S CLIMATE-RESILIENT LIVELIHOODS

## A GENDER-RESPONSIVE DECISION FRAMEWORK FOR VALUE CHAINS, LOW-CARBON TECHNOLOGY AND FINANCE

Federal Ministry for Economic Cooperation and Development

NEW ZEALAND FOREIGN AFFAIRS & TRADE Manatū Aorere

Sweden Sverige

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

# SUMMARY

This brief presents a decision-making framework developed under the EmPower: Women for Climate-Resilient Societies programme[1] (EmPower) in Asia and the Pacific to advance gender-responsive climate action and accelerate women's economic empowerment through low-carbon technology adoption. The framework provides practical steps to identify climate-vulnerable value chains with high relevance for women-led enterprises, evaluate renewable energy or low-carbon technologies suitable for women-led enterprises and design gender-responsive financing strategies that strengthen resilience, productivity and women's economic empowerment. This guidance supports practitioners and decision-makers in government, civil society and financial institutions to foster climate-resilient, women-led enterprises across Asia and the Pacific. It is designed not only for programme implementation, but also to inform climate policy, local economic planning and investment decisions under national adaptation, just transition and green growth agendas.

**Key highlights:**

- Aligns with national and regional climate priorities, including the Sustainable Development Goals (SDG5, SDG7, SDG13), the United Nations Framework Convention on Climate Change Gender Action Plan (UNFCCC GAP), and Association for Southeast Asian Nations (ASEAN) frameworks.
- Promotes tested renewable energy and low-carbon technologies tailored for women-led enterprises.
- Offers a pathway to scale inclusive solutions for a just and sustainable transition.

This tool can be applied by governments, financial institutions, civil society organizations and development partners to:

- **Identify** climate-vulnerable value chains where women's economic participation is significant.
- **Analyze** how gender inequalities shape women's risks, roles and opportunities within those value chains.
- **Assess** renewable energy and low-carbon technologies suited to women-led enterprises and local market realities.
- **Design** financing approaches that are relevant, accessible and affordable for women.
- **Inform** climate policy implementation, livelihood programming and investment decisions under national and local climate priorities.

1 Jointly implemented by UN Women and the UN Environment Programme, with support from the Governments of Germany, New Zealand, Sweden and Switzerland, the EmPower: Women for Climate-Resilient Societies (EmPower) programme aims to strengthen gender equality and human rights in climate change and disaster risk actions in the Asia and the Pacific region.

# INTRODUCTION

Women and marginalized groups across Asia and the Pacific are disproportionately affected by climate change, environmental degradation and disasters, particularly those working in informal, climate-vulnerable sectors like agriculture. Despite their critical contributions in key value chains, women's roles remain underrecognized, limiting their opportunities for building resilience and economic empowerment. Renewable energy and low-carbon technologies can reduce climate-related production risks, improve resource efficiency, and enable women-led enterprises to sustain and upgrade livelihoods under changing climatic conditions. However, women continue to face structural barriers across finance, asset ownership, technology access, market participation and decision-making power, limiting both uptake and equitable benefit. These exclusions reduce the effectiveness and sustainability of climate interventions. The EmPower decision-making framework addresses these gaps through a structured, inclusive approach built on four pillars: 1) value chain identification; 2) gender analysis; 3) technology evaluation; and 4) gender-responsive financing. It also offers practical entry points, technology options and design considerations to support governments and partners in scaling gender-responsive, climate-resilient programming that promotes women's leadership in the just transition. This framework is intended to help bridge the persistent gap between gender commitments in climate policy and practical investment choices at enterprise and value-chain level.

# FRAMEWORK OVERVIEW

The decision-making framework is comprised of four components:

**Value chain identification**

**Gender analysis**

**Technology market assessment and evaluation**

**Gender-responsive financing**

### 1. Value chain identification

Identify value chains where women's participation is significant and where climate hazards threaten productivity, resource access, continuity of production or market stability. Prioritization should assess both economic relevance and exposure to climate risks such as drought, flooding, heat stress, ecosystem degradation or supply-chain disruption.

