Print ISSN: 0215-0411 - Online ISSN : 0215-0419
Volume: 4 , Issue: 1, Spring 2025

SPECIAL ISSUE

Special Issue
Spring 2025

Khyber Journal of Public Policy

KJPP

National Institute of Public Administration

National School of Public Policy

Simulation on
Bridging Gaps in Implementation of Industrial & Economic Development Strategies in Pakistan
پاکستان میں اقتصادی اور صنعتی ترقی کے عمل میں حائل رکاوٹوں کا خاتمہ

Summary of Policy Analysis & Recommendations

Public Policy Simulation Exercise
Conducted During 42nd MCMC
at NIPA, Peshawar
during 14th to 21st January 2025

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Preface

The National School of Public Policy (NSPP) in Pakistan, through its Policy Simulation Exercises (PSE) at its training units such as the National Institute of Public Administration (NIPA), has adopted the innovative concept of Policy Labs. These Policy Labs are designed to emulate global practices, fostering a focused research environment where government officers from diverse academic and professional backgrounds engage with real-world challenges. The results of these simulations offer actionable insights and practical policy recommendations to government entities, enhancing their operational effectiveness and societal impact.

In January 2025, NIPA, Peshawar organized a comprehensive Policy Simulation Exercise aimed at addressing critical gaps in the implementation of economic and industrial development strategies in Pakistan. This simulation focused on 11 key dimensions of policy design, implementation, and facilitation, each chosen for its strategic significance to Pakistan's economic and industrial progress. These dimensions included**:**

1. Bridging Gaps in Industrial Policy Design and Facilitation at the National Level
2. Bridging Gaps in SEZ Policies and Implementation: A Case Study of Rashakai SEZ
3. Bridging Gaps in TVET Policies and Practices: Evaluating Their Impact on Employment and Industry in Pakistan
4. Bridging Gaps in IT Export and Freelancing Policies: Analyzing Economic Impacts on Pakistan
5. Bridging Gaps in Automobiles and Transportation Industry Policies: A Critical Evaluation for Industrial Development in Pakistan
6. Bridging Gaps in Labour Policies, Regulations, and Welfare Practices: Implications for Industrial Development and Social Protection in Pakistan
7. Bridging Gaps in Mechanized Agriculture and Smart Agricultural Techniques: Exploring Their Potential for Industrial Development in Pakistan
8. Bridging Gaps in Policies for High-Tech and Innovative Industries: Lessons from China’s Reverse Engineering Strategies for Pakistan
9. Bridging Gaps in the Textile Sector of Pakistan: A Critical Analysis and Way Forward
10. Bridging Gaps in Policies and Practices for the Export Sector of Pakistan: An Evaluation for Enhanced Global Competitiveness
11. Bridging Gaps in Energy, POL, Gas/LNG Policies and Strategies: Supporting Industrial Development in Pakistan

This document summarizes the key findings and policy recommendations emerging from this simulation exercise. It serves as a resource for policymakers, practitioners, and stakeholders committed to bridging the gaps in Pakistan's economic and industrial policy frameworks, fostering sustainable growth and development.

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JANUARY 23, 2025

Research Group-1: Bridging Gaps in Industrial Policies: Design, Implementation, and Facilitation for Investment and Industrial Progress in Pakistan

Pakistan lacks a unified and comprehensive national industrial policy framework to guide sustainable industrial development. The fragmented nature of multi-layered policies, outdated property rights laws, inefficient judicial performance, inadequate law enforcement, redundant inspection regimes, lack of e-governance integration, and a disjointed regulatory structure have created significant barriers for industrialists, investors, and manufacturers. This convoluted governance landscape not only stifles national economic growth but also deters both domestic and foreign direct investment (FDI) in the industrial sector.

The federal, provincial, and local governance ecosystem has failed to prioritize industrial development or create an enabling environment for businesses. These institutions remain stagnant, with little capacity to respond to or capitalize on rapid global advancements in technology, innovation, manufacturing, finance, and trade dynamics. As a result, Pakistan's governance at all levels has fallen short in adopting global best practices for fostering industrial growth and innovation.

This failure has particularly affected historically prominent manufacturing hubs like Gujranwala, Gujrat, Sialkot, Faisalabad, Karachi, and Hyderabad. These cities, once renowned for their technological and manufacturing prowess, have seen their potential suppressed due to ineffective policies and governance practices. The inability to modernize and support these hubs has not only diminished their industrial output but also weakened Pakistan’s competitiveness in the global marketplace. A robust and visionary industrial policy is urgently needed to address these challenges and unlock the country's industrial potential.Every sector of industrial policy has a different policy.

Pakistan still has opportunities to capitalize on emerging and futuristic industrial and technological trends. By leveraging its skilled youth, the country can actively participate in innovative domains such as AI-driven electric vehicles (EVs), robotics manufacturing, and artificial intelligence (AI)-powered industries. These sectors hold the potential to position Pakistan as a competitive player in the global industrial landscape. Simultaneously, it is essential to focus on traditional industrial development, prioritizing the production of goods that reduce import dependence and enhance export potential.

Moreover, this planning should prioritize fostering innovation, ensuring technology transfer, and creating an ecosystem that supports start-ups and SMEs in cutting-edge sectors. The focus should be on emerging technologies such as

artificial intelligence (AI), electric vehicles (EVs), advanced robotics, and renewable energy systems, which represent the future of global industrial trends. Developing policies to attract foreign direct investment (FDI) in these sectors, establishing research and development (R&D) hubs, and forging partnerships with global tech leaders will accelerate the adoption of these technologies in Pakistan.

Historically, countries like Japan, China, and India have demonstrated the effectiveness of reverse engineering as a critical policy tool during their early stages of industrial development. For example, Japan's post-World War II industrial rise was fueled by acquiring and reverse engineering Western technologies in sectors like automobiles and electronics. Companies like Toyota and Sony initially learned from imported technologies, adapted them to their needs, and later became global leaders. Similarly, China adopted a strategy of acquiring the best consumer and industrial technologies from abroad, dismantling them, studying their design and production techniques, and reengineering them to manufacture domestically. Today, companies like Huawei and BYD are global giants in telecommunications, Fast levitation trains and EVs, respectively, showcasing how reverse engineering led to indigenous innovation and dominance in critical sectors.

India also embraced reverse engineering during its early industrialization phase, particularly in the pharmaceutical and software industries. Indian firms initially replicated drugs patented abroad, adapted them to local needs, and eventually built a robust pharmaceutical sector that now supplies a significant portion of the world's generic medicines. Similarly, India's IT industry, initially reliant on outsourced projects, gradually developed into a global powerhouse by learning and adapting technologies to create its own products and solutions.

Pakistan can adopt a strategic approach by acquiring advanced machinery and technologies in key sectors such as automobiles, electronics, robotics (including robotic arms and humanized robots), aerospace, high-speed trains, renewable energy systems (solar panels and wind turbines), agricultural technologies (smart farming tools, high-yield crop varieties, and precision agriculture systems), and other industrial innovations from developed nations. By employing reverse engineering, Pakistan can adapt these technologies to local needs and manufacture them domestically, fostering technological self-reliance and reducing dependence on imports.

For instance, importing state-of-the-art machinery for AI-driven electric vehicle (EV) manufacturing and renewable energy systems, such as advanced solar panels or wind turbines, could enable Pakistan to study their design, optimize production processes, and develop localized versions. These adapted technologies could cater to both domestic and regional markets, offering cost-effective and competitive solutions.

This approach positions Pakistan to lead in emerging industries such as EV battery production, AI-powered industrial automation, and renewable energy manufacturing. Similarly, applying this strategy to agriculture could transform

farming by introducing smart irrigation, precision drones, and AI-driven machinery, boosting productivity and ensuring food security.

By integrating reverse engineering with targeted R&D investments and fostering innovation, Pakistan can establish a competitive edge in high-tech industries and unlock substantial economic growth. Creating an enabling environment for start-ups and SMEs is crucial, requiring tax incentives, R&D grants, and streamlined regulations. Establishing technology parks, innovation hubs, and industrial clusters with modern infrastructure can attract domestic entrepreneurs and foreign investors. For instance, Pakistan could develop specialized industrial zones for robotics and AI in cities like Karachi and Lahore, mirroring Shenzhen's transformation into a global tech hub through strategic planning and investment.

To achieve this, a comprehensive and integrated industrial planning framework is imperative. This framework should be designed using advanced planning tools, such as the Input-Output Model, which enables the operational planning of detailed macro- and micro-level production ecosystems. These ecosystems should encompass interlinked critical industries, ensuring domestic production of intermediary and final products while incorporating global and domestic supply-and-demand mechanisms for each production chain. This approach allows for creating a robust industrial base that minimizes reliance on imports and maximizes value-added exports. (A detailed technical note explaining ***Input-Output Model*** can be seen in the Annexure)

Countries like China and Russia have successfully employed Input-Output Models to achieve unprecedented technological, industrial, and manufacturing growth. By integrating such tools into Pakistan's industrial planning, it is possible to replicate similar success. At the macro level, the framework would ensure that national industrial strategies are aligned with global technological trends, market dynamics, and national economic priorities. It would also focus on fostering competitive advantages in strategic industries while addressing structural challenges that inhibit growth.

By adopting this integrated planning approach, Pakistan can achieve long-term industrial growth, enhance productivity, and position itself as a global player in manufacturing and technological innovation.

By focusing on both advanced technological sectors and traditional manufacturing, Pakistan can unlock its industrial potential, create jobs, and achieve sustainable economic growth while strengthening its position in the global industrial and technological ecosystem. After 18th Constitutional Amendment, the subject of industries was transferred to the provinces. Therefore, every provincial government has developed its own policy. Ever since inception of Pakistan, the industrial policies kept shifting. The political economy took preference over developing a policy for industries. The main stakeholders were never taken on board while forming industrial policy or a particular sector was promoted at the

cost of rest. The targets set were never realistic, thus, the policy implementation became difficult.

Pakistan's industrial sector is at critical juncture as the exports in general, and that of textile sector in particular, are declining resulting in huge trade deficit. The industrial sector does not possess requisite technological infrastructure as well as skilled manpower. In addition to this, small and medium enterprises have not been given priority. The industrialists complain that they are not taken on board while forming policies.

Ministry of Industries and Production has so many departments responsible for increasing industrial growth but their performance is below average and some need restructuring. The artificial intelligence is not being properly used in the industrial sector. Moreover, the Industries of Pakistan are facing stiff competition from their rivals such as China, India, Vietnam etc. The trade diplomacy could not properly brand products internationally. Moreover, the use of outdated methods in the industries and import of raw material escalate the cost of production. Earlier, the energy crisis did damage to the industrial sector and now high tariff rates are doing the same. It is important, in this backdrop, that Pakistan shall make a national industrial policy after proper consultation with all stakeholders. The policy shall contained framework for horizontal and vertical interventions.

This comprehensive research provides a critical evaluation of Pakistan's industrial policies, sectoral performance, and regulatory framework. The study highlights key challenges, opportunities, and prospects for fostering industrial growth through effective policymaking, bridging gaps in regulatory mechanisms, and ensuring alignment with global standards.

The report begins with an introduction to the historical evolution of industrial policies in Pakistan, followed by a legal and situational analysis of the industrial sector. Key policies such as the Textile and Apparel Policy 2020-25, Electric Vehicle Policy 2019, and Small and Medium Enterprises (SME) Policy 2021 are examined for their strengths, weaknesses, and policy gaps.

Special focus is given to the impact of Special Economic Zones (SEZs) in Khyber Pakhtunkhwa (KP) on industrialization. A comparative analysis with successful models from China and Bangladesh offers valuable lessons for Pakistan. Similarly, the auto industry, information technology sector, high-tech industries, and export sectors are critically analyzed through situational assessments, SWOT analyses, and stakeholder evaluations.

