District Pathways to Integrate Youth Into Green Economy and Sustainable Livelihoods

DISTRICT MARDAN
KHYBER PAKHTUNKHWA, PAKISTAN

A Policy-Relevant Analysis and Strategic Recommendations

Research and Report
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EXECUTIVE SUMMARY

District Mardan in Khyber Pakhtunkhwa represents a strategic focal point for youth integration into green economy pathways. With a population of 2.74 million according to the 2023 Census, Mardan possesses significant demographic potential given that approximately 64 percent of its population is under 30 years of age. The district's location along the M1 Motorway corridor, proximity to the Rashakai Special Economic Zone under CPEC, and its status as a major agricultural producer create a distinctive confluence of economic opportunities aligned with sustainable development objectives.

This assessment identifies four priority value chains that offer the highest potential for youth integration into green economy livelihoods: solar energy and renewable technologies, climate smart agriculture and agro processing, digital economy and IT services, and livestock value addition with green practices. These pathways leverage Mardan's comparative advantages including the highest solar radiation levels in KPK at 4.99 kWh per square meter per day, an established agricultural base producing over 1.36 million tons of sugarcane annually, and strategic connectivity to emerging industrial zones and digital infrastructure.

The analysis reveals that youth unemployment in Pakistan stands at 9.86 percent for the 15 to 24 age group, with significant skills mismatches between educational outputs and labor market requirements. Only 18 percent of graduates currently meet industry skill requirements, while an estimated 1.5 million technical positions remain vacant nationally. These gaps present both challenges and opportunities for targeted interventions in Mardan that can align youth capabilities with emerging green economy demands.

Key Findings

Domain	Key Findings
Demographics	Population 2.74 million with 64% under 30 years; 83.48% rural population; literacy rate 55.79% with significant gender gap of 25.65 percentage points
Economic Structure	Agriculture employs 41.6% of workforce; major crops include sugarcane (1.36M tons), wheat, maize, tobacco; 185 industrial units in district
Green Energy Potential	Highest solar radiation in KPK at 4.99 kWh/m2/day; KPK Solar Scheme targeting 100,000 households; PKR 55 billion allocated for government building solarization
Strategic Infrastructure	Rashakai SEZ: 1,000 acres with 80% local employment commitment; 50,000 projected direct jobs; CPEC flagship project with Phase 1 inaugurated July 2023
Digital Economy	Pakistan ranks 4th globally in freelancing; IT exports exceeded USD 3.5 billion in 2024; DigiSkills 3.0 offers 3 million free trainings over 3.5 years

Priority Value Chains Identified

Priority	Value Chain	Youth Potential	Green Economy Linkage
1	Solar Energy and Renewables	Very High: Installation, maintenance, sales, enterprise development	Direct: Clean energy generation, reduced emissions, rural electrification
2	Climate Smart Agriculture	High: Precision agriculture, organic inputs, processing	Direct: Reduced chemical inputs, water efficiency, soil health improvement
3	Digital Economy and IT Services	Very High: Freelancing, e-commerce, digital marketing	Indirect: Low carbon employment, location independence, reduced commuting
4	Livestock Value Addition	High: Technical services, processing, marketing	Direct: Biogas from manure, improved feed efficiency, reduced methane

1. DISTRICT CONTEXT

1.1 Geographic Profile

District Mardan occupies a strategically significant position in the settled districts of Khyber Pakhtunkhwa, situated approximately 60 kilometers northeast of Peshawar and 90 kilometers from the federal capital Islamabad via the M1 Motorway. The district extends between latitudes 34 degrees 05 minutes to 34 degrees 32 minutes North and longitudes 71 degrees 48 minutes to 72 degrees 25 minutes East, encompassing a total area of 1,632 square kilometers. Its borders connect with Buner District to the east, Malakand to the north, Swabi to the southeast, Nowshera to the south, and Charsadda and Mohmand districts to the west and northwest respectively.