## 2. Gender analysis

Map the roles of women-led enterprises in the prioritized value chains and identify the climate and gender-related barriers they face. Use participatory methods and stakeholder engagement to capture diverse experiences and context-specific challenges. The analysis should also examine how climate impacts interact with existing gender inequalities to deepen unpaid care burdens, mobility constraints, safety risks and exclusion from adaptation resources. Key questions to guide the analysis include:

- What is the scale of participation by women within the value chain?
- What is their socioeconomic profile (e.g., income levels, social or ethnic background)?
- What roles do women occupy (e.g., production, processing, distribution, sales)?
- What are women's income levels, and do they retain control over their earnings?
- What types and sizes of enterprises do women operate and under which business models (e.g., household, cooperative, micro/small/medium-sized)?
- How are women entrepreneurs affected by climate change impacts?
- What gender-based constraints do women face and what are the implications for their economic empowerment?
- Who controls productive assets, technology decisions and income across the value chain?
- Where are women concentrated in lower-value functions, and what barriers prevent movement into higher-value segments?

## 3. Technology market assessment and evaluation

Identify the range of renewable energy and low-carbon technologies available (e.g., at regional, national or local scale), focusing on technologies relevant to women-led enterprises in the prioritized value chains. Analyze key factors such as:

- **Availability and accessibility** – including local manufacture, distribution channels, cost and after-sales service
- **Technical performance and suitability** – with attention to the operational requirements and relevance for different types and sizes of women-led enterprises
- **Policy and regulatory environment** – including existing incentives, standards and potential barriers to deployment
- **Adoption barriers** – such as affordability, social norms, technical literacy and infrastructure constraints

- **Capacity-building needs** – identifying specific support required by women entrepreneurs for effective technology uptake, operation and maintenance.

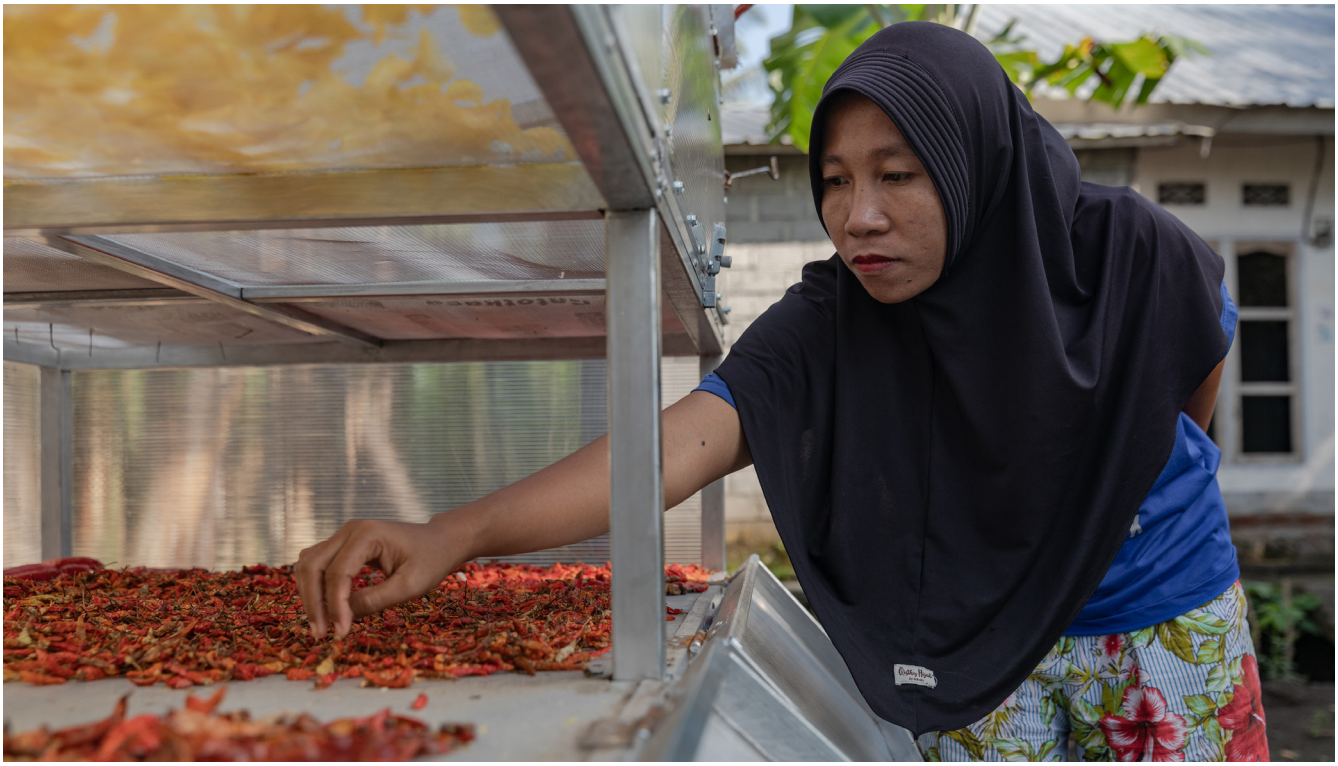
Evaluate the technologies identified against a set of indicators (shown in the table below) to assess their potential to:

i. Promote women's economic empowerment

ii. Create value for women-led enterprises, and

iii. Build women's climate resilience.

Technologies should also be assessed for risks of maladaptation, including unsustainable resource use, ecosystem stress or creation of new financial burdens for women-led enterprises.



A chilli farmer in East Lombok, Indonesia dries harvested chillies using a solar dryer, ensuring reliable drying despite unpredictable weather conditions. Photo: UN Environment Programme/Nyimas Laula

| Technology evaluation checklist | |
|---|---|
| **Criteria** | **Indicators** |
| Climate resilience benefits | Does the technology:<br>• Enable income stability or diversification in response to climate shocks?<br>• Enable continuity of production of goods or services during climate-related events?<br>• Enhance access to critical resources, such as water and energy?<br>• Reduce livelihood vulnerability to specific climate hazards?<br>• Reduce greenhouse gas (GHG) emissions?<br>• Promote adaptation (poverty reduction, food security, improved health outcomes)? |
| Women's empowerment benefits | Does the technology:<br>• Support women´s agency (participation and leadership) within the value chain?<br>• Strengthen women´s income security through:<br>  • Direct economic benefits: increased income?<br>  • Indirect economic benefits: i.e. time saving and the creation of jobs for local women?<br>• Improve the quality or safety of women's work? |
| Upgrading potential[2] | Does the technology create value for women-led enterprises through:<br>1. **Process upgrading:** making production more efficient, using less energy or doing things faster, which helps lower costs. For example, when women-led businesses use solar or other low-carbon technologies, they often spend less on electricity and other running costs.<br>2. **Product upgrading:** making products better or offering new varieties that customers value more. For example, using solar dryers to improve the quality and variety of dried goods, helping women entrepreneurs earn more.<br>3. **Functional upgrading:** enabling a business to take on a new role in the value chain that allows it to charge more. For example, a fisherwoman who buys a solar dryer and starts selling dried fish can make more money than only selling raw fish.<br>4. **Channel upgrading:** selling the same product in a new market, like moving from local sales to exporting internationally. |

2 Renewable energy and low-carbon technology adoption by women entrepreneurs can be envisaged as a business upgrading strategy. Upgrading can enable women's income to be increased; and refers to the acquisition of technological and market capabilities that can improve the competitiveness of women-led businesses and enable them to access viable value chains or improve their position in existing chains. Adapted from FAO. 2018. *Developing gender-sensitive value chains – Guidelines for practitioners*.

## 4. Gender-responsive financing

Integrate gender-responsive principles into climate finance architecture to ensure women benefit from the just transition. By embedding **relevance**, **accessibility** and **affordability** into financial instruments and strategies, programmes can unlock women's leadership, improve access to renewable and low-carbon technologies and enhance inclusion in climate funds, carbon markets and just transition efforts.

**Gender-responsive principles for climate finance**

**Relevance:** Does the financing directly support women's participation in climate-resilient value chains and reduce their vulnerability to climate risks? Investments should enhance productivity, quality and income while dismantling structural gender barriers, such as lack of collateral, limited access to financial services and weak decision-making power.

**Accessibility:** Are financial mechanisms adapted to women's lived realities? This includes designing climate finance instruments with inclusive eligibility criteria, simplified application processes and attention to gaps in digital and financial literacy, as well as using trusted delivery channels such as cooperatives, women's associations and local intermediaries that women already engage with.

