

Site Selection for Solar Manufacturing: A Guide to Nepal's Special Economic Zones

SEZ Strategy, Site Selection & Export Potential

Content Partner: J. v. G. technology GmbH

Turnkey solar module production lines — since 1997

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Technical Overview: Nepal's Special Economic Zones for Solar Manufacturing



Created as part of the PVKnowHow Knowledge Network



Prepared by J.v.G. Technology GmbH



European specialists in turnkey solar module production lines

Nepal's Solar Manufacturing Opportunity

Market Context

- Nepal imports nearly all solar modules — no domestic production at scale
- Domestic solar demand growing rapidly, driven by rural electrification targets
- India's import-substitution policy creates adjacent export opportunity
- MENA markets seeking certified, cost-competitive module sources

Strategic Window

- Nepal sits between two large energy markets: India and Central Asia
- SEZ framework now operational — foreign investment eligible
- Labor cost advantage over established Asian manufacturing hubs
- Government prioritizing export-oriented industrial policy

Why Site Selection Matters

Infrastructure Dependency

- Solar module production requires stable, uninterrupted power supply
- Lamination and cell-string processes are sensitive to voltage fluctuations
- Water access, waste management, and road connectivity are non-negotiable

Logistics Cost Sensitivity

- Raw materials (glass, cells, backsheet, EVA) are import-dependent
- Distance to border crossings directly impacts landed cost and lead time
- Export routing must align with target market customs corridors

Regulatory & Incentive Access

- SEZ location unlocks tax holidays, duty exemptions, and streamlined procedures
- Non-SEZ sites face higher administrative burden and fewer incentive tiers
- Site selection determines customs classification and re-export eligibility

Overview of Nepal's SEZ Framework

Legal Foundation

- Special Economic Zone Act provides the legislative basis
- Nepal SEZ Authority (SEZA) administers approvals and operations
- One-stop service for investment registration, permits, and licensing
- Foreign ownership up to 100% permitted for export-oriented industries

Operational SEZs (Relevant Sites)

- **Bhairahawa SEZ** — oldest and most developed; near India border
- **Simara SEZ** — newer zone; direct road and air access
- Both zones designated for manufacturing and export industries
- Additional zones under development in Panchkhal and Dhangadhi

Infrastructure Requirements for PV Manufacturing

Power Supply

- Minimum: 1–3 MW continuous demand for a 50–100 MW/yr module line
- Stable voltage required for laminator platens ($\pm 5^{\circ}\text{C}$ uniformity)
- Backup generation or SEZ-dedicated substation strongly preferred

Factory Space

- Cleanroom-grade assembly area for cell stringing and lay-up
- High-ceiling clearance for automated laminator and conveyor systems
- Warehouse space for glass, backsheet, and finished module storage

Water & Waste

- Cooling water required for laminator and EL testing equipment
- Chemical waste protocols for encapsulant and flux handling
- SEZ zones typically provide centralized utility connections

Digital & Telecom

- PLC-based production control requires reliable data connectivity
- Remote diagnostics and ERP integration depend on stable internet
- Fiber connectivity available in both Bhairahawa and Simara SEZs

Logistics & Border Access

1

Raw Material Inbound

Glass, EVA, backsheet, cells imported via Indian border crossings – Sunauli (Bhairahawa) and Birgunj (Simara)

2

In-Country Movement

Road transport within Nepal is primary mode; both SEZ sites sit on key highway corridors with domestic trucking access

3

Export Routing

Finished modules exit via same border crossings into India or onward to third-country markets through Indian ports (Kolkata, Nhava Sheva)

i Nepal has no deep-water port. All containerized exports depend on Indian transit – making border crossing efficiency a critical operational variable.

Labor Availability

Cost Advantage

- Nepali manufacturing labor costs are significantly below Chinese, Vietnamese, and Indian benchmarks
- Minimum wage in industrial zones remains among the lowest in South Asia
- Large pool of young, trainable workforce in Terai region near both SEZs
- Proven turnkey manufacturing concepts include full on-site team training — no prior experience required

Skill Considerations

- Solar module assembly is process-driven — trained in weeks, not years
- Semi-automatic lines reduce dependence on highly skilled operators
- Technical management roles may require expatriate or returnee expertise initially
- Engineering graduates available from Tribhuvan University and Pokhara University

Government Incentives

Tax Holidays

- Up to 10-year income tax exemption for export-oriented SEZ industries
- 50% tax reduction for subsequent years
- Dividend tax exemptions for SEZ-based investors

Customs & Duties

- Import duty exemption on raw materials and machinery for production
- No VAT on inputs used in export manufacturing
- Re-export of finished goods eligible for duty-free treatment under SAFTA