The district's physiography divides into two distinct zones. The northeastern portion comprises mountainous terrain characterized by small hills, with Pajja or Sakra reaching 2,056 meters and Garo or Pato at 1,816 meters representing the highest elevations. The southwestern region consists predominantly of fertile alluvial plains interspersed with low hills. Geological evidence suggests this plain once formed a lake bed that gradually filled with sediment deposits from surrounding highland streams. This alluvial composition contributes to the exceptional agricultural productivity that defines Mardan's economic base.

Administrative Structure

Administrative Unit	Number	Details
Tehsils	5	Mardan, Takht Bhai, Katlang, Rustam, Lund Khwar
Union Councils	69	Distributed across five tehsils
Households	400,904	Average household size 6.85 persons
Major Towns	6	Mardan City, Takht Bhai, Par Hoti, Rustam, Sheikh Maltoon, Katlang

1.2 Climatic Conditions

Mardan experiences a hot semi arid climate classified as BSh under the Koppen system, characterized by hot summers and mild winters with moderate precipitation concentrated during the monsoon season. The mean annual temperature averages 22.2 degrees Celsius, with summer maximums frequently exceeding 40 degrees Celsius during May through July and winter minimums dropping to near freezing in December and January. Annual precipitation averages approximately 559 millimeters, with the majority occurring during the July to September monsoon period.

The district possesses exceptional solar energy potential, recording the highest solar radiation levels in Khyber Pakhtunkhwa at an average of 4.99 kWh per square meter

per day. Peak solar insolation occurs during June, creating optimal conditions for photovoltaic applications across agricultural, residential, and commercial sectors. This solar resource endowment positions Mardan as a priority district for renewable energy integration within provincial green economy strategies.

Climate vulnerability assessments indicate increasing exposure to heat stress, erratic rainfall patterns, and flash flooding risks. Pakistan ranks among the ten most climate vulnerable nations globally according to the Global Climate Risk Index, having experienced losses exceeding USD 30 billion from the 2022 floods alone. Agricultural projections suggest potential cereal yield reductions of 15 to 20 percent and livestock productivity declines of 20 to 30 percent under current climate trajectories, underscoring the imperative for climate smart livelihood transitions.

1.3 Demographic Composition

The 2023 Population and Housing Census enumerated District Mardan's population at 2,744,898 persons residing in 400,904 households, representing an annual growth rate of 2.46 percent since the 2017 census. The sex ratio stands at 105.44 males per 100 females, while the urban rural distribution shows 16.52 percent urban and 83.48 percent rural populations. The overwhelmingly rural character of the district's population shapes livelihood patterns and service delivery requirements.

Indicator	Male	Female	Total
Total Population	1,406,148	1,338,750	2,744,898
Urban Population	232,748	220,594	453,342
Rural Population	1,173,400	1,118,156	2,291,556
Under 10 Years	403,185	383,175	786,360
Literacy Rate	68.31%	42.66%	55.79%

The demographic profile reveals a substantial youth bulge with approximately 28.69 percent of the population under 10 years and an estimated 64 percent under 30 years of age. This demographic dividend presents both opportunity and challenge: opportunity in the form of a large potential workforce for emerging economic sectors, and challenge in the need to generate sufficient productive employment. The literacy rate of 55.79 percent masks significant gender disparities, with male literacy at 68.31 percent substantially exceeding female literacy at 42.66 percent, a gap of nearly 26 percentage points that constrains women's economic participation. Pashto serves as the predominant language, spoken by 99.07 percent of the population.

2. ECONOMIC PROFILE

2.1 Economic Structure Overview

Mardan's economy demonstrates a diversified structure anchored in agriculture while incorporating significant manufacturing, services, and emerging industrial activities. Agriculture employs approximately 41.6 percent of the district workforce and generates the primary economic output through intensive irrigated cultivation enabled by the Upper and Lower Swat Canal systems. The manufacturing sector encompasses agro processing, textiles, light engineering, and construction materials, while services include retail trade, transport, professional services, and an expanding digital economy.