**Affordability:** Are financing terms appropriate for women's financial capacities, particularly for micro-entrepreneurs, smallholder farmers and women-led cooperatives? Options like concessional loans, group-based lending or de-risking tools[3] can improve uptake and ensure gender-equitable access to transition finance.[4] Blended finance, guarantees, first-loss mechanisms and group-based models may be needed where conventional finance products remain inaccessible.

3 Instruments that reallocate, share, or reduce investment risks to make lending viable for underserved groups. Adapted from the World Resources Institute. 2022. *How to De-risk Low-carbon Investments*.

4 Transition finance is understood as finance deployed or raised to implement their net-zero transition, in line with the temperature goal of the Paris Agreement and based on credible corporate climate transition plans. Adapted from OECD. 2022. *OECD Guidance on Transition Finance: Ensuring Credibility of Corporate Climate Transition Plans, Green Finance and Investment*.

# APPLYING THE FRAMEWORK TO EMPOWER PHASE II

The decision-making framework has been applied during Phase II of the *EmPower: Women for Climate-Resilient Societies* programme to guide country teams and implementing partners, including non-governmental organizations and financial institutions, in Bangladesh, Cambodia, Indonesia, the Philippines and Viet Nam.

### EmPower Phase II (2023–2027)

In 2018, UN Women and the UN Environment Programme (UNEP) initiated the EmPower: Women for Climate-Resilient Societies programme (EmPower) with support from the Government of Sweden to accelerate gender-responsive and human rights-based climate actions in Bangladesh, Cambodia, Viet Nam and in the wider Asia-Pacific region. Now in its second phase (2023–2027), the programme has expanded to include Indonesia and the Philippines with support from the Governments of Germany, New Zealand, Sweden and Switzerland.

Under the EmPower programme, the establishment of gender-responsive finance for renewable energy and low-carbon technologies for climate-resilient livelihoods is a key outcome. Specifically, targets for EmPower Phase II include:

- a **USD 20 million investment** in gender-responsive renewable energy entrepreneurship will be mobilized
- **110,000 women** will benefit from climate-resilient livelihoods and services
- **1,600 women micro, small and medium-sized enterprises** will build climate-resilient livelihoods using renewable energy

# THE RESULTS

### 1. Priority value chains

**Rice, fish, chicken and weaving were identified as highly relevant value chains for women-led enterprises across Bangladesh, Cambodia, Indonesia, the Philippines and Viet Nam.** These value chains were prioritized because they combine high participation of women, strong exposure to climate-related disruption, and practical opportunities for renewable energy and low-carbon technology adoption that can improve productivity, resilience and enterprise upgrading. Millions of women, particularly those from low-income, rural, Indigenous and ethnic minority communities, are engaged in these value chains. They work predominantly in production and processing roles, as rice farmers and millers, fish processors and sellers, weavers and backyard chicken producers, and in some cases as business-owners. Women operating in these value chains face diverse gender-specific and climate-related challenges that limit their opportunities for economic and social empowerment.