Key findings reveal significant gaps in policy implementation, rigid regulatory mechanisms, and limited technological adaptation in industries like textiles, IT, and high-tech manufacturing. The study also explores the potential of reverse engineering, e-commerce, and digital policies to enhance competitiveness.

Sector-specific analyses, such as energy, pharmaceuticals, and fertilizers, underscore the critical role of targeted reforms in overcoming challenges.

Comparative evaluations of industrial policies with India, China, and Malaysia further identify actionable insights for policy refinement.

Issues and Challenges

1. **Lack of a Unified Industrial Policy:**
    - The country lacks an integrated industrial policy, with each sector having its own policy.
    - Provincial governments have different policies, leading to fragmented goals and no national framework.
    - The absence of a coherent strategy and a whole-of-government approach hampers progress.
2. **Political Economy and Policy Inconsistency:**
    - Each political party introduces its own industrial policies, leading to discontinuity and lack of consistency.
    - Aligning policies with international best practices remains a challenge.
3. **Stakeholder Exclusion in Policy Formulation:**
    - Industrial policies are often formulated without stakeholder consultation.
    - Even when input is sought, it is rarely incorporated into the final policy.
4. **Elite Capture in Policy Decisions:**
    - Policies favor stakeholders with political influence or financial contributions to ruling parties.
    - For example, APTMA exerts disproportionate influence over industrial policies.
5. **Misaligned Priorities and Neglect of Innovation:**
    - Pakistan has prioritized textiles and fertilizer subsidies over IT, AI, and R&D.
    - Subsidies benefit mill owners rather than farmers, and labor capacity building is ignored.
6. **Challenges in SME Financing and Integration:**
    - Providing concessionary loans and integrating SMEs into the mainstream industry remains a challenge.
7. **Low Adoption of Modern Technologies:**
    - Industries rely heavily on manual labor, reducing efficiency and product quality.
    - Balancing automation with employment remains a key challenge.
8. **Energy Crisis and High Tariff Rates:**
    - Industrial growth is negatively affected by high energy costs and regional non-competitiveness.
    - International financial pressures complicate tariff adjustments.
9. **Lack of Innovation and Resistance to Change:**
    - Cultural inertia hinders industrial innovation.

- The electric vehicle policy, for instance, faced resistance from established industries.

10. **Overregulation and Bureaucratic Hurdles:**
    - Complex regulatory frameworks discourage industrialization and investment.
11. **Low Labor Productivity:**
    - The industrial workforce lacks productivity-enhancing skills.
12. **Governance and Funding Issues in TEVT Institutions:**
    - TVET institutions suffer from governance, monetary, and training challenges.
13. **Weak Linkages Between Industry and Training Institutes:**
    - Aligning technical skills training with international demands remains a challenge.
14. **Fake Certifications and Unregulated Institutes:**
    - The proliferation of fraudulent certifications undermines the TVET sector's credibility.
15. **Dependence on Imported Energy and Conventional Fuels:**
    - The oil and gas sector relies heavily on imports, with limited strategic reserves.
16. **Cybersecurity and IT Infrastructure Challenges:**
    - Concerns over data privacy, internet shutdowns, and regulatory clampdowns impact IT growth.
    - Poor IT infrastructure in rural areas hampers digital integration.
17. **Export Diversification and Industrial Base Expansion:**
    - Value addition and improving industrial capacity remain challenges.
18. **Investment Shortfall in High-Tech Sectors:**
    - Pakistan lacks professionals in AI and Virtual Reality, limiting high-tech industry expansion.
19. **Challenges for Freelancers and Digital Economy:**
    - Issues include the absence of PayPal, unreliable internet, and inconsistent tax policies.
20. **Taxation and Regulatory Challenges for Industries:**
    - Issues include refund delays, double taxation, and inconsistent incentives.
21. **Non-Compliance with Environmental and Labor Laws:**
    - Pakistan struggles with enforcing minimum wage, health insurance, and child labor laws.
22. **Untapped Potential in Emerging Sectors:**
    - Opportunities in EVs, electronics, lithium batteries, and clean technology remain underexplored.
23. **Global Branding and Compliance with International Standards:**
    - Pakistani products need better branding, certification, and adherence to global value chains.
24. **Trade Negotiations for Improved Exports:**

- Strengthening international trade agreements is necessary for export growth.

25. **Slow Industrial Land Acquisition Processes:**
    - Lengthy bureaucratic delays hinder industrial expansion.
26. **Inefficiencies in Industrial Institutions:**
    - Bodies like PIDC, EDB, and NPO lack effectiveness.
27. **Frequent Political Changes Impacting Industry:**
    - Policy instability due to government transitions disrupts industrial progress.
28. **Relocation of Industries to Other Countries:**
    - Industries, including IT and textiles, are shifting to countries with better business environments.

Conclusion: The industrial sector lacks a national industrial policy, which hinders economic growth. Major challenges include an unskilled workforce, uncompetitive tariffs, taxation issues, low R&D investment, and excessive regulations. Political priorities often diverge from international best practices, further slowing progress.

Recommendations:

1. **Develop a National Industrial Policy:**
    - Define clear objectives and targets with stakeholder input.
    - Ensure a structured implementation and monitoring mechanism.
2. **Align Industrial Growth with International Competitiveness:**
    - Prioritize export-oriented industries and high-tech sectors.
3. **Ensure Inclusive Policy Formulation:**
    - Establish a National Business Council representing all sectors.
    - Prevent elite capture in policy decisions.
4. **Improve Policy Implementation and Coordination:**
    - Define Key Performance Indicators (KPIs) for execution.
    - Require performance agreements for industrial bodies.
5. **Enhance Energy and Resource Exploration:**
    - Streamline licensing for oil and gas exploration.
    - Develop alternative energy sources.
6. **Promote Local Manufacturing in Emerging Industries:**
    - Provide incentives for EV production and high-tech sectors.
7. **Support SMEs with Concessionary Loans and Integration Policies.**
8. **Increase Investment in R&D and Innovation:**
    - Boost research funding and industry-academic collaboration.
9. **Bridge the Gap Between Industry and Training Institutes:**
    - Align curricula with market needs and global skill demands.

- Conduct skill mapping for labor market optimization.

10. **Strengthen TVET Funding and Oversight:**
    - Increase per-trainee budget allocations.
    - Establish a centralized database for certificate verification.
11. **Focus on Export Diversification and Value Addition:**
    - Ensure regional competitiveness in key industries.
12. **Streamline Tax Policies and Reduce Harassment by FBR:**
    - Involve traders in tax policy discussions.
13. **Develop High-Tech Education and Training Programs:**
    - Send professionals abroad for training in emerging technologies.
14. **Ensure Industrial Compliance with Environmental Standards:**
    - Enforce regulations to promote clean technology adoption.
15. **Expedite Industrial Land Acquisition Processes:**
    - Amend the Land Acquisition Act for faster approvals.
16. **Improve Business Climate for Investment:**
    - Ensure ease of doing business through regulatory simplification.

Research Group-2: Bridging Gaps in SEZ Policies and Implementation: A case Study of Rashakai SEZ

The Rashakai Special Economic Zone (SEZ), a cornerstone initiative under the China-Pakistan Economic Corridor (CPEC), represents a transformative project for industrialization in Pakistan, specifically in the Khyber Pakhtunkhwa (KP) region. Strategically located in Nowshera district, Rashakai SEZ is a joint venture between the China Road and Bridge Corporation (CRBC) and the KP Economic Zones Development and Management Company (KPEZDMC). Operated through the Rashakai Special Economic Zone Development and Operations Company (RSEZDOC), this project is designed to catalyze economic growth, attract foreign direct investment (FDI), and create employment opportunities.

Officially launched in May 2021, the Rashakai SEZ spans 1,000 acres, with a total development cost of $128 million. The project is structured into three phases, to be completed over 6-7 years, with a concession period of 30 years. Of the total land, 778 acres are designated as leasable—702 acres for industrial and 76 acres for commercial use. Phase 1, covering 247 acres, has already been completed, leasing 87 acres to enterprises. As of now, 20 enterprises, including two Chinese companies, are approved, with 10 enterprises under construction. The project has attracted an estimated investment of PKR 85 billion, comprising PKR 57.6 billion in foreign and PKR 27.4 billion in local contributions.

SEZ Incentives and Strategic Significance

Rashakai SEZ offers a robust incentive framework to investors, ensuring operational stability and a favorable business environment. Investors benefit from a one-time exemption from customs duties and taxes on capital goods, reducing initial setup costs. Moreover, a 10-year income tax exemption from the start of commercial operations makes this SEZ highly attractive for enterprises. Long-term confidence is further fostered through a 99-year land lease arrangement. Enhanced security, 24/7 operational stability, and infrastructural readiness position Rashakai SEZ as a competitive hub for industrial activity.

Aligned with CPEC's objectives, the project fosters industrial cooperation between China and Pakistan. It serves as a gateway for technological and knowledge transfer while driving KP’s socio-economic development. As an anchor for KP's economic transformation, Rashakai SEZ is pivotal for creating jobs, promoting exports, and reducing regional inequalities.

Infrastructure and Utilities Development

A key highlight of Rashakai SEZ is its comprehensive infrastructure, including road connectivity, electricity, and gas supply. An access road, spanning 3.2 kilometers, was completed in March 2021 at a cost of PKR 530 million. For electricity, PKR 1.826

billion has been allocated to provide a total capacity of 210 MW across three phases. Phase 1 delivered 10 MW by November 2020, Phase 2 added 160 MW in March 2023, and Phase 3 aims to supply 50 MW by June 2024, despite delays in grid connectivity and licensing. Two internal grid stations, one of which is dedicated to the Chinese firm Century Steel, await licensing for full energization.

Gas infrastructure, with a capacity of 30 mmcfd, was completed at a cost of PKR 1.203 billion. The internal distribution system is fully operational, with maintenance agreements in place with the Sui Northern Gas Pipelines Limited (SNGPL). These infrastructural advancements ensure the zone's readiness for large-scale industrial operations, despite occasional delays in regulatory processes.

Comparative Analysis of SEZ Frameworks

A comparative analysis of SEZ laws in Pakistan, China, and Indonesia reveals critical insights into governance and operational frameworks. Pakistan's SEZ Act of 2012, amended in 2016, emphasizes industrial growth through public-private partnerships. By contrast, China's SEZ regulations, initiated in 1980, focus on modernization and technical collaboration with foreign enterprises. Indonesia's SEZ framework under Law No. 40/2021 prioritizes national integration and economic diversification. While China's SEZs have achieved global success due to robust incentives, governance, and export-oriented strategies, Pakistan faces challenges in regulatory delays, policy consistency, and infrastructure readiness, limiting its potential to replicate China's achievements.

Revisiting Incentive Policies to Enhance Investment Attractiveness

To address the challenges posed by IMF conditions, which require halting the creation of new Special Economic Zones (SEZs) and Export Processing Zones (EPZs) while discontinuing tax incentives for existing ones, Pakistan must adopt a strategic approach to sustain industrial growth and attract investment. A carefully negotiated framework with the IMF that allows targeted incentives under strict monitoring and compliance can preserve SEZs' critical role in economic development and export growth.

Key Recommendations

1. **Integrated/Allied Industrial Units**

   - Promote **Integrated Industrial Units** in SEZs under the China-Pakistan Economic Corridor (CPEC) by offering targeted incentives such as reduced import duties and tax exemptions.
   - Encourage clustering of related industries, following the successful Chinese SEZ model, to foster innovation, reduce costs, and enhance efficiency.