The district's strategic position along major transportation corridors and proximity to the Rashakai Special Economic Zone positions it for economic transformation. The CPEC initiative has elevated Mardan's investment profile, with the Rashakai SEZ representing one of the flagship industrial projects designed to attract manufacturing investment in textiles, automotive, pharmaceuticals, electronics, food processing, and electric vehicle components.

2.2 Agricultural Sector

Agriculture constitutes the foundation of Mardan's economy, with the district ranking among the most productive agricultural zones in Khyber Pakhtunkhwa. The fertile alluvial plains support year round cultivation through the extensive canal irrigation network, enabling double and triple cropping patterns. Major crops include sugarcane, wheat, maize, tobacco, rice, and various vegetables, with sugarcane predominating as the highest value crop given the presence of sugar processing infrastructure.

Major Crop Production

Crop	Season	Production	Market Orientation
Sugarcane	Kharif	1.36 million tons	Sugar mills
Wheat	Rabi	91,000 tons	Local and regional
Maize	Kharif	89,600 tons	Feed and food
Tobacco	Rabi	Significant	Khyber Tobacco Company
Vegetables	Multiple	Various	Local markets
Citrus	Perennial	Rustam Valley	Provincial markets

The Sugar Crops Research Institute established in 1952 and upgraded in 1981 operates in the district, conducting research on sugarcane varieties, cultivation practices, and processing technologies. The institute's development of chipped bud technology reportedly reduces seed costs by up to 90 percent, demonstrating the potential for research driven productivity improvements. Horticulture, particularly

citrus cultivation in the Rustam Valley, provides diversification opportunities with oranges, plums, pears, persimmons, and other fruits produced for provincial markets.

2.3 Manufacturing and Industry

The district hosts approximately 185 industrial units spanning multiple manufacturing categories. Agro processing represents the largest industrial subsector, including sugar mills, flour mills, rice husking units, and edible oil extraction. The Khyber Tobacco Company operates significant processing facilities linked to the local tobacco cultivation. Marble processing units leverage deposits from adjacent areas, with an estimated 90 percent of processed marble destined for domestic markets. Additional manufacturing includes furniture production, handicrafts, and light engineering workshops serving agricultural equipment needs.

Industry Category	Major Products	Employment Significance
Agro Processing	Sugar, flour, rice, edible oil	Major employer; seasonal peaks
Tobacco	Processed tobacco products	Linked to local cultivation
Marble	Tiles, slabs, decorative items	Growing sector; export potential
Textiles	Garments, embroidery	Women employment opportunities
Construction Materials	Bricks, blocks, aggregates	Construction sector linkage
Light Engineering	Agricultural equipment, repairs	Skilled labor requirement

2.4 Rashakai Special Economic Zone

The Rashakai Special Economic Zone represents a transformative economic development initiative under the China Pakistan Economic Corridor framework. Located approximately 20 kilometers from Mardan city along the M1 Motorway, the 1,000 acre industrial zone is being developed through a joint venture between the Khyber Pakhtunkhwa Economic Zones Development and Management Company and the China Road and Bridge Corporation. Phase 1 was inaugurated in July 2023 ahead of the December target, signaling accelerated development momentum.

The SEZ targets investment in textiles and apparel, automotive assembly and parts, pharmaceuticals, electronics, food processing, and electric vehicle manufacturing. The zone's 80 percent local employment commitment and projected 50,000 direct jobs carry significant implications for youth employment in Mardan and surrounding districts. Indirect employment through supply chains, services, and induced economic activity could multiply these figures substantially. The SEZ's focus on manufacturing sectors aligned with global value chains creates pathways for skilled and semi skilled youth employment that complement green economy objectives through cleaner production technologies and environmental compliance requirements.