## 2. Key constraints faced by women entrepreneurs

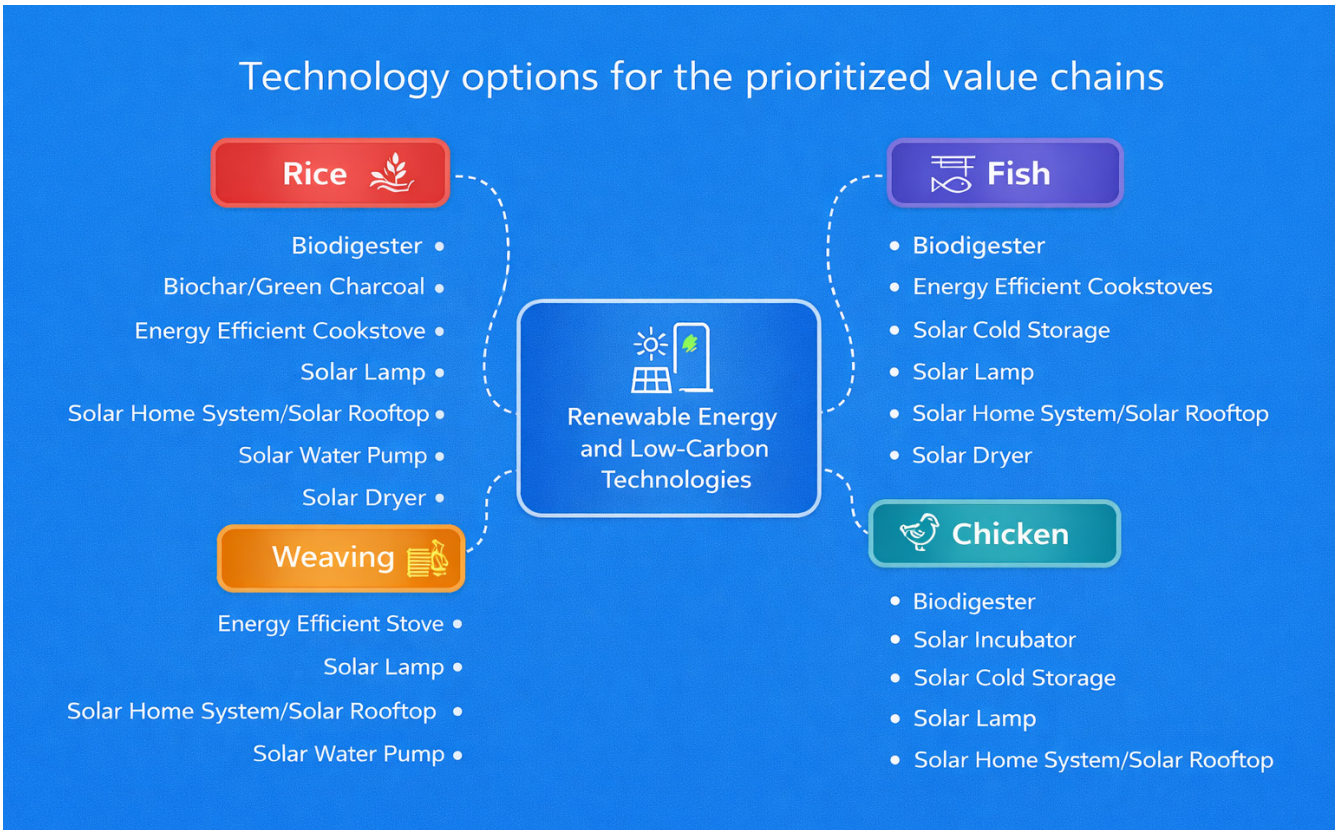
**Women face multiple gender-based constraints in the rice, fish, chicken and weaving value chains.** *Asymmetrical power relations* limit women's visibility and recognition, which often results in unpaid or underpaid work when compared to men. This was found to be especially the case in the fish and rice value chains where women's work is not usually distinguished from their other household responsibilities and as such is not directly remunerated. The lack of recognition for women's work can restrict their access to government support, training and extension services. In Bangladesh, for example, women are automatically registered on government databases as housewives even when they contribute to family fishing activities. And in Indonesia, it can be a long process for women to change their identity on their ID cards to "fisherwomen". *Women have limited access to key resources*, including, education and skills-development specifically relating to appropriate technologies, as well as market linkages and financial services, including control over earned income. *Cultural and social norms* often define what roles women can or cannot perform. For example, cultural beliefs that women should not be aboard fishing vessels or should have limited social interactions beyond the home can restrict women's options for generating an income. In certain value chains, women face *health and safety risks*, such as exposure to saline water (e.g., among river fishing women in Bangladesh, where prolonged contact can lead to skin and reproductive health issues), air pollution (e.g., from fossil-fuel powered machinery), harmful chemicals (e.g., in spinning mills) or unsafe machinery (e.g., the use of old boiler furnaces in rice mills). *Socioeconomic differences* can also determine gender-constraints, with wealthier and more educated women tending to face fewer barriers.

**Climate-related challenges faced by women in the rice, fish, chicken and weaving value chains** primarily relate to reduced fish stocks and rice yields, risks to chicken health (such as extreme heat or disease), and limited access to raw materials (such as cotton and hemp) used for weaving. Besides this, women-owned assets, such as fishing equipment and chicken coops, can also be damaged or destroyed. For many women, climate change is resulting in lower productivity and profits or a loss of livelihood income altogether.