2. **Decentralized Management Infrastructure**

- ❖ Adopt a **Shenzhen-inspired decentralized management model**, providing autonomy to SEZ authorities for streamlined operations.
- ❖ Establish independent SEZ authorities to reduce bureaucratic delays and enhance competitiveness among zones.

3. **Investor Facilitation**

- ❖ **One-Stop Shops (OSS):** Implement Section 11 of the SEZ Act 2012 in spirit by establishing OSS facilities within SEZs. These hubs will centralize services such as regulatory approvals, tax facilitation, utility connections, and land allocation, significantly improving the ease of doing business.
- ❖ **Expedited NOCs for Foreign Investors:** Develop a digital, automated system for swift issuance of NOCs, balancing security measures with ease of access. Eliminate non-essential requirements like police clearance certificates to reduce barriers.

4. **Infrastructure Readiness**

- ❖ Implement **time-bound procedures for land allocation and development** with penalties for delays to attract investors and reduce costs.
- ❖ Enable developers and co-developers to manage internal utility distribution and offer bulk land rates to reduce infrastructure cost burdens.

5. **Efficient Monitoring and Evaluation Systems**

- ❖ Develop **digitized performance monitoring systems** using KPIs to track SEZ progress, identify challenges, and ensure timely interventions.

6. **Marketing and Promotion**

- ❖ Leverage the credibility of the China Road and Bridge Corporation (CRBC) to promote SEZs internationally through targeted campaigns, trade body collaborations, and diplomatic missions.
- ❖ Highlight the strategic location, tax incentives, connectivity, and business-friendly environment of SEZs to attract investors from the UK, UAE, and other developed countries.

7. **Access to Finance for SMEs**

- ❖ Introduce **targeted financial reforms** to address limited access to finance for SMEs in SEZs, including soft loans, government-backed credit schemes, and tailored financial products.
- ❖ Collaborate with the State Bank of Pakistan to offer longer repayment terms and industry-specific financing options.

Research Group-3: Bridging in TVET Policies and Implementation Strategies: Evaluating Their Impact on Employment, Foreign Remittances, and Industry in Pakistan

Pakistan, the fifth most populous country in the world, has a population of approximately 245 million. A significant portion of this demographic—64%—is under the age of 30 (Economic Survey of Pakistan, 2023). This youth bulge presents both an opportunity and a challenge. If properly harnessed, it can become a demographic dividend that drives economic growth. However, given the current economic conditions, including a high unemployment rate of 6.3%, fiscal imbalances, and a lack of opportunities, there is an increasing risk of social instability. Many young individuals, out of desperation, are turning to illegal activities such as drug addiction and trafficking, human smuggling, and even extremist activities (Habib, 2024).

Women, in particular, face additional challenges such as exploitation, domestic violence, and unsafe working environments (ADB, 2016). Moreover, approximately 29.75% of the population remains single, with over 10 million unmarried women, creating social and economic challenges (Daily Pakistan; Bureau of Statistics). Without structured intervention, youth frustration could escalate, turning this untapped human resource into a potential social liability.

Foreign Remittances and Their Economic Impact

Foreign remittances are a vital source of foreign exchange for Pakistan, playing a significant role in boosting GDP, alleviating poverty, and supporting household consumption. According to the State Bank of Pakistan, remittances from the Gulf region account for more than 60% of total inflows, contributing approximately US$30 billion annually. These funds are crucial in supporting the balance of payments and sustaining the country's economic stability.

However, there is potential for Pakistan to increase remittance inflows to US$60 billion over the next two years. Achieving this goal could help reduce reliance on IMF conditionalities and foreign borrowing from countries like China, Saudi Arabia, and the UAE, thus preserving national pride and the dignity of Pakistan’s leadership.

The remittances received play a significant role in financing essential sectors such as education, healthcare, and small business investments, which directly contribute to improving the living standards of families across the country. Despite this positive impact, heavy reliance on remittances also presents structural economic challenges. It highlights the limited availability of domestic employment opportunities and fosters a shift toward consumption-driven growth, rather than encouraging productive investments that could drive long-term economic sustainability.

To address these challenges, it is essential to diversify the economy and invest in sectors that can generate sustainable employment opportunities and long-term growth, reducing dependency on remittances and strengthening Pakistan's economic resilience.

Skill Development: A Missing Link? - Employment Trends in the Gulf and Policy Shifts

Gulf countries, particularly the UAE and Saudi Arabia, have become increasingly frustrated with hiring Pakistani workers due to the widespread prevalence of non-professional practices and deceptive tactics by Pakistani overseas employment promoters/ A significant issue lies within the inefficiency of the Bureau of Immigration, which often facilitates the recruitment of unskilled laborers by sending workers with fake certifications, charging them hefty amounts for the service. These fraudulent practices have led to a negative reputation for Pakistani workers, tarnishing their image abroad. As a result, ill-prepared, untrained, and ill-mannered workers often find themselves in low-paying, physically demanding jobs, leading to poor work performance and complaints from employers.

This situation has caused a policy shift in countries like the UAE and Saudi Arabia, who are now increasingly hiring workers from countries like India and Bangladesh, where workers are perceived as better trained and more professional. The damage to Pakistan's labor market reputation is not just an economic setback for individuals but also a blow to the country’s image on the international stage.

In this context, skill development has emerged as a crucial determinant of both employment quality and the earning potential of Pakistani workers in the Gulf. While many Pakistani laborers migrate with limited vocational training, their lack of specialized skills restricts them to lower-level jobs that demand minimal education or expertise. Although Pakistan's Technical and Vocational Education and Training (TVET) sector has made strides in workforce development, there remain significant gaps in adapting training programs to meet the evolving needs of Gulf economies, which require workers with advanced and specialized skills in sectors such as construction, hospitality, healthcare, and engineering.

To address these challenges, Pakistan must focus on providing more targeted, high-quality training through one-year, two-year, and three-year diploma programs in collaboration with industry standards and market needs. These specialized training programs will not only equip workers with relevant skills but also ensure they are prepared to take on roles that are in high demand in the Gulf region. Furthermore, reforming institutions such as the Pakistan Engineering Council (PEC), engineering universities, NAVTTC and TVET institutions is essential to ensure that the country's workforce is highly competitive on a global scale. This will require the integration of international standards and modern training practices to prepare workers for the global labor market.

It is also imperative to implement stricter regulations to prevent fraudulent practices by employment promoters and ensure that workers are provided with genuine

opportunities for skill development. Strengthening regulatory bodies and improving the efficiency of the Bureau of Immigration will help restore trust in the Pakistani workforce and eliminate the risks associated with fraudulent recruitment practices.

This initiative is not only a matter of improving individual career prospects but is also critical for Pakistan's national economic security. Remittances from overseas workers play a vital role in the country's economy, and a skilled labor force will increase both the quality and quantity of remittances. By aligning skill development with the specific demands of the Gulf region, Pakistan can regain its competitive edge, restore its reputation, and contribute to the long-term economic stability of the nation.

For example, if Pakistan's workers were trained in advanced construction management or specialized technical skills aligned with Gulf market needs, they would be able to secure higher-paying jobs, which would directly impact their families and the national economy. By ensuring that training programs are relevant and rigorous, Pakistan can also reduce the number of unskilled workers and increase the number of skilled professionals contributing positively to the labor market abroad.One of the most viable solutions to this crisis is a robust Technical and Vocational Education and Training (TVET) sector. However, the current education system in Pakistan is divided into two streams—general education and TVET—both of which suffer from inefficiencies and misalignment with labor market demands. To turn this youth bulge into an economic asset, the TVET sector must be strategically reformed and optimized.

The Role of TVET in Addressing Youth Unemployment

Pakistan's education system consists of primary, secondary, and higher education, with students choosing between general education and vocational training after secondary school. Despite its importance in workforce development, the TVET sector remains underutilized, with only 4% of the youth population enrolled in skill-based education compared to 69% in general education (NSIS, 2022).

The low enrollment in TVET is due to multiple factors, including a limited number of institutes, outdated curricula, weak enforcement mechanisms, and public mistrust. However, TVET graduates demonstrate significantly higher employability than general education graduates, with 70% securing employment and contributing 80% of Pakistan's remittances (GIZ/BEO statistics, 2023).

Given Pakistan's need for skilled labor, estimated at 1 million annually against a supply of only 0.45 million (NSIS, 2022), investment in TVET is critical. Countries like Hong Kong, Singapore, Taiwan, and South Korea have demonstrated that a skilled workforce can be a catalyst for economic transformation (Ministry of Manpower, Singapore).

Challenges in the TVET Sector

Despite substantial funding—over 200 billion PKR in the last eight years—TVET programs have not yielded significant improvements. Key issues include:

1. Overlapping Training and Resource Allocation

Multiple agencies, including NAVTTC, PSDF, EU-GIZ, and ADB, fund training programs with minimal coordination. This leads to redundancy, where the same trainees enroll in different programs, creating inefficiencies and fund misallocation. Private training institutes exploit this by enrolling the same students in multiple programs, leading to inflated numbers and misreporting.

2. Fragmented Development of Centers of Excellence

Multiple entities—NAVTTC, TVETAs, EU-GIZ, CPEC-China, Fuji Foundation, and Pakistan Bait-ul-Mal—invest in Centers of Excellence without a unified strategy. This lack of coordination leads to redundant spending, as seen in Punjab, where an ADB-funded $110 million loan project overlaps with similar initiatives.

3. Duplication in Curriculum Development

NAVTTC and EU-GIZ have developed curricula for over 75 and 100 trades, respectively, with another set of qualifications being developed under an ADB-funded project. This redundancy wastes resources and creates inconsistencies in training standards.

4. Repetitive Teacher Training Programs

Due to excessive funding from GIZ-EU, PSDF, ADB, and DigiSkills, the same trainers undergo repeated training sessions. Additionally, many trainers lack industry-specific expertise, and university professors with little relevance to TVET are also included in these programs.

5. Industry Mismatch

TVET curricula often fail to align with labor market demands, producing graduates who are either underqualified or overqualified. Weak industry linkages prevent effective workforce integration.

6. Corruption and Bureaucratic Inefficiency

Corruption within the implementation process leads to inflated contracts, ghost enrollments, and fund mismanagement. Many training centers are allocated more trainees than their capacity allows, leading to financial leakage.

7. Lack of Post-Training Support

Graduates struggle to find employment due to inadequate job placement services, career counseling, and mentorship.

8. Shortage of Skilled Trainers

The lack of trained and experienced instructors significantly impacts the quality of vocational education. Many trainers lack hands-on industry experience, making training ineffective.

9. Outdated Curriculum and Lack of Standardization

Many courses fail to incorporate modern industry trends, leading to outdated training. The absence of standardized certification frameworks results in credibility issues for graduates.

10. Absence of a Dual Apprenticeship Model

Pakistan has yet to adopt a dual apprenticeship system, similar to Germany's model, which integrates classroom education with hands-on training in industries.

Practical Recommendations for Reform

To address these inefficiencies, the following measures should be implemented:

1. Establish a Unified National TVET Framework

A centralized body should oversee all TVET-related initiatives to ensure policy coherence and prevent duplication.

2. Strengthen Coordination Among Funding Agencies

A joint task force comprising NAVTTC, TVETAs, PSDF, and international donors should be formed to align funding priorities and eliminate overlapping projects.

3. Implement a National Apprenticeship Program

Adopt the German Dual Apprenticeship model, ensuring industry participation in curriculum design and training execution.

4. Develop a Standardized Curriculum

Harmonize all qualifications into a single national certification framework, ensuring alignment with industry requirements.

5. Establish an Independent Monitoring and Evaluation System

Create a transparent mechanism to track TVET fund utilization, trainee progress, and employment outcomes.