Parameter	Details
Total Area	1,000 acres in three phases
Location	M1 Motorway, 20 km from Mardan city
Development Partners	KPEZDMC and China Road and Bridge Corporation
Target Industries	Textiles, automotive, pharmaceuticals, electronics, food processing, EV manufacturing
Employment Commitment	80% local employment; 50,000+ projected direct jobs
Phase 1 Status	Inaugurated July 2023

3. YOUTH EMPLOYMENT DYNAMICS

3.1 Labor Force Context

Pakistan's labor force comprises approximately 71.8 million persons according to the Labour Force Survey 2020 to 2021, with 67.3 million employed and 4.5 million unemployed, yielding an overall unemployment rate of 6.3 percent. However, youth unemployment presents a more challenging picture, with the 15 to 24 age cohort experiencing unemployment rates of 9.86 percent according to 2024 ILO estimates. This elevated youth unemployment reflects structural mismatches between educational outputs and labor market requirements, limited formal sector job creation, and constraints on geographic mobility for employment.

Gender disparities in labor force participation remain pronounced. Female labor force participation stands at 22.63 percent compared to 84.79 percent for males, placing Pakistan among the lowest globally for women's economic engagement. Of workers in the informal sector, 81 percent are women, typically engaged in home based work with limited earnings potential and no social protection coverage. These patterns hold particular relevance for Mardan given prevailing social norms around women's work and mobility.

Indicator	Value
National Youth Unemployment (15 to 24)	9.86% (ILO 2024)
Male Labor Force Participation	84.79%
Female Labor Force Participation	22.63%
Women in Informal Sector	81% of informal workers
Youth Not in Employment, Education, or Training	Approximately 50%
Graduates Meeting Industry Requirements	Only 18%
Technical Positions Vacant Nationally	1.5 million estimated

3.2 Skills Mismatch Challenge

A persistent skills mismatch constrains youth employment outcomes across Pakistan. Research indicates that only 18 percent of graduates possess skills meeting industry requirements, while an estimated 1.5 million technical positions remain unfilled nationally due to qualified candidate shortages. This paradox of simultaneous youth unemployment and technical vacancies points to fundamental disconnects between educational curricula, vocational training, and evolving labor market demands.

The Technical and Vocational Education and Training sector in Khyber Pakhtunkhwa operates through KP TEVTA with 106 institutes across the province. The EU and GIZ supported TVET Sector Support Programme has strengthened competency based training approaches and industry linkages. However, green economy skills

remain underrepresented in training curricula, creating gaps in solar installation, precision agriculture, digital economy, and other emerging sectors where demand exceeds supply.

3.3 Gender Dimensions

Social norms rooted in Pashtunwali cultural frameworks significantly shape women's economic participation in Mardan. Mobility constraints, gender segregated workplace expectations, and family permission structures limit women's access to employment outside the home. Home based work in embroidery, stitching, and handicrafts represents the dominant modality for women's economic activity, typically through piece rate arrangements with intermediaries that capture significant value while workers receive minimal returns.

These constraints do not preclude women's integration into green economy pathways but rather indicate the need for compatible modalities. Digital economy work offers location independence compatible with mobility constraints. Collective enterprise models such as women's producer groups can aggregate activity within socially acceptable parameters. Agricultural value addition activities conducted at home or in women only processing centers align with prevailing norms while generating income. Solar home systems reduce household energy burdens that disproportionately affect women's time allocations. Identifying norm compatible entry points represents a strategic imperative for inclusive green economy transitions.

4. GREEN ECONOMY CONTEXT

4.1 Provincial Green Economy Initiatives

Khyber Pakhtunkhwa has positioned itself as a leader in Pakistan's green transition through multiple policy initiatives and investment programs. The provincial Energy Department oversees renewable energy expansion, with KP possessing an estimated 30,000 MW hydropower potential alongside substantial solar and wind resources. The Pakhtunkhwa Energy Development Organization coordinates renewable energy project development and investment facilitation.