**Climate change impacts also exacerbate existing gender inequalities**, heightening risks of gender-based violence and undermining women's livelihoods. As climate-related shocks, such as droughts, floods and resource scarcity, intensify, women, particularly those in rural and low-income communities, often bear increased burdens of unpaid care work, are forced to migrate, or must travel longer distances for water, firewood or food. These conditions heighten exposure to sexual violence, harassment and exploitation, especially in displacement settings or informal labour markets. Loss of income and weakened economic independence can increase women's vulnerability to intimate partner violence and reduce their ability to leave abusive situations.

## 3. The technology options

From EmPower technology market assessments carried out in Bangladesh, Cambodia, Indonesia, the Philippines and Viet Nam, nine renewable energy and low-carbon technologies were identified as relevant for women enterprises engaged in the rice, fish, chicken and weaving value chains. They are solar rooftop or small solar systems, solar lamps, biodigesters, energy efficient stoves, solar water pumps, solar cold storage, solar dryers, biochar/green charcoal and solar incubators. All nine technologies can be promoted to a wide-range of women-led enterprises within the chicken, rice, fish and weaving value chains, as summarized in the diagram below.

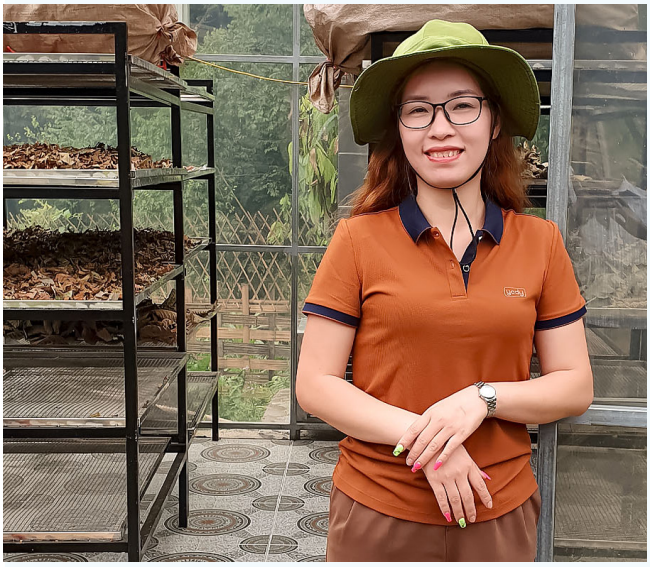



These nine technologies also have wider applications among women-led enterprises operating in other climate-vulnerable value chains beyond the four prioritized in the EmPower assessment, as summarized in the table below. These insights are relevant for programme developers, practitioners and decision-makers across government, donor agencies, civil society and financial institutions working at the nexus of energy access, sustainable livelihoods and gender-responsive climate action. Technology suitability will vary by enterprise scale, climate context, local market conditions and women's control over productive decisions; therefore technology promotion should always be linked to local assessment.

| Technology | Examples of enterprise |
|---|---|
| Biodigester | Agriculture, livestock, poultry and aquaculture enterprises from household to community to large-scale. |
| Solar home system/ solar rooftop | Wide application for a range of household and commercial set-ups using solar appliances, including farming, food & beverage, livestock, retail shops, charging stations, manufacturing or processing units, ecotourism, as well as household-based enterprises such as weaving, sewing, handicrafts and hairdressing. |
| Solar water pump | Primarily in agricultural enterprises, solar water pumps can also be used to support livestock, poultry and aquaculture. |
| Solar dryer | Enterprises selling agricultural, livestock, fishery and non-timber forest products (such as mango, spices, banana, pineapple, mushrooms, herbs, pickles, rice, tea, meat and fish). Suitable for individual farmers and cooperatives, as well as small and large-scale processing factories. |
| Green charcoal/ biochar | Enterprises in the agriculture, forestry, aquaculture and food-processing sectors, where organic waste is readily available, such as coconut, straw, rice, bamboo, tea clippings and wood. |
| Energy efficient cookstoves | Cooking-based enterprises or enterprises that entail cooking, such as parboiling rice before drying, boiling linen and thread for weaving or fish frying and smoking. |
| Solar cold storage | Enterprises that involve the production of perishable items, such as vegetables, chicken, meat, fish and dairy, as well as horticultural products. Due to high cost, a shared system accessible to numerous women would be more affordable. |
| Solar incubator | Poultry raising or egg production, as well as insect production, from small-scale backyard setups to medium-sized breeding units to large commercial farms. |
| Solar lamps | Any micro or small enterprise, especially in rural or off-grid communities. Solar lamps can be useful for retail shops, small production units or home-based businesses (weaving, raising livestock, cooking) where women manage daily operations and require basic energy solutions to improve their productivity. |