6. Integrate TVET with the Digital Economy

Expand digital skills training, including AI, blockchain, and cloud computing, to equip youth with future-ready skills.

7. Enhance Industry Linkages and Employer Incentives

Encourage private-sector participation through tax breaks and incentives for hiring TVET graduates.

8. Improve Gender Inclusion in TVET

Develop targeted programs for women, ensuring safe learning environments and employment opportunities.

9. Expand Public Awareness Campaigns

Address public mistrust by highlighting success stories and the economic benefits of vocational training.

10. Strengthen International Collaboration

Learn from successful TVET models (e.g., Germany, Singapore) and integrate best practices into Pakistan's system.

Removal of Technical Training Stigma and Image Building for Technical Education Among Youth

Technical and Vocational Education and Training (TVET) plays a crucial role in national development by equipping individuals with practical skills that directly contribute to the economy. However, in Pakistan, TVET suffers from a persistent stigma, often being perceived as an inferior alternative to mainstream academic education. This negative perception discourages students from pursuing technical education, resulting in a skills gap in the workforce and a lack of qualified professionals in key technical fields. Addressing these challenges is essential to improving the image of TVET and integrating it effectively into the broader education system.

2. Challenges Leading to the Stigma

Several factors contribute to the negative perception of technical education in Pakistan, including institutional policies, societal attitudes, and structural limitations. Key challenges include:

A. Negative Role of the Pakistan Engineering Council (PEC)

PEC, as a regulatory body for engineers, has contributed to the belittling of TVET graduates in several ways:

1. **Discrimination Against Diploma Holders**: PEC has systematically excluded diploma holders from recognition in the engineering sector. Despite possessing practical and

technical skills, these professionals are often denied employment in roles that require engineering expertise, pushing them into low-paying and informal jobs.

2. **Restrictive Licensing Policies**: PEC has imposed barriers preventing diploma holders from obtaining professional engineering licenses, further limiting their career growth and reducing their marketability.
3. **Creating an Artificial Hierarchy**: The Council's rigid categorization of qualifications has led to an artificial distinction between engineers and skilled technicians, reinforcing the notion that technical education is inferior to university degrees. Several Court cases have been filed to defgrade and exclude from jobs by PEC in the high courts and supreme courts. They have huge money and they use corrupt practices to influence policy makers against Diploma graduates.
4. **Industry-Wide Stigma**: PEC's stance has influenced hiring trends, where employers, particularly in the engineering and construction sectors, prefer university graduates over technically trained professionals, despite the latter's hands-on expertise.
5. **Exclusion from Policy Discourse**: The voices of TVET graduates are often missing from national policy discussions on technical education, largely due to PEC's resistance to integrating them into professional and decision-making circles.
6. **Impact on Foreign Employment**: The devaluation of TVET in Pakistan impacts overseas job opportunities, as technical professionals from other countries receive higher recognition and wages than their Pakistani counterparts.

B. Societal and Economic Challenges

1. **Cultural Perception** – TVET is often considered a last resort for academically weaker students.
2. **Lack of Awareness** – Limited understanding of career opportunities in technical fields among parents, students, and employers.
3. **Job Market Mismatch** – TVET graduates face difficulties in securing relevant employment due to outdated curricula and employer bias.
4. **Inferior Infrastructure** – Poorly equipped institutions and outdated teaching methods diminish the quality of technical education.
5. **Limited Career Progression** – Few pathways exist for TVET graduates to transition to higher education or managerial positions.
6. **Socioeconomic Barriers** – Higher-income families prefer university education, viewing technical training as suitable for lower-income groups.

3. Impact of Stigmatization on Youth and Society

The negative perception of TVET results in several adverse consequences:

- **Lower Enrollment Rates** – Many students and parents see technical training as a last resort, reducing the talent pool in skill-based professions.
- **Underutilization of Skilled Labor** – Many diploma holders are forced to work in unrelated or informal sectors despite their technical expertise.
- **Limited Career Growth** – The absence of structured career pathways discourages students from pursuing technical education.
- **Brain Drain** – Many skilled technicians migrate abroad for better recognition and pay, leading to a loss of talent.

- **Reduced Industrial Growth** – A shortage of skilled workers hampers industrial productivity and competitiveness.

4. Strategies for Image Building and Stigma Removal

A comprehensive strategy is needed to change perceptions, improve TVET quality, and integrate it with national development plans.

A. Policy and Regulatory Reforms

1. **PEC Reform** – The Pakistan Engineering Council must adopt a more inclusive approach by recognizing diploma holders and integrating them into professional frameworks.
2. **National Qualification Framework Alignment** – TVET qualifications should be aligned with higher education degrees to allow seamless academic progression.
3. **Industry Recognition** – Encourage companies to establish competency-based hiring practices rather than solely focusing on degree-based recruitment.

B. Media and Public Awareness Campaigns

1. **Promotional Campaigns** – Government and industry should run campaigns showcasing the success stories of TVET graduates.
2. **Influencer and Social Media Engagement** – Collaborate with industry leaders and influencers to advocate for TVET.
3. **TVET Ambassadors Program** – Appoint successful TVET graduates as role models to inspire youth.

C. Industry-Academia Collaboration

1. **Stronger Industry Linkages** – Encourage apprenticeship programs and industry-sponsored certifications.
2. **Public-Private Partnerships** – Establish joint programs between universities, TVET institutes, and industries.
3. **Recognition of Prior Learning (RPL)** – Create pathways for diploma holders to obtain equivalent degrees based on experience and skill assessments.

D. Financial and Career Incentives

1. **Scholarships and Grants** – Offer financial aid to students pursuing technical education.
2. **Job Placement Programs** – Develop government-backed job portals specifically for TVET graduates.
3. **Entrepreneurship Support** – Provide grants and incubation programs for TVET graduates to start their businesses.

E. Infrastructure Development and Quality Enhancement

1. **Upgrading Facilities** – Improve the infrastructure of technical training institutions to meet international standards.

2. **Training of Trainers** – Enhance instructors' skills through specialized training programs.
3. **Technology Integration** – Introduce e-learning platforms and virtual simulations for practical training.

F. Creating Clear Career Pathways

1. **Recognition of Prior Learning (RPL)** – Provide transition opportunities for TVET graduates to move into higher education.
2. **Lifelong Learning Opportunities** – Facilitate continuous skill development and professional growth.
3. **Industry Endorsement** – Promote industry-recognized certifications to boost employability.

5. Recommendations for Further Enhancement

1. **Develop a National TVET Branding Campaign**
    - Use slogans, role models, and storytelling techniques to change societal perceptions.
    - Showcase successful TVET graduates who have excelled in their careers or started their businesses.
2. **Establish Model Centers of Excellence**
    - Develop high-quality training centers that set benchmarks for TVET education.
    - Ensure these centers are equipped with modern technology and internationally certified trainers.
3. **Strengthen Industry-Academia Collaboration**
    - Establish advisory boards with industry representatives to align curricula with market needs.
    - Encourage industries to invest in TVET institutions through Corporate Social Responsibility (CSR) initiatives.
4. **Introduce TVET in Schools**
    - Integrate technical training into mainstream school curricula to create early exposure.
    - Provide career counseling to guide students toward TVET pathways.
5. **Leverage International Best Practices**
    - Learn from successful TVET models in countries like Germany, Finland, and Singapore.
    - Establish partnerships with international technical institutions for knowledge exchange.

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Research Group-4: Bridging Gaps in IT Export and Freelancing Policies and Implementation Strategies in Pakistan

In recent years, Pakistan's information technology (IT) sector has emerged as a significant contributor to the national economy, bolstered by progressive policies and innovative practices aimed at fostering IT exports and freelancing. These initiatives align with global trends, where digital trade and freelancing platforms have become instrumental in driving economic growth and employment opportunities (World Bank, 2022). This document explores the key policies, institutional frameworks, and practices shaping the IT exports and freelancing landscape in Pakistan, with a focus on their economic implications.

The Government of Pakistan has introduced several policy measures to support the IT sector. The Digital Pakistan Policy 2018 serves as a cornerstone, providing a strategic framework for enhancing the IT ecosystem through tax incentives, infrastructure development, and capacity building (Ministry of Information Technology and Telecommunication [MoITT], 2018). Similarly, the establishment of technology parks and incubators under the auspices of public-private partnerships has played a pivotal role in nurturing startups and attracting foreign investment (Pakistan Software Export Board [PSEB], 2023). These initiatives aim to increase IT exports and strengthen the freelancing economy, which is increasingly recognized as a global trendsetter in digital work.

Freelancing, as a subset of the IT sector, has seen exponential growth in Pakistan, driven by platforms like Upwork, Fiverr, and Freelancer. According to the Global Gig Economy Index, Pakistan ranks among the top five freelancing markets globally (Payoneer, 2022). This growth has been facilitated by initiatives such as the eRozgar Program and the DigiSkills Training Program, which equip individuals with the skills needed to compete in the global freelancing market. Additionally, the Pakistan Freelancers' Policy 2021 introduced measures to streamline payments for freelancers, reduce transaction costs, and enhance digital payment systems (State Bank of Pakistan [SBP], 2021).

Despite these advances, challenges remain in the form of limited infrastructure, policy inconsistencies, and the lack of a robust legal framework. Infrastructure gaps, particularly in rural areas, restrict access to high-speed internet, a critical enabler for IT exports and freelancing (Ali, 2020). Moreover, inconsistencies in tax policies and the absence of clear guidelines for freelancing income have created barriers for IT professionals. Addressing these challenges is crucial for realizing the sector's full potential.

This policy paper provides a comprehensive analysis of the policies and practices influencing the growth of IT exports and freelancing in Pakistan. It explores the economic impact, compares global benchmarks, and offers actionable recommendations for enhancing Pakistan's position in the global digital economy.

The economic impacts of IT exports and freelancing on Pakistan are manifold. In 2022, the IT sector contributed approximately $3.5 billion in export revenue, representing a year-on-year growth of 17% (SBP, 2023). This revenue supports job creation, skill development, and technology transfer, fostering economic resilience in a volatile global market. Moreover, freelancing offers an inclusive employment model, empowering women and youth to participate in economic activities from remote locations (Ali & Khan, 2021). However, to sustain this growth trajectory, Pakistan must adopt international best practices. For instance, India and Bangladesh have successfully implemented policies focusing on digital inclusion, enhanced broadband penetration, and incentivizing IT education (World Bank, 2022). Learning from these models, Pakistan can refine its policies to address structural and systemic barriers.

In conclusion, while Pakistan's policies and practices have laid a solid foundation for IT exports and freelancing, strategic interventions are needed to maximize their economic benefits. Strengthening institutional frameworks, expanding infrastructure, and aligning with global best practices will enable Pakistan to leverage its IT sector as a driver of sustainable economic growth. This policy paper provides a comprehensive analysis of the policies and practices influencing the growth of IT exports and freelancing in Pakistan. It explores the economic impact, compares global benchmarks, and offers actionable recommendations for enhancing Pakistan's position in the global digital economy.

Macro-Level Recommendations

1. Policy Integration and Regulatory Reforms

- Establish a comprehensive digital trade policy covering data protection, intellectual property rights (IPR), and taxation.
- Develop clear and simplified tax guidelines tailored for freelancers and IT exports.
- Strengthen enforcement mechanisms for IPR to protect freelancers and IT firms from exploitation.

2. Infrastructure Development

- Expand broadband connectivity, particularly in underserved rural areas.
- Encourage renewable energy solutions for uninterrupted IT operations.
- Modernize the national grid to ensure a stable power supply for tech hubs.