The KPK Solar Scheme represents a flagship initiative for residential solarization, targeting 100,000 households through tiered subsidy structures. Tier 1 households consuming up to 100 units receive systems at zero markup, Tier 2 households consuming up to 200 units receive 50 percent cost sharing, and Tier 3 households consuming up to 300 units access subsidized financing. Priority groups including widows, orphans, minorities, and disabled persons receive enhanced support. The government has also allocated PKR 55 billion for solarization of 13,000 government buildings, creating substantial installation and maintenance employment opportunities.

Tier	Consumption Category	Support Mechanism
Tier 1	Up to 100 units monthly	Zero markup financing
Tier 2	Up to 200 units monthly	50% cost sharing
Tier 3	Up to 300 units monthly	Subsidized financing
Priority Groups	Widows, orphans, minorities, disabled	Enhanced support packages
System Specifications	2kW systems with batteries, fans, converters	Complete installation included

4.2 Climate Commitments and Carbon Markets

Pakistan's updated Nationally Determined Contributions commit to 60 percent emissions reduction with international support, 60 percent renewable energy in the power mix, and 30 percent electric vehicle penetration by 2030. The 2025 Carbon Asset Inventory initiative maps renewable energy projects for carbon credit certification under Verra, Gold Standard, and GCC frameworks, creating potential revenue streams from emissions reductions. These commitments create policy momentum and financing opportunities for green economy investments at provincial and district levels.

Climate smart agriculture practices including precision irrigation, improved seed varieties, integrated pest management, biogas production from agricultural residues, and organic certification offer pathways to reduce agricultural emissions while improving productivity and resilience. The provincial agriculture department

promotes these practices through extension services, though adoption rates remain limited by awareness, financing, and technical support constraints.

4.3 Digital Economy Opportunities

Pakistan ranks fourth globally in freelancing, with IT exports and freelance earnings exceeding USD 3.5 billion in 2024. The digital economy offers location independent employment particularly suited to youth in areas with limited formal sector job availability. The Ministry of IT and Ignite's DigiSkills program has delivered over 4.5 million free trainings since 2018, with DigiSkills 3.0 launched in 2025 offering an additional 3 million trainings over 3.5 years.

Digital economy work represents a green livelihood pathway given its low carbon footprint, minimal resource consumption, and elimination of commuting emissions. For youth in Mardan, platforms like Upwork, Fiverr, Freelancer, and PeoplePerHour provide access to global markets for services including graphic design, digital marketing, web development, content writing, data entry, and emerging fields like AI prompt engineering and UI/UX design. Mobile payment systems including JazzCash and Easypaisa facilitate cross border earnings receipt.

Digital Pathway	Training Duration	Income Potential	Entry Requirements
Graphic Design	3 to 6 months	Medium to High	Creativity, software skills
Digital Marketing	3 to 6 months	Medium to High	Communication skills
Web Development	6 to 12 months	High	Programming aptitude
E Commerce	2 to 4 months	Variable	Platform knowledge
Content Writing	2 to 3 months	Medium	English proficiency
Virtual Assistance	1 to 2 months	Low to Medium	Basic computer literacy
Mobile App Development	6 to 12 months	High	Programming, UI/UX

5. PRIORITY VALUE CHAIN ANALYSIS

5.1 Selection Methodology

Four priority value chains have been identified through application of multi criteria assessment considering employment generation potential, youth compatibility, green economy contribution, market growth dynamics, and implementation feasibility within Mardan's specific context. The selected value chains leverage district comparative advantages while addressing documented youth employment challenges and provincial green economy policy priorities.

Criterion	Weight	Application
Employment Potential	High	Number of youth jobs creatable
Youth Compatibility	High	Entry barriers, skill requirements
Green Economy Contribution	High	Emissions reduction, sustainability
Market Growth	Medium	Demand trajectory, price stability
Feasibility	Medium	Capital, infrastructure, support

5.2 Value Chain 1: Solar Energy and Renewable Technologies

Rationale

Mardan's status as the district with highest solar radiation in Khyber Pakhtunkhwa at 4.99 kWh per square meter per day creates a natural advantage for solar energy development. The KPK Solar Scheme's target of 100,000 household installations, combined with the PKR 55 billion government building solarization program, generates substantial demand for installation, sales, and maintenance services. Agricultural applications including solar powered irrigation, crop drying, and cold storage expand the addressable market further. Youth can enter this value chain at multiple points from technical installation roles to sales and marketing to enterprise ownership, with relatively modest capital requirements and trainable skill sets.