The process of evaluating the nine technologies using a set of indicators related to climate resilience, women's economic empowerment and business value creation was somewhat constrained by the limited availability of relevant and disaggregated data. In particular, there was a notable lack of evidence on the impact of technology adoption on women-led enterprises and on the role of these technologies in enhancing climate resilience. Despite these data gaps, **four technologies emerged as having the highest potential to support women-led businesses within the prioritized value chains: rooftop or small-scale solar systems, solar water pumps, solar dryers (see box), and biodigesters.**

**Strengthening women's climate resilience and economic empowerment through solar dryers: A case study from Viet Nam's tea sector**



In Viet Nam, in Bac Kan Province, the Nghia Ta Cooperative, previously reliant on sun and firewood to dry tea products, invested in a solar drying house, with support from EmPower. Within just five months, the cooperative tripled its productivity and profits, while customers rated the tea quality significantly higher. This growth enabled the cooperative to create more jobs for women in the community. With 100 per cent energy savings, the loan for the solar drying house is expected to be repaid within 1.5 years.

In terms of **climate resilience benefits**, the transition to a solar drying house resulted in reduced GHG emissions (solar power replacing firewood) and offered a reliable source of clean energy. The use of the solar drying house also decreased the risk of climate-related damage to the tea products and also provided a more stable and consistent income.

**Women's empowerment benefits** included an enhanced sense of agency, reflected in increased social status and greater economic independence among the cooperative's women members. Income security and quality of work improved, as women had more time for other tasks and social activities, and were less exposed to firewood smoke and direct sunlight. Business growth led to the creation of additional jobs for women, while physical strain was reduced, as manual handling of tea leaves was no longer required.

**The solar dryer technology demonstrated clear value creation for women-led enterprises through multiple forms of value chain upgrading**. Process upgrading was evident through reduced drying time and increased production efficiency, which contributed to lower unit costs. Product upgrading was achieved as the solar drying technology improved hygiene; protecting against ultraviolet light exposure, rain and insects; and enhanced product quality in terms of taste, aroma and colour through a controlled environment. Functional upgrading was also observed, with the solar drying enterprise enabling women to move up the value chain by expanding their roles beyond production into higher-value activities like distribution and sales.

## 4. Applying gender-responsive financing principles

Applying the gender-responsive principles of relevance, accessibility and affordability to EmPower's portfolio of financial products and services has yielded valuable insights for programme design and implementation.

During Phase I of the programme, some women-led enterprises reported a number of challenges in accessing finance. These included complex loan application procedures, misalignment between loan

sizes or interest rates to women's borrowing capacity, stringent eligibility criteria, and a weak link between credit provision and complementary support such as training and capacity-building. These findings highlight the importance of designing financial products that are tailored to the needs and realities of women entrepreneurs, especially from low-income and marginalized backgrounds.

Under Phase II, EmPower is working with financial institutions in participating countries to expand the availability of loans for women-led enterprises adopting clean and renewable energy and low-carbon technology. Some financial institutions have introduced tailored lending schemes that explicitly target low-income and marginalized women entrepreneurs, increasing the inclusiveness of the initiative. Loan sizes in participating countries are largely aligned with the costs of the nine key technologies identified by the programme; including solar dryers, biodigesters, efficient cookstoves, ensuring affordability and women's uptake of these solutions. Large- scale loans are also made available and are well-suited for small to medium enterprises, women-led cooperatives and associations interested in making collective investments. Loan terms, including repayment periods and interest rates, were also found to be broadly consistent with gender-responsive financing principles, offering further evidence of progress towards greater inclusion.