3. Financial Incentives and Investment

- Establish venture capital and innovation funds for tech startups.
- Provide tax incentives and subsidies for both foreign and local IT investors.
- Facilitate partnerships between IT professionals and financial institutions to improve access to business loans.

4. Education and Skill Development

- Collaborate with global tech firms to reform curricula in universities and vocational institutes.
- Promote industry-recognized certifications in AI, cybersecurity, cloud computing, and data analytics.
- Launch youth and gender-focused digital skill training programs.

5. Global Market Integration

- Strengthen trade agreements to enhance IT export opportunities.
- Facilitate partnerships with global freelancing platforms for better market access.
- Promote Pakistan's IT talent through international marketing campaigns.

Micro-Level Recommendations

6.1 Digital Infrastructure and Connectivity

- Increase investments in broadband expansion to ensure nationwide high-speed internet access.
- Partner with telecom companies to improve network reliability and affordability.

6.2 Freelancer Support Programs

- Expand training programs in digital marketing, financial management, and negotiation skills.
- Collaborate with international freelancing platforms to develop tailored training modules.
- Advocate for the introduction of PayPal and other global payment solutions in Pakistan.

6.3 Education and Talent Development

- Modernize curricula to focus on practical, industry-driven skills.
- Promote continuous learning through government-backed online platforms.
- Establish mentorship and coaching programs for freelancers and tech startups.

6.4 Simplification of Taxation Policies

- Develop a dedicated tax framework for freelancers and IT exporters.
- Provide tax exemptions or reductions for IT-related income.
- Launch awareness campaigns to educate freelancers on tax compliance.

6.5 Women and Minority Inclusion

- Design dedicated platforms and mentorship programs for women freelancers.
- Introduce flexible work policies to encourage female participation in the tech industry.
- Offer scholarships and financial support for women pursuing STEM education.

6.6 Cybersecurity and Data Protection

- Implement robust data protection laws aligned with global standards.
- Provide affordable cybersecurity tools and training for freelancers and IT businesses.
- Conduct national cybersecurity awareness campaigns to improve digital safety.

6.7 Promoting Innovation and Startups

- Increase venture capital investment through government-backed incentives.
- Develop and fund more incubators and accelerators for tech startups.
- Reduce bureaucratic hurdles for startups seeking funding and market entry.

Research Group-5: Bridging Gaps in Automobiles and Transportation Industry Policies and Implementation Strategies in Pakistan

The automobile industry is a vital sector for any economy, often referred to as the "mother of all industries" due to its significant role in revenue generation, employment, foreign exchange, and technology transfer. It also impacts various other sectors, including steel, plastics, and fuel, making auto sales a key economic indicator.

In Pakistan, the automobile sector encompasses the production and assembly of passenger cars, light commercial vehicles, trucks, buses, tractors, and motorcycles. The auto spare parts industry is a key allied sector, contributing to the economy by employing around 0.7 million people. Together, the automobile and auto parts industries contribute roughly 4% to Pakistan's GDP and generate about Rs. 30 billion (USD 108 million) in taxes and duties annually.

With 124 manufacturing facilities—34 for four-wheelers and 90 for two/three-wheelers—Pakistan produces approximately 1.8 million motorcycles and 200,000 vehicles annually. This sector provides jobs to 3.5 million people and supports the growth of the vendor industry.

Critique of the Auto Industrial Development and Export Policy (AIDEP) 2021-26: A Framework for Monopoly, Not Progress

The **Auto Industrial Development and Export Policy (AIDEP) 2021-26** fails to provide a forward-looking roadmap for the growth and modernization of Pakistan’s automobile sector. Instead of outlining strategies for technological advancement, domestic manufacturing, and competitive market expansion, the policy appears to serve as a justification for the **status quo**, prioritizing the interests of the **Big Three** auto manufacturers. Rather than acting as a **progressive policy document**, it functions more as an **advocacy tool**, reinforcing the dominance of these corporations while neglecting the broader national interest.

A key reason for this **policy failure** is the **strong grip of the Big Three over the Engineering Development Board (EDB)**, the primary regulatory body responsible for overseeing the sector. Their influence ensures that policies remain skewed in their favor, allowing them to maintain **a near-monopoly** without meaningful competition or innovation. This has severely hindered the development of a truly **indigenous auto industry**, leaving Pakistan dependent on expensive imports and outdated assembly-based operations.

In stark contrast, **Malaysia and India** have implemented policies that actively **protect domestic manufacturing** and promote the growth of local manufacturers and **Original Equipment Manufacturers (OEMs)**. Their strategies encourage **technology transfer, localization of spare parts, and market diversification**, ensuring a more robust and self-reliant auto industry.

One of the most pressing issues in Pakistan's auto sector is the **artificial price inflation** imposed by the Big Three. These companies **import spare parts at exorbitant costs** from their parent companies abroad, transferring the financial burden to local consumers. As a result, despite being an **assembly-based industry**, car prices in Pakistan remain among the **highest in the region**, with **little value addition** happening locally. This is in stark contrast to Pakistan's **tractor industry**, where nearly **100% of parts are locally manufactured**, making tractors **one of the most affordable in the world**. The success of the tractor industry demonstrates that **true localization** is achievable, but the auto sector remains trapped in an **assembly-based, import-dependent model** due to the vested interests of the Big Three.

To **break this cycle**, Pakistan needs a **policy overhaul** that prioritizes:

- **Genuine localization of auto manufacturing** rather than mere assembly.
- **Incentives for new market entrants** to foster competition.
- **Strict regulations on price manipulation** through artificial cost inflation of imported spare parts.
- **A shift in regulatory oversight** from corporate-dominated entities to independent bodies focused on national interest.

Without these structural changes, **Pakistan's auto industry will continue to stagnate**, burdened by **high prices, low innovation, and a lack of domestic production capacity**, ultimately harming consumers and the national economy.

Currently, the composition of the Engineering Development Board (EDB) is heavily dominated by representatives from the "Big Three" automobile manufacturers. This skewed representation has created a significant conflict of interest, as these manufacturers actively work to stifle competition and prevent the entry of new, indigenous car manufacturers into the market. Through both direct and indirect tactics, the Big Three have effectively turned the EDB into a protector of their own business interests, rather than a regulator that serves the broader automotive sector and the national interest.

The EDB, in its current form, has failed to foster innovation, competition, and growth within the automotive industry. Instead, it has become a tool for maintaining the oligopoly of the Big Three, which undermines the development of a competitive and inclusive market. This monopolistic control not only limits consumer choice but also hinders the growth of local engineering talent, innovation, and the potential for Pakistan to become a hub for indigenous automotive manufacturing.

To address these issues, it is imperative to **reconstitute the Engineering Development Board** and free it from the clutches of the Big Three. The EDB must be restructured to ensure fair representation from a diverse range of stakeholders, including small and medium-sized enterprises (SMEs), new market entrants, engineering experts, and representatives from academia. This will help create a more balanced and transparent regulatory environment that prioritizes the growth of the entire automotive sector and aligns with the broader national interest.

Key Recommendations for Reforming the EDB:

1. **Diversify Board Composition:**
    - Reduce the dominance of the Big Three by limiting their representation on the board.
    - Include representatives from emerging automotive manufacturers, SMEs, and indigenous engineering firms.
    - Incorporate independent experts from academia, research institutions, and engineering associations to provide unbiased insights.
2. **Promote Fair Competition:**
    - Introduce policies that encourage the entry of new players into the automotive market.
    - Eliminate discriminatory practices and ensure a level playing field for all manufacturers.
    - Provide incentives for indigenous car manufacturers to innovate and compete globally.
3. **Enhance Transparency and Accountability:**
    - Establish clear guidelines and criteria for decision-making within the EDB.
    - Implement mechanisms to prevent conflicts of interest and ensure that board members act in the best interest of the sector and the nation.
    - Regularly audit the EDB's operations and publish reports to maintain public trust.
4. **Support Innovation and Local Talent:**

- Allocate resources for research and development (R&D) to foster innovation in the automotive sector.
- Collaborate with universities and technical institutes to develop skilled engineers and technicians.
- Encourage the adoption of new technologies, such as electric vehicles (EVs) and hybrid systems, to modernize the industry.

5. **Strengthen Regulatory Frameworks:**
    - Develop and enforce regulations that promote fair trade practices and prevent monopolistic behavior.
    - Ensure that all manufacturers adhere to quality standards and environmental regulations.
    - Facilitate the growth of ancillary industries to support the automotive sector.
6. **Engage Stakeholders:**
    - Hold regular consultations with industry stakeholders, including new entrants, SMEs, and consumer groups, to gather feedback and address concerns.
    - Foster collaboration between the public and private sectors to drive sustainable growth in the automotive industry.

By reconstituting the Engineering Development Board and implementing these reforms, Pakistan can break free from the monopolistic control of the Big Three and create a more dynamic, competitive, and inclusive automotive sector. This will not only benefit consumers and new market entrants but also contribute to the nation's economic growth, technological advancement, and global competitiveness. The time has come to prioritize the broader national interest over the narrow business interests of a few dominant players and pave the way for a brighter future for Pakistan's automotive industry.

Industry-Level Recommendations

1. **Industry Participation in Policy Making**: Ensure that all major players, including auto parts manufacturers and the informal sector, are involved in the policymaking process.
2. **Integration of Formal and Informal Sectors**: Integrate the informal auto parts sector into the formal industry to reduce exploitation and improve standardization.
3. **Technology Upgradation**: Introduce new technologies in manufacturing and assembling to reduce cost inefficiency and improve competitiveness.
4. **Skill Development**: Invest in training programs and technical education to enhance workers' skills, particularly in modern technologies such as CAD/CAM.
5. **Import Dependency**: Address the high import bill of CKD kits, which have contributed to low localization. A ban on the import of locally produced items, as practiced in Malaysia, would encourage collaboration with local industries to improve the quality of auto parts.

Out-of-the-Box Recommendations

1. **Revive Pakistan Steel Mills Corporation (PSMC)**: The PSMC, once a cornerstone of Pakistan's industrial development, is underutilized. Revitalizing this facility could support the auto industry by ensuring a local supply of steel, reducing dependence on imports, and lowering production costs for auto manufacturers.

By implementing these reforms, Pakistan can build a more dynamic and competitive automobile industry, reduce dependence on imports, and promote local manufacturing, ultimately benefiting consumers and contributing to economic growth.

Research Group-6: Bridging Gaps in Labour Policies, Regulations, and Welfare Practices in Pakistan

Non-compliance with labor laws and government-mandated minimum wage standards remains a significant issue in many countries, including Pakistan. Despite legal frameworks that outline minimum wage and worker protections, factories, shops, industries, hotels, and even domestic workers often do not receive their fair share of wages or benefits. This widespread disregard for labor rights leads to severe exploitation, economic inequality, and the violation of human rights.

In Pakistan, workers in the informal sector, such as domestic workers, street vendors, and agricultural laborers, often lack legal protection. Many are employed without contracts or written agreements, making it easier for employers to evade their responsibilities, including the payment of minimum wages, social security benefits, and pension plans. Furthermore, even within formal industries, wages that appear on official documents may differ from the actual wages paid, leading to the exploitation of workers who have no legal recourse.

The situation is particularly dire for security guards in Pakistan. These workers are often paid less than the government-mandated minimum wage and are subjected to grueling 12-hour shifts, with no overtime or compensatory benefits. This sector's exploitation highlights the flaws in the enforcement of labor laws and the urgent need for more robust systems of accountability. These workers are often undocumented, making it difficult for them to claim their rights, and in many cases, they are forced to accept lower wages than the law requires out of fear of losing their jobs.