Youth Entry Points

Entry Point	Capital	Youth Potential	Training Needs
Installation Technician	Low	Very High	3 to 6 month certification
Sales and Marketing	Minimal	High	Product knowledge, sales skills
Maintenance Technician	Low	High	Troubleshooting, electrical
Enterprise Owner	Medium	Medium	Business management

Component Assembly	Low	Medium	Technical training
System Designer	Low	Medium	Engineering fundamentals

Technical skills requirements include basic electrical knowledge, photovoltaic system design principles, safety certification, and troubleshooting capabilities. Training programs of 3 to 6 months duration can prepare youth for installation technician roles, with progression pathways to system design and enterprise development. The government building solarization program offers particular opportunity for youth enterprises to secure installation contracts through appropriate procurement modalities.

5.3 Value Chain 2: Climate Smart Agriculture and Agro Processing

Rationale

Agriculture's 41.6 percent workforce share and Mardan's production base of over 1.36 million tons of sugarcane, 91,000 tons of wheat, and 89,600 tons of maize establish the sectoral foundation for climate smart agriculture pathways. The Sugar Crops Research Institute provides institutional capacity for technology development and dissemination. Climate vulnerabilities including water stress, heat exposure, and pest pressures create demand for adaptive practices that simultaneously improve productivity and environmental outcomes. Youth can provide precision agriculture services, organic input supply, solar irrigation installation, biogas system operation, organic certification coordination, and improved seed distribution.

Green Agriculture Opportunities

Opportunity	Youth Roles	Environmental Benefit
Precision Agriculture	Drone operators, soil testers, data analysts	Optimized inputs, water efficiency
Organic Input Production	Bio fertilizer, biopesticide production	Reduced chemicals, soil health
Solar Irrigation	Installation, maintenance technicians	Eliminated diesel dependence
Biogas Systems	Plant operators, maintenance	Waste conversion, reduced methane
Organic Certification	Coordinators, auditors, aggregators	Premium markets, chemical reduction
Improved Seed Distribution	Entrepreneurs, extension agents	Climate resilient varieties

The district's agricultural extension infrastructure and research institution presence provide foundations for technology transfer and skill development. Youth agri tech entrepreneurs can serve as bridges between research advances and farmer adoption, creating service based businesses around precision agriculture, input

supply, and value addition. The transition to climate smart practices addresses both environmental imperatives and market opportunities through premium pricing for certified products.

5.4 Value Chain 3: Digital Economy and IT Services

Rationale

The digital economy pathway offers distinctive advantages for youth in Mardan including location independence that overcomes geographic isolation, minimal capital requirements, access to global markets, free training through DigiSkills and similar platforms, and compatibility with social norms constraining women's mobility. Pakistan's fourth place global ranking in freelancing and IT export growth exceeding USD 3.5 billion demonstrate market viability. The pathway's low carbon footprint qualifies it as a green livelihood given minimal resource consumption and eliminated commuting emissions.

Youth can enter through multiple service categories matched to aptitudes and training investments. Graphic design and digital marketing require 3 to 6 month training investments with medium to high income potential. Web development and mobile app development require 6 to 12 month training but offer high income potential. Entry level pathways including data entry, virtual assistance, and content writing require minimal training while building foundational platform experience. DigiSkills courses cover freelancing fundamentals, digital marketing, graphic design, SEO, WordPress, e commerce, AI applications, and UI/UX design.