Applying a gender-responsive lens also pointed to alternative financing models that EmPower or other organizations could explore to expand access and uptake. These include pay-per-use schemes and community- or cooperative-based financing mechanisms that mitigate or distribute risk while enabling broader participation. Other innovative financial instruments worth considering include sustainability-linked loans and results-based climate finance, which provide financial incentives or payments to clean technology users. These could help cover loan repayments or ongoing costs such as maintenance and repair, further encouraging and accelerating clean technology adoption by women-led enterprises. While promising financing models are emerging, sustained evidence is still needed on repayment performance, business growth and resilience outcomes among different categories of women-led enterprises.

The decision-making framework is not only an analytical tool; it is actively applied across EmPower's regional and country programming, with governments, ecosystem enablers, CSOs and financial institutions. Implementation and monitoring efforts are ongoing to assess its impact on renewable energy uptake, women's enterprise growth and the resilience of climate-vulnerable communities. We now have proof that investing in women through tailored value chain, technology and financing strategies delivers tangible climate and development results. The opportunity ahead lies in scaling these solutions and institutionalizing this framework within policies, budgets and systems to accelerate a just and gender-responsive transition.

The actions outlined below are targeted towards government ministries and departments, financial institutions, donors, civil society, academia and development partners. To drive meaningful change, these recommendations must be embedded in climate policy, livelihood programmes and finance strategies. Uptake can be accelerated through enabling policies, cross-sectoral partnerships, and by integrating the framework within national adaptation and just transition plans.

# RECOMMENDATIONS

## 1. Programme design and policy priorities

- Identify and prioritize value chains where women's participation is significant and climate risks threaten livelihoods, productivity and market continuity.
- Conduct gender analysis using participatory methods to identify roles, opportunities and constraints within value chains, paying attention to income levels, ethnic and social background, and informality.
- Leverage women's groups, associations and cooperatives to reach scale.

## 2. Technology and capacity support

- Evaluate and promote high-potential technologies in line with women's business models and operational realities.
- Ensure integrated support, including technology promotion and tailored capacity-building on its use, maintenance, safety and business integration to improve uptake and sustainability.

## 3. Inclusive finance

- Co-create financial products with women entrepreneurs and financial institutions that are relevant, accessible and affordable.
- Pilot and scale community-based and cooperative financing models that pool risk and enable shared investments.
- Explore carbon finance schemes that incentivize women's adoption of renewable energy and low-carbon technologies by reducing net costs or generating performance-based payments.

## 4. Policy and institutional uptake

- Integrate the decision-making framework in climate, energy and livelihoods planning instruments, including nationally determined contributions (NDCs), national adaptation plans (NAPs), just transition strategies, local climate plans and livelihood recovery programmes.
- Build institutional capacity to apply the framework across sectors and programming cycles, from assessment to design, implementation and monitoring.

## 5. Monitoring and evaluation

- Strengthen monitoring systems to track not only technology deployment, but also its effects on women's income, decision-making power, safety, workload and resilience.
- Use sex-disaggregated and qualitative data to capture transformational change and inform iterative programme improvements.

- Partner with national statistics offices and academic institutions to address data gaps on the impact of technology adoption on women's empowerment and resilience.

# CONCLUSION

The opportunity to implement this decision-making framework lies in its potential to catalyze transformative and climate-resilient development at scale. With global commitments to just transitions, inclusive climate finance and the SDGs, this is a timely tool to guide governments, donors and practitioners from intention to implementation. The framework not only bridges the policy-to-practice gap but provides a blueprint for unlocking investments in women's climate leadership. Applying this decision-making framework has clear implications for governments, development partners and financial institutions.

First, it can be used to inform the design and implementation of **NAPs and NDCs** by embedding sector-specific, gender-responsive technology pathways and value chain interventions.

Second, it highlights practical entry points for advancing **just transition strategies** that centre women as key actors in the shift towards green, inclusive economies. The framework also provides actionable recommendations for the design of **gender-responsive climate finance instruments**, such as proposals to the Green Climate Fund (GCF), by identifying the technologies, sectors and financing models that effectively reach and empower women.

Lastly, they can support governments and institutions in applying **gender-responsive public procurement** measures, such as preferential sourcing or supplier development programmes, to integrate women-led renewable energy enterprises into national and local supply chains. Scaling this approach will require institutional uptake, stronger evidence systems and deliberate investment in women not only as beneficiaries of climate action, but as economic actors shaping resilient transitions.