The impact of these violations is not limited to Pakistan. Around the world, non-compliance with minimum wage laws and poor working conditions create similar challenges. For example, in countries like Japan, South Korea, Canada, and the United States, minimum wage laws are strictly enforced, and violations carry significant legal consequences. These countries have established comprehensive legal frameworks that ensure workers' rights are protected. Employers who fail to comply with minimum wage laws face severe penalties, including fines and imprisonment.

In Japan, for instance, the government has put in place the Minimum Wage Law, which sets wage standards based on regions and industries. Any violation of this law is treated as a criminal offense, and employers who fail to comply are subject to heavy fines. Similarly, in South Korea, the government has instituted a system of monitoring and reporting wage violations, with penalties for non-compliant employers. Canada and the U.S. have also implemented detailed legal structures that ensure compliance with labor laws, and violations are met with serious consequences, including lawsuits, fines, and public shaming. The judicial systems in these countries are highly sensitive to labor rights, and courts often rule in favor of workers against both large and small businesses.

For example, in 2019, the U.S. Department of Labor investigated a major fast-food chain for wage violations, resulting in the company being forced to pay over $1 million in back wages to workers who had not been paid the federal minimum wage. In Japan, a prominent clothing manufacturer was fined for failing to meet the minimum wage standards for its factory workers, and the company faced public backlash for exploiting its workers.

These countries demonstrate that when governments take labor law violations seriously, there are tangible improvements in workers' rights, income security, and overall economic stability. Workers in these countries benefit from comprehensive health insurance, pensions, and other benefits that ensure their financial security and quality of life.

In contrast, in Pakistan and other developing nations, the lack of enforcement and accountability results in an environment ripe for exploitation. Without proper oversight, workers remain vulnerable to wage theft, unsafe working conditions, and the denial of basic human rights. This undermines not only the well-being of workers but also the broader economy, as low wages and poor working conditions contribute to poverty, inequality, and social unrest.

It is essential for Pakistan to adopt a more rigorous approach to enforcing labor laws, ensuring that all workers, regardless of their industry or sector, are paid a fair wage, have access to social protections, and work in safe and healthy environments. The consequences of failing to do so are far-reaching, affecting not only the individual workers but also the country's economic development and social cohesion.

In conclusion, the non-compliance with labor laws and the failure to pay minimum wages is a serious violation of human rights and has significant economic and legal consequences. Countries like Japan, South Korea, Canada, and the U.S. serve as examples of how strict enforcement of labor laws can lead to better outcomes for both workers and the economy. Pakistan must take heed of these examples and implement stronger measures to protect its workers, ensuring that their basic rights are respected and upheld. The exploitation of workers, particularly in the informal and underregulated sectors, must be addressed to foster a more equitable and just society.

Recommendations for Strengthening Pakistan's Labour Framework

These recommendations aim to address systemic gaps in Pakistan's labour policies, regulations, and welfare systems. By focusing on legal reforms, institutional capacity, and inclusivity, the proposed measures seek to promote equitable industrial growth, enhance social protection, and incorporate global best practices.

Policy and Actionable Recommendations:

To address the significant issue of non-compliance with labor laws and minimum wage standards in Pakistan, a comprehensive approach involving legal, institutional, and

societal reforms is essential. Drawing from international best practices, the following policy and actionable recommendations are proposed to ensure the protection of workers' rights, improve enforcement, and tackle exploitation across various sectors:

1. **Strengthening Legal Frameworks and Enforcement**
    - **Policy Recommendation:** Review and revise the existing labor laws to ensure they are comprehensive and adaptable to changing economic conditions, including the informal sector. Laws should explicitly cover all workers, including domestic workers, street vendors, and those in informal or part-time employment.
    - **Actionable Steps:**
        - Establish a national task force to review labor laws and propose necessary updates, ensuring they include provisions for the gig economy and informal workers.
        - Ensure that penalties for non-compliance with minimum wage laws and worker protections are severe and consistently enforced.
        - Require employers to maintain accurate, accessible wage records and submit regular audits to a regulatory body to ensure compliance.
        - Establish dedicated labor law enforcement units within the police and labor departments to specifically investigate and act on violations.
        - Create a centralized system for reporting wage violations, allowing workers to file complaints anonymously without fear of retaliation.
    - **Example:** In South Korea, the government created a specialized labor inspection agency that conducts routine inspections and responds to worker complaints swiftly. The agency has significantly reduced violations of labor laws through proactive engagement and enforcement.
2. **Comprehensive Monitoring and Documentation**
    - **Policy Recommendation:** Implement a robust system for monitoring labor conditions in both formal and informal sectors, ensuring proper documentation of wages and working conditions.
    - **Actionable Steps:**
        - Introduce a national electronic database for wage records, where all employers must register their employees and update salary details regularly.
        - Mandate that all businesses, including small enterprises and domestic employers, provide a written contract for each worker outlining pay, hours, benefits, and job responsibilities.
        - Create a public, accessible platform where workers can view and compare industry-standard wages to empower them to advocate for themselves.
        - Establish a complaint redressal mechanism where workers can report discrepancies in wages, hours, or benefits, and ensure that these reports are treated as confidential and legally binding.
    - **Example:** In the United States, the Fair Labor Standards Act (FLSA) enforces detailed wage documentation and transparent reporting, and businesses must provide clear wage records to both workers and authorities. This transparency has empowered workers to ensure they are paid fairly.

3. **Protection of Vulnerable Workers in the Informal Sector**
    - **Policy Recommendation:** Extend labor protections, including minimum wage, social security, and pension rights, to workers in the informal sector, such as domestic workers, street vendors, and agricultural laborers.
    - **Actionable Steps:**
        - Implement a national registration system for informal workers, allowing them to access social security, health insurance, and pension benefits.
        - Launch an awareness campaign to educate informal workers about their rights and available support mechanisms.
        - Develop partnerships with NGOs and community organizations to help inform and assist informal workers in registering for benefits and filing complaints.
    - **Example:** In Argentina, domestic workers were granted formal labor protections, including access to minimum wage, paid vacation, and social security, following a significant policy shift that recognized their labor rights and included them in the formal economy.
4. **Regulation and Standardization of Working Hours and Conditions**
    - **Policy Recommendation:** Enforce strict regulations on working hours, overtime pay, and working conditions, especially in sectors like security services, hospitality, and manufacturing, where violations are rampant.
    - **Actionable Steps:**
        - Enforce limits on working hours, ensuring no worker is required to work beyond a 48-hour week without proper compensation.
        - Introduce penalties for employers who force workers to work overtime without compensation or force workers to work under unsafe conditions.
        - Implement mandatory safety standards and health regulations in workplaces, particularly in sectors such as construction, security, and agriculture.
        - Require all employers to provide access to rest breaks, health and safety equipment, and safe working environments, particularly in industries with physically demanding tasks.
    - **Example:** In Japan, the government enforces strict labor laws that regulate working hours and overtime. Companies that violate these laws face hefty fines and public reputations that are closely monitored by the media.
5. **Strengthening the Social Protection System**
    - **Policy Recommendation:** Reform Pakistan's social protection system to include all workers, particularly those in the informal and under-regulated sectors, ensuring access to healthcare, pensions, and unemployment benefits.
    - **Actionable Steps:**
        - Establish a universal social security system that is not contingent upon formal employment status, enabling informal workers to benefit from pensions, health insurance, and unemployment benefits.

        - Expand and improve the Employee Old-Age Benefit Institution (EOBI) and Workers Welfare Fund to ensure better coverage and access for all workers, regardless of sector.
        - Create a basic income guarantee for workers in highly precarious jobs, such as domestic workers or seasonal agricultural workers, to provide financial stability in times of hardship.
    - **Example:** In Canada, the government provides universal healthcare and pensions to all residents, including informal workers. Similarly, the United Kingdom has introduced universal social security schemes that protect all workers, regardless of employment status, in times of illness, retirement, or unemployment.
6. **Public Awareness Campaign and Worker Empowerment**
    - **Policy Recommendation:** Launch a comprehensive public awareness campaign to inform workers of their rights, the importance of labor law compliance, and how they can hold employers accountable.
    - **Actionable Steps:**
        - Use media, social media, and community programs to educate workers on their legal rights and available resources for reporting violations.
        - Establish labor rights education programs in schools and vocational training centers to instill a strong sense of worker advocacy among future generations.
        - Empower labor unions and worker organizations to become more active in advocating for better labor conditions and providing legal support for workers facing exploitation.
    - **Example:** In the Philippines, public awareness campaigns have helped increase the reporting of labor violations, and unions play a key role in negotiating improved wages and conditions for workers in sectors like retail, construction, and domestic work.
7. **Private Sector Accountability and Corporate Social Responsibility (CSR)**
    - **Policy Recommendation:** Promote corporate social responsibility (CSR) and make businesses accountable for their labor practices by encouraging transparency and ethical labor standards.
    - **Actionable Steps:**
        - Introduce mandatory reporting requirements for large businesses on their labor practices, including wage structures, working conditions, and the number of workers in informal sectors.
        - Encourage businesses to adopt CSR initiatives that include fair wage policies, employee welfare programs, and transparency in labor practices.
        - Promote partnerships with international organizations and global supply chains to ensure that businesses align with global labor standards and fair trade practices.
    - **Example:** In the European Union, the introduction of the EU Directive on Non-Financial Reporting requires large companies to disclose their labor practices, including worker conditions and fair wage policies, as part of their annual reports.
8. **Establish the Pakistan Labour Information Management System (PLIMS)**

- To ensure the equitable implementation of labour policies across Pakistan, PLIMS should be established, modeled after the Benazir Income Support Program (BISP). This centralized database will link stakeholders such as federal and provincial ministries, Workers' Welfare Fund, and social security institutions. It will provide an interactive platform for employers, unions, and international organizations to access laws, report issues, and align with ILO conventions.

9. **Legal and Policy Reforms**
    - **Develop a Unified National Labour Policy:** Harmonize provincial labour laws and align them with international standards post-18th Amendment.
    - **Revise Outdated Laws:** Update the Factories Act (1934) and related legislation to address modern challenges, including gig work and occupational safety.
    - **Extend Coverage to the Informal Sector:** Amend laws to include informal workers in social protection schemes such as healthcare and pensions.
10. **Institutional Capacity Building**
    - **Enhance Provincial Labour Departments:** Provide adequate funding, training, and digital tools to improve labour inspections and law enforcement.
    - **Strengthen the Workers Welfare Fund (WWF):** Implement regular audits and grievance redressal mechanisms for transparency and better fund utilization.
    - **Support Provincial Workers Welfare Boards (PWWBs):** Provide technical and financial support to underdeveloped regions like Balochistan.
11. **Formalizing the Informal Sector**
    - **Introduce Incentives for Formalization:** Create programs offering tax benefits and financial support to small businesses that formalize their workforce.
    - **Digital Worker Registration:** Develop a centralized platform for registering informal workers and ensuring access to social protection schemes.
12. **Promote Gender Equality and Social Inclusion**
    - **Gender-Specific Welfare Initiatives:** Introduce maternity benefits, workplace accommodations, and childcare support for female workers.
    - **Address Child Labour:** Strengthen enforcement of child labour laws and provide alternative education and vocational training.
    - **Empower Marginalized Groups:** Ensure equitable representation of women, minorities, and informal workers in unions and tripartite decision-making bodies.
13. **Strengthening Enforcement Mechanisms**
    - **Reform Labour Inspections:** Increase inspection frequency, supported by trained personnel and digital tools.
    - **Enforce Minimum Wage Compliance:** Regularly review and adjust minimum wages in line with inflation and cost of living.
    - **Combat Bonded Labour:** Strengthen enforcement of the Bonded Labour System (Abolition) Act (1992), using targeted inspections and rehabilitation programs.
14. **Enhance Workplace Safety**

- **Adopt Comprehensive Safety Standards:** Enforce rigorous workplace safety regulations aligned with international practices.
- **Regular Safety Audits:** Mandate periodic audits, especially in high-risk industries like mining and garment manufacturing.