5.5 Value Chain 4: Livestock and Dairy Value Addition

Rationale

Livestock contributes approximately 40 percent of agricultural GDP in Khyber Pakhtunkhwa, with substantial buffalo, cattle, goat, sheep, and poultry populations in Mardan. The district hosts 223 registered poultry farms serving regional markets. Global halal food market size of USD 3 trillion and growing demand from Gulf countries, Afghanistan, and Central Asian markets create export oriented opportunities. Green practices in livestock including biogas from manure, improved feed management, water efficiency measures, and halal organic certification address environmental concerns while accessing premium markets.

Green Livestock Opportunities

Opportunity	Description	Youth Roles
Biogas Production	Converting manure to clean fuel and organic fertilizer	Plant operators, installation technicians
Improved Feed Management	Balanced rations reducing emissions per output unit	Feed formulation, distribution

Water Efficiency	Recycling systems, efficient watering	System installation, management
Halal Organic Certification	Accessing premium markets	Certification coordinators, auditors
Solar Cold Chain	Solar powered milk cooling	Installation, operation
Veterinary Services	Community para veterinarians	Service providers, input supply

Youth integration into livestock value chains can occur through technical service provision including veterinary paraprofessional services, artificial insemination, and feed formulation advisory. Processing roles in milk collection, chilling, and dairy product manufacturing offer employment in emerging commercial operations. Marketing functions including quality certification, market information services, and digital platforms for livestock trading represent entrepreneurship opportunities. The biogas pathway specifically merges waste management, clean energy, and organic fertilizer production, creating multiple value streams from livestock enterprises.

6. INSTITUTIONAL ECOSYSTEM

6.1 Government Institutions

Multiple government departments and programs operate in Mardan with relevance to youth integration into green economy pathways. The district administration provides coordination functions across sectors, while line departments implement programs in their respective domains. The agriculture and livestock departments deliver extension services and input support. The energy department implements the KPK Solar Scheme and related renewable energy initiatives. KP TEVTA operates vocational training institutes with potential for green skills curriculum integration.

Institution	Focus Areas	Relevance to Youth Green Economy
District Administration	Coordination, planning	Program convergence, monitoring
Agriculture Extension	Technology dissemination	Climate smart practice adoption
Livestock Department	Animal health, production	Green livestock practices
Sugar Crops Research Institute	Sugarcane research	Climate resilient varieties
KP TEVTA	Vocational training	Green skills development
Energy Department	Renewable energy programs	Solar scheme implementation
Labor Department	Employment services	Job matching, skills certification

6.2 Development Partners

Several development partners implement programs in Khyber Pakhtunkhwa with relevance to youth and green economy objectives. The EU and GIZ support TVET sector strengthening through competency based curriculum development and industry linkages. UK FCDO through the SEED program supports renewable energy investment and carbon market development. The World Bank finances multiple operations in skills development, private sector growth, and climate resilience. USAID programs address agricultural trade and value chain development. FAO and UNDP support climate smart agriculture and youth focused climate action respectively.

Partner	Program Focus	Youth Green Economy Relevance
EU/GIZ	TVET Sector Support Programme	Skills development, industry linkages
UK FCDO/SEED	Renewable energy, carbon markets	Green finance, certification
World Bank	Skills, private sector, climate	Investment, policy support
USAID/PATTA	Agricultural trade, value chains	Market access, export orientation

FAO	Climate smart agriculture	Technology transfer, capacity
UNDP	Youth, climate action	Youth employment, resilience

6.3 Private Sector and Financial Services

The Khyber Pakhtunkhwa Board of Investment and Trade promotes investment attraction and business facilitation. The Khyber Chamber of Commerce and Industry provides business association services. Private sector actors in priority value chains include the Khyber Tobacco Company, sugar mills, marble processors, and emerging renewable energy companies. The Rashakai SEZ development consortium represents major private investment aligned with manufacturing sector growth.