Investment Facilitation

- One-stop service window within each SEZ for registration and approvals
- Land lease arrangements available through SEZA authority
- Foreign currency repatriation permitted for export earnings

Bhairahawa SEZ Analysis

Strengths

- Oldest operational SEZ — proven administrative track record
- Direct road link to Sunauli border crossing (India)
- Gautam Buddha International Airport adjacent — air freight capable
- Established industrial tenants provide supply chain ecosystem
- Largest plot availability of active Nepali SEZs

Constraints

- Power supply historically intermittent — industrial backup required
- Border crossing congestion at Sunauli can increase lead times
- Zone saturation risk as existing tenants expand
- Distance from Kathmandu logistics hub (~280 km)

📄 **Assessment:** Bhairahawa SEZ offers the most mature operational environment and the clearest export corridor — the preferred site for a first-phase solar module facility.

Simara SEZ Analysis

Strengths

- Newer zone — modern infrastructure and utility planning
- Simara Airport nearby — dual road and air access
- Close proximity to Birgunj/Raxaul border crossing — major India trade corridor
- Birgunj ICD (Inland Container Depot) enables containerized export
- Competitive land lease rates vs. Bhairahawa

Constraints

- Fewer established tenants — less developed supply ecosystem
- Utility connections still being expanded for heavy industrial use
- Administrative processes less tested at scale
- Requires independent infrastructure investment for large-format production

Assessment: Simara SEZ is the stronger candidate for a second-phase or parallel facility — particularly if the Birgunj ICD corridor continues to expand.

Comparative Advantages: Bhairahawa vs. Simara

Criterion	Bhairahawa SEZ	Simara SEZ
Operational Maturity	High — longest-running SEZ	Medium — newer, modernized
Border Access	Sunauli / India (road)	Birgunj ICD / India (road + container)
Airport Proximity	Gautam Buddha Intl. (adjacent)	Simara Airport (nearby)
Power Reliability	Variable — backup needed	Newer grid infrastructure
Land Availability	Larger plots available	Competitive lease rates
Supply Ecosystem	Established industrial tenants	Early-stage development
Best Suited For	Phase 1 anchor facility	Phase 2 or parallel expansion

Export Requirements & Risks

Certification Requirements

- IEC 61215 / IEC 61730 certification required for EU and most regulated markets
- BIS certification required for modules sold into India
- MENA markets increasingly require IEC compliance and third-party testing
- Proven turnkey concepts with TÜV-certified designs reduce certification lead time

Trade & Logistics Risks

- Indian transit dependency creates single point of failure for all exports
- Border delays and customs disputes can disrupt just-in-time delivery schedules
- India's domestic content requirements (DCR) may restrict Nepal-origin modules in some tenders
- Currency risk: USD-denominated module prices vs. NPR operating costs

Mitigating Factors

- SAFTA agreement provides preferential tariff access within South Asia
- Nepal-India Trade Treaty offers additional facilitation mechanisms
- Diversified target market strategy (Nepal + India + MENA) reduces single-market exposure

Key Project Data

Solar ...

Scale

Export-oriented solar
module manufacturing
facility

Autom...

Factory Type

Automated solar module
production — semi or fully
automated lamination lines

2 SEZs

Main Regions

Bhairahawa SEZ (Phase 1) /
Simara SEZ (Phase 2)

3 Mark...

Target Markets

Nepal (domestic) · India ·
MENA region

 **Investment Focus:** Export-oriented manufacturing · **Source:** PVKnowHow / J.v.G. Technology GmbH · **Framework:** Nepal SEZ Act / SEZA

Nepal Solar Manufacturing: Strategic Assessment

1 SEZ framework is investable

Legal, fiscal, and administrative infrastructure is in place — foreign investment is eligible and tax incentives are real

2 Bhairahawa is the logical first site


Operational maturity, border access, and airport proximity make it the lowest-risk initial location

3 Export viability depends on certification and routing

IEC and BIS compliance are non-negotiable; Indian transit dependency must be managed contractually

4 Proven turnkey concepts reduce execution risk

An experienced European turnkey provider with a proven manufacturing concept shortens the path from investment to production

 Source: PVKnowHow Knowledge Network · Technical input: J.v.G. Technology GmbH (European specialists in turnkey solar module production lines, since 1997)

About the Content Partner

J. v. G. technology GmbH – The DESERT Company

Founded in 1997 in Bavaria, Germany. Family-owned engineering company specializing in turnkey solar module production lines.

More than 90 factory projects delivered worldwide.

On-site team training included – no prior manufacturing experience required.

Key areas:

Turnkey PV manufacturing lines | DESERT Technology® |
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Source:

<https://www.pvknowhow.com/countries/nepal/site-selection-nepal-sezs-solar-manufacturing>

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