15. **Expand Social Protection Coverage**
    - **Expand EOBI Coverage:** Simplify registration processes and incentivize employers to enroll workers in the Employees Old-Age Benefits Institution.
    - **Universal Social Protection Framework:** Develop frameworks for universal social protection, including healthcare, pensions, and housing, for all workers, especially in rural and informal sectors.
16. **Encourage Unionization and Collective Bargaining**
    - **Simplify Union Registration:** Reduce bureaucratic hurdles and protect against employer retaliation to promote union formation.
    - **Empower Trade Unions:** Strengthen union participation in policymaking and enhance their capacity to advocate for workers' rights.
17. **Technological Integration**
    - **Leverage Technology for Transparency:** Implement digital platforms for fund disbursement, compliance monitoring, and grievance redressal.
    - **Real-Time Data Collection:** Develop a labour market information system to monitor trends and inform policy decisions.
18. **Adopt Global Best Practices**
    - **Skill Development Programs:** Partner with industries to introduce vocational training and dual education systems similar to Germany's model.
    - **Progressive Wage Policies:** Create a Fair Wage Commission to periodically adjust wages based on economic conditions, following international models.
    - **Anti-Discrimination Legislation:** Implement hiring and workplace equality measures akin to Canada's Equal Employment Opportunity framework.
19. **Stakeholder Engagement and Public Awareness**
    - **Promote Tripartite Collaboration:** Enhance engagement among government, employers, and labour unions to address systemic issues and foster collective solutions.
    - **Public Awareness Campaigns:** Educate workers about their rights and employers about their responsibilities, focusing on informal and marginalized workers.
20. **Economic Incentives for Compliance**
    - **Tax Breaks for Compliant Employers:** Offer financial incentives for employers who adhere to labour laws and provide social protections.
    - **Subsidized Welfare Contributions:** Provide subsidies for welfare contributions to encourage the inclusion of informal workers.
21. **Case Scenario-Based Implementation**
    - **Train Law Enforcement on Bonded Labour Laws:** Provide specialized training for law enforcement and judiciary on bonded labour laws and human rights frameworks.
    - **Expedited Trial Forums:** Establish dedicated forums for swift legal proceedings in bonded labour cases.

- **Awareness Campaigns for Bonded Labour Workers:** Launch awareness programs to educate workers about their rights under the Bonded Labour System (Abolition) Act (1992).

Research Group-7: Bridging Gaps in Agriculture Mechanization and Smart Agricultural Policies and Implementation Strategies in Pakistan

The report explores the potential and prospects of mechanized agriculture and smart agricultural techniques as drivers of productivity, sustainability, and industrial development in Pakistan. With agriculture contributing 23% to GDP and employing 38% of the labor force, its modernization is critical to addressing challenges like low productivity and inefficient practices. The analysis emphasizes the importance of adopting innovative technologies and implementing cohesive policies to unlock the sector's potential.

Pakistan's agriculture sector plays a pivotal role in the economy, yet it struggles with outdated practices and limited mechanization. Mechanized tools and smart agriculture technologies, such as IoT and precision farming, can transform farming practices, reduce costs, and enhance yields. However, barriers such as fragmented landholdings, high costs, and limited access to financing hinder progress.

Agricultural development in Pakistan has evolved through several phases: Post-Independence Era (1947-1960), which focused on food security and land reforms; the Green Revolution (1960s-1970s), which introduced high-yield seeds, chemical fertilizers, and expanded irrigation; Mechanization Initiatives (1980s-1990s), which promoted tractors, threshers, and irrigation systems; Modernization and Globalization (2000s-2010s), which shifted toward sustainable practices and biotechnology; and Recent Developments (2020-Present), emphasizing climate-resilient agriculture and digital solutions.

The report employs multiple analytical frameworks, including situational analysis, which highlights the uneven adoption of mechanization and smart technologies across regions; stakeholder analysis, which identifies key players such as government, research institutions, farmers, private sector, and financial institutions while noting weak coordination; SWOT analysis, which points out strengths like a large agricultural base and international collaboration, weaknesses like fragmented policies, opportunities in public-private partnerships, and threats from political instability; and gap analysis, which reveals critical gaps in policy, infrastructure, and farmer training, limiting the adoption of advanced technologies.

Key challenges include the lack of a comprehensive national policy on mechanization and smart agriculture, high costs of machinery and limited financing options for small farmers, inadequate infrastructure and fragmented landholdings, insufficient training programs and technical support, and weak coordination among federal and provincial stakeholders.

Mechanized and smart agricultural techniques offer transformative potential for Pakistan's agriculture sector. However, existing gaps in policies, infrastructure, and collaboration must be addressed to achieve sustainable growth and industrial development.

The report proposes actionable recommendations: develop a cohesive national policy focused on mechanization and smart agriculture, invest in rural infrastructure including electricity, internet, and storage facilities, provide low-interest loans and subsidies to make technologies affordable for smallholders, promote public-private partnerships to facilitate access to advanced equipment, launch extensive training programs to build farmers' capacity, and leverage underutilized imported machinery while promoting local manufacturing through reverse engineering.

A detailed log frame outlines the strategic objectives, activities, timelines, and key performance indicators for implementing the proposed initiatives. This structured approach ensures measurable progress and accountability in transforming the agriculture sector.

Mechanization and smart agriculture are vital for transforming Pakistan's agricultural sector, enabling higher productivity, sustainability, and profitability. Agriculture plays a significant role in Pakistan's economy, contributing substantially to GDP, employment, and exports. However, there is a pressing need to improve its efficiency through mechanization and the adoption of modern technologies to ensure that the sector remains competitive and resilient in a rapidly changing global market.

1. Importance of Mechanization in Agriculture

Mechanization involves using machinery to carry out agricultural tasks that were traditionally done by hand or animal labor. The importance of mechanization in Pakistan's agricultural sector can be understood through the following points:

- **Increased Productivity:** Mechanization leads to faster and more efficient planting, harvesting, and processing of crops. This is particularly crucial for a country like Pakistan, where a large agricultural base is facing increasing labor shortages and rising wages.
- **Cost-Effectiveness:** Mechanized farming reduces the dependence on manual labor, providing cost savings in an economy where labor costs are steadily increasing. This is vital for maintaining competitiveness in both domestic and international markets.
- **Consistency and Precision:** Machines offer greater precision in applying fertilizers, pesticides, and irrigation, resulting in more consistent crop yields and reducing waste. Precision farming is particularly important for high-value crops that require specific growth conditions.
- **Increased Scale:** Mechanization facilitates large-scale farming, which is essential for achieving economies of scale. This is particularly beneficial for large landholders, allowing them to operate more efficiently and sustainably.

2. Dimensions of Smart Agriculture

Smart agriculture integrates digital technologies, data-driven decision-making, and automation to optimize farming practices. Key dimensions of smart agriculture include:

- **Precision Agriculture:** The use of GPS, Internet of Things (IoT) devices, and remote sensing technologies helps monitor soil health, crop growth, and water usage. This allows for more accurate farming decisions and resource allocation.
- **Data-Driven Decision Making:** Smart farming leverages big data and artificial intelligence (AI) to make informed decisions regarding irrigation, pest management, crop rotation, and market trends. This optimizes farm management and ensures greater productivity.
- **Sustainable Practices:** Smart agriculture promotes environmentally friendly farming practices by improving resource management, reducing pesticide use, and enhancing water conservation methods.
- **Integration of Renewable Energy:** The integration of solar and wind energy in farming operations reduces dependency on traditional energy sources, providing a more sustainable and cost-effective alternative for farmers.

Recommendations for Mechanization and Smart Agriculture

1. Expanding Mechanization and Smart Agriculture in Pakistan: Leveraging Innovation and Reverse Engineering for Local Adaptation

In the context of Pakistan, agriculture remains the backbone of the economy, contributing significantly to GDP, employment, and exports. Despite its centrality, the sector faces numerous challenges related to productivity, sustainability, and outdated farming practices. Mechanization and smart agriculture are poised to address these issues, but adapting modern technologies to local needs is essential for long-term success. One potential solution lies in leveraging **smart reverse engineering** to replicate and adapt advanced agricultural machinery from countries like China, the United States, Israel, and India, tailoring these machines to local conditions without incurring prohibitive costs.

The Role of Reverse Engineering in Mechanization

Reverse engineering refers to the process of deconstructing existing machinery to understand its components, functionalities, and design, which allows for its reproduction or adaptation to local needs. This process can benefit Pakistan by allowing the country to replicate machinery from global leaders in agricultural technology, making it more affordable and suited to Pakistan's unique agricultural environment. Below, we explore how smart reverse engineering, combined with local manufacturing capabilities, can benefit Pakistan by enhancing productivity and lowering costs.

Case Study: Innovation and Technological Advancements from Global Leaders

1. **China**:
    - **Innovation in Cost-Effective Machinery**: China has made significant strides in creating cost-effective agricultural machinery for small-scale and large-scale farmers alike. Chinese agricultural technology is known for its affordability and high efficiency, catering to the needs of countries with large agricultural sectors like Pakistan. By reverse engineering Chinese machinery, Pakistan can adapt this technology for local soil types, crops, and climatic conditions. With large-scale manufacturing capabilities in cities like **Gujranwala** and **Faisalabad**, Pakistan can develop advanced machinery suited to local requirements, increasing productivity and reducing dependence on imported equipment.
    - **Cost Savings**: Reverse engineering Chinese machines will cut down on the high costs of importing these machines, making them more accessible to Pakistani farmers, especially smallholders who traditionally lack access to modern farming tools.
2. **United States**:
    - **High-Precision Farming Equipment**: The United States is a global leader in the development of high-precision farming equipment, particularly machinery for precision planting, irrigation, and harvesting. By reverse engineering U.S.-developed equipment, Pakistan can replicate these technologies on a local scale, using Pakistan's own resources and knowledge to reduce costs. Additionally, Pakistani engineers can innovate on the existing designs, improving them to suit the specific challenges faced by the country, such as erratic weather patterns and water scarcity.
    - **Data-Driven Agricultural Solutions**: U.S. companies have also pioneered the integration of **Internet of Things (IoT)** and **Artificial Intelligence (AI)** into agricultural machinery, enabling real-time data collection and analysis. Pakistan can adopt and adapt these systems to optimize water usage, fertilizer application, and pest control. This would not only increase yields but also promote more sustainable farming practices in Pakistan, especially in the face of mounting water scarcity.
3. **Israel**:
    - **Water-Efficient Machinery**: Israel has long been a leader in developing technologies that address water scarcity, a critical challenge for Pakistan. Israeli innovations in drip irrigation and water-efficient crop management technologies have transformed agriculture in arid regions. By reverse engineering Israeli irrigation technologies, Pakistan can develop locally tailored, cost-effective systems to manage its scarce water resources more efficiently. Localizing these systems can provide significant water savings, leading to more sustainable agricultural practices.
    - **Desert Farming Technologies**: In addition to irrigation systems, Israel has also developed technologies for farming in arid and semi-arid regions, making agriculture viable even in regions with limited rainfall. By adapting these technologies to Pakistan's agricultural landscape, particularly in arid regions like Sindh and Balochistan, Pakistan can increase the productivity of areas previously deemed unsuitable for conventional farming.
4. **India**:

- **Adapting Affordable Technologies for Small Farmers**: India has seen a surge in innovations designed to address the challenges faced by smallholder farmers. By reverse engineering Indian agricultural machinery, Pakistan can access affordable, simple-to-use machinery tailored to smaller landholdings. India's success in promoting **micro-irrigation systems**, **small-scale tractors**, and **manual equipment** can be replicated and scaled in Pakistan, enabling greater mechanization at the grassroots level.
- **Mechanized Harvesting Solutions**: India has also focused on developing cost-effective, **low-maintenance mechanized harvesters** for various crops, including rice and wheat. Replicating these solutions through smart reverse engineering can lead to significant time and labor savings, reducing the dependency on manual labor, which is becoming increasingly scarce and expensive in Pakistan.