Financial services availability includes commercial bank branches, microfinance institutions, and digital payment platforms. Microfinance providers including Akhuwat and NRSP operate in the district, though youth specific products remain limited. Collateral requirements, limited credit history, and risk perceptions constrain young entrepreneur access to finance. Digital financial services through JazzCash and Easypaisa facilitate freelance payment receipt and small scale transactions, creating pathways around formal banking barriers.

7. STRATEGIC RECOMMENDATIONS

The following recommendations emerge from analysis of Mardan's context, youth employment dynamics, green economy opportunities, and institutional ecosystem. Recommendations are grouped by thematic area and designed as decision support inputs rather than operational blueprints, consistent with the study's analytical and recommendation oriented purpose.

7.1 Skills Development Recommendations

District Green Skills Training Facility

Establish a dedicated district level facility offering modular training programs in priority green economy skills including solar installation and maintenance, climate smart agriculture technologies, digital economy competencies, and livestock green practices. The facility should operate through partnership with KP TEVTA and industry stakeholders, employing competency based approaches aligned with labor market requirements. Modular design enables youth to combine skill sets across value chains, for example solar plus digital marketing for solar enterprise development.

DigiSkills District Access Points

Create facilitated learning centers at tehsil headquarters providing internet connectivity, computer equipment, and mentorship support for youth accessing DigiSkills and other digital training platforms. Female dedicated centers or time slots address mobility and segregation constraints. Peer learning groups and experienced freelancer mentorship accelerate progression from training to earning. Integration with mobile payment onboarding enables immediate income receipt capability.

Rashakai SEZ Training Pipeline

Coordinate with KPEZDMC and incoming SEZ investors to identify specific skill requirements for target industries including textiles, automotive, pharmaceuticals, and electronics. Develop pre employment training programs aligned with investor recruitment timelines to ensure local youth capture the 80 percent local employment commitment. Green manufacturing modules addressing cleaner production, environmental compliance, and occupational health prepare youth for modern industrial employment.

7.2 Enterprise Development Recommendations

Youth Solar Enterprise Program

Design an integrated support package enabling youth to establish solar installation and maintenance enterprises targeting household and government building markets. Components include startup capital or inventory financing, technical training and certification, customer acquisition support linking to KPK Solar Scheme

implementation, and business management skill development. Youth enterprises can access government building contracts through appropriate procurement set asides or subcontracting arrangements with larger firms.

Youth Agri Tech Incubation

Establish a district agri tech incubator supporting youth entrepreneurs developing precision agriculture services, organic input production, agro processing value addition, and digital agriculture platforms. The incubator provides workspace, seed funding, technical mentorship, and market linkage support. Collaboration with the Sugar Crops Research Institute leverages existing research capacity for technology commercialization through youth enterprises.

7.3 Enabling Environment Recommendations

District Youth Green Economy Coordination Platform

Create a multi stakeholder coordination mechanism bringing together district administration, line departments, TVET institutions, development partners, private sector, and youth representatives for joint planning, information sharing, and progress monitoring. Quarterly meetings enable program alignment, resource sharing, and adaptive management. The platform provides a visible focal point for youth green economy initiatives and enables identification of emerging constraints requiring collective action.

Youth Finance Access Enhancement

Work with microfinance institutions and banks to develop youth appropriate financial products addressing collateral constraints through group guarantees, equipment based financing, or blended finance mechanisms. Graduated repayment schedules aligned with enterprise development stages reduce default risk while enabling early stage investment. Bundled business development services improve investment success rates and financial institution confidence in youth lending.

7.4 Summary Recommendations Matrix

Recommendation	Priority	Lead Institution	Timeframe
District Green Skills Facility	High	KP TEVTA	Near term
Youth Solar Enterprise Program	High	Energy Department	Near term
DigiSkills Access Points	High	IT Department/Ignite	Near term
Rashakai SEZ Training Pipeline	High	KPEZDMC/TEVTA	Near term
Youth Agri Tech Incubation	Medium	Agriculture Department	Medium term

Coordination Platform	Medium	District Administration	Near term
Youth Finance Enhancement	Medium	Finance Department/MFIs	Medium term

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