Leveraging Reverse Engineering for Local Adaptation and Affordability

Through reverse engineering, Pakistan can achieve the following key outcomes:

1. **Cost Reduction**: Importing advanced machinery can be prohibitively expensive due to high customs duties and shipping costs. By reverse engineering existing models from China, the U.S., Israel, and India, Pakistan can reduce costs, making advanced agricultural technologies affordable for farmers across the country. This can be especially beneficial for smallholder farmers who otherwise may not have access to mechanization due to financial constraints.
2. **Local Adaptation**: Reverse engineering enables Pakistan to modify machinery to suit the local agricultural context. Pakistan has diverse farming conditions, from flood-prone areas in Punjab to dryland farming in Balochistan, and adapting machinery to these conditions is crucial. By using reverse engineering, Pakistan can tailor equipment for local soil types, weather patterns, and crop varieties, enhancing both efficiency and sustainability.
3. **Boosting Local Manufacturing**: Reverse engineering allows Pakistan to develop a robust domestic manufacturing industry focused on agricultural machinery. By collaborating with local engineering firms and technical institutes, Pakistan can build a sustainable ecosystem of machinery production, creating jobs, supporting small and medium enterprises (SMEs), and strengthening its industrial base. The **Gujranwala Industrial Estate**, for example, could become a hub for manufacturing customized agricultural machinery, benefiting both the agricultural sector and the local economy.
4. **Incentivizing Innovation**: As local manufacturers gain experience in reverse engineering and adapt technologies to local needs, they will also be encouraged to innovate. With the right investment in research and development (R&D), Pakistan can develop its own unique agricultural technologies that could be exported to other countries with similar agricultural challenges.

Key Recommendations for Implementing Smart Reverse Engineering

1. **Develop Strong Policy Frameworks**: The government of Pakistan should create policies that support the development of local agricultural machinery through reverse engineering. This could include offering subsidies or tax incentives for companies

engaged in the production of locally adapted machinery. Additionally, creating a **National Machinery Innovation Fund** could provide seed funding for small and medium-sized enterprises (SMEs) involved in reverse engineering and manufacturing.

2. **Public-Private Partnerships (PPP)**: The government should foster PPPs to facilitate the import and local adaptation of advanced machinery. This could include joint ventures between Pakistani companies and global machinery manufacturers, ensuring the sharing of technology and expertise. For instance, working with Chinese or Indian manufacturers to set up local assembly lines would lower costs and ensure that machines are produced in-country.
3. **Invest in Skill Development**: Reverse engineering requires a skilled workforce capable of understanding and adapting foreign designs. Pakistan should invest in technical education and training programs for engineers, technicians, and farmers to develop the necessary skills for machinery adaptation and operation. Technical institutes like **NAVTTC** and universities specializing in agricultural engineering could play a vital role in providing this training.
4. **Strengthen Infrastructure**: For reverse engineering to be successful, Pakistan must invest in the infrastructure needed for machinery production and testing. This includes improving power supply, road networks, and internet connectivity to rural areas, which would facilitate the widespread adoption of mechanization.
5. **Collaborate with International Experts**: To successfully replicate and adapt advanced machinery, Pakistan should collaborate with international experts from countries like China, the U.S., Israel, and India. This could include setting up joint R&D centers and innovation hubs that focus on creating solutions for local agricultural challenges.

- By harnessing the potential of **smart reverse engineering**, Pakistan can make significant strides in mechanizing its agricultural sector, addressing the challenges of low productivity, outdated farming practices, and resource inefficiency. Through strategic partnerships, local manufacturing, and adaptation of global innovations, Pakistan can ensure that its farmers, both small and large, have access to affordable, efficient, and sustainable agricultural machinery. By embracing reverse engineering as a key enabler of innovation, Pakistan can transform its agricultural landscape, increase productivity, and improve food security for future generations.

- **Skill Development and Innovation:** Technical institutes and universities should be encouraged to engage in reverse engineering and research and development (R&D) of agricultural machinery. This would help build a skilled labor force capable of sustaining the initiative and fostering innovation in the sector.

2. Large-Scale Farming with High-Yield Practices

Mechanization plays a key role in enabling large-scale, high-yield farming, which is essential for improving food production and meeting the growing demand for agricultural products. Key recommendations include:

- **Land Consolidation:** Encouraging land consolidation can increase farm size, making it easier to adopt mechanized practices. Supporting cooperatives and community farming initiatives will allow smaller farmers to access machinery and resources.

- **Access to High-Yielding Varieties:** Developing and promoting high-yielding crop varieties can significantly increase food production, especially when combined with mechanized farming techniques.
- **Agri-Tech Investments:** Both public and private investments in agri-tech startups can lead to the development of innovative farming technologies that increase yield per hectare and optimize resource use.

Relationship Between Community and Corporate Farming in Pakistan

Both community farming (smallholder farming) and corporate farming play crucial roles in Pakistan's agricultural sector. A balanced approach that integrates both models can help address challenges and drive innovation.

- **Community Farming:** Smallholder farmers make up the majority of Pakistan's agricultural producers. However, they face challenges like limited access to modern machinery, poor credit access, and outdated farming practices. Mechanization and smart agriculture can significantly enhance their productivity and improve their livelihoods.
- **Corporate Farming:** Large-scale commercial farms have the advantage of economies of scale, making it easier for them to adopt mechanization and modern technologies. They can also serve as demonstration hubs, showcasing the benefits of mechanization to smaller farmers.

The challenge lies in bridging the gap between these two models. By fostering cooperation between community and corporate farming, both can benefit from mechanization and smart agricultural practices.

Key Issues and Challenges

Despite the potential benefits of mechanization and smart agriculture, several challenges hinder their widespread adoption in Pakistan:

1. **High Initial Cost of Machinery:** Even locally produced machinery can be expensive for smallholders. Financial support, subsidies, or easy financing options are necessary to make machinery affordable.
2. **Lack of Infrastructure:** Poor rural infrastructure, including roads and electricity, limits the reach of mechanized farming technologies.
3. **Inadequate Training:** Many farmers lack the technical knowledge to operate modern machinery effectively. Capacity-building programs are needed to address this gap.
4. **Land Fragmentation:** Smallholder farmers often have fragmented land holdings, which makes mechanization more challenging. Land consolidation efforts are essential.
5. **Water Scarcity:** Efficient water management is critical, and smart irrigation technologies need to be promoted to address Pakistan's water scarcity issues.
6. **Resistance to Change:** Cultural practices and traditional farming methods often make farmers hesitant to adopt new technologies.

Recommendations to Overcome Challenges

To address these challenges, the following measures are recommended:

1. **Government Support for Mechanization:** The government should provide subsidies or low-interest loans to enable farmers to purchase machinery.
2. **Infrastructure Development:** Improved rural infrastructure, including roads, electricity, and internet connectivity, is crucial for the success of mechanization and smart agriculture.
3. **Capacity-Building Initiatives:** Training programs should be designed to teach farmers how to use new machinery and technologies. Extension services can play a vital role in this effort.
4. **Support for Smallholder Farmers:** Farmer cooperatives or groups should be formed to pool resources and share machinery, making mechanization more accessible.
5. **Research and Development:** Public and private institutions should invest in R&D to develop machinery and high-yielding crop varieties suited to local conditions.
6. **Water Management Technologies:** Introducing smart irrigation technologies, such as drip irrigation and automated sprinklers, will improve water efficiency and help manage scarce water resources.

Mechanization and the adoption of smart agriculture are essential for enhancing Pakistan's agricultural productivity and ensuring food security. By focusing on local production of machinery through reverse engineering, promoting large-scale farming, and embracing high-yield practices, Pakistan’s agricultural sector can significantly improve. Bridging the gap between community and corporate farming models, supporting capacity-building initiatives, and addressing infrastructure and financial constraints are key to overcoming challenges and unlocking the full potential of the sector.

Research Group-8: Bridging Gaps in Policies for High-Tech and Innovative Industries: Lessons from China's Reverse Engineering Strategies for Pakistan

Innovation has long been the engine of economic progress, dating back to ancient civilizations that laid the groundwork for modern engineering and technological advancement. In today's global economy, high-tech and innovative industries are pivotal for sustainable growth and competitiveness. Reverse engineering, a strategic process of deconstructing and replicating technologies, has emerged as a critical tool for technological development. This approach has been instrumental in the economic transformation of nations such as China and Japan, providing valuable lessons for Pakistan as it seeks to modernize its industrial base and reduce reliance on imports.

The Role of Reverse Engineering in Economic Transformation

Reverse engineering allows countries to bridge technological gaps, enhance local capabilities, and foster innovation. China and Japan have demonstrated the efficacy of this approach across multiple sectors. China institutionalized reverse engineering through state-backed initiatives like "Made in China 2025," leveraging it to advance defense, semiconductors, renewable energy, and telecommunications. For instance, Chinese firms like LONGi Solar adapted German solar panel designs to dominate global renewable energy markets. Similarly, the Chengdu Aircraft Corporation reverse-engineered Russian aircraft technologies to produce platforms like the JF-17 Thunder.

Japan's post-World War II industrial revival was also fueled by reverse engineering. Automakers such as Toyota and Nissan studied American manufacturing techniques, introducing innovations like lean production and Kaizen, which propelled them to global leadership. In electronics, Sony's reverse engineering of U.S. tape recorders led to the development of superior consumer products. Supported by robust government policies, Japan transformed into a technological powerhouse.

Potential for Reverse Engineering in Pakistan

For Pakistan, reverse engineering offers immense potential to address economic and technological challenges. The country's high import bill, amounting to $54.73 billion in FY 2023-24, underscores its dependence on foreign technologies. By integrating reverse engineering into its national strategy, Pakistan can localize production, enhance export competitiveness, and foster sustainable economic growth. Key sectors for intervention include:

1. **Defense and Aerospace**: Institutions like the Pakistan Aeronautical Complex (PAC) Kamra and Pakistan Ordnance Factories (POF) Wah already possess technical expertise. Scaling reverse engineering can bolster defense manufacturing and reduce reliance on imports.
2. **Pharmaceuticals**: The replication of generic medicines and biosimilars can meet local demands while enabling Pakistan to compete in international markets.
3. **Agriculture**: Inspired by Chinese and Japanese models, precision farming tools, hybrid seeds, and localized agricultural machinery can enhance productivity and food security.
4. **Renewable Energy**: Localizing solar panel and wind turbine production through reverse engineering can reduce energy import costs and support the transition to sustainable energy sources.
5. **IT and E-Commerce**: Reverse engineering can help Pakistan replicate and innovate on successful global platforms, fostering growth in the digital economy.
6. **Textiles and Surgical Instruments**: Concentrated in the Golden Triangle region (Sialkot, Faisalabad, Gujranwala), these industries can adopt modern production techniques to compete globally.

Lessons from China's Strategies

China's reverse engineering success can guide Pakistan in crafting policies for industrial transformation:

1. **Automotive Sector**: Joint ventures and technology-sharing agreements with foreign automakers allowed Chinese firms like BYD to innovate in electric vehicles.
2. **Electronics**: Subsidized R&D and intellectual property strategies enabled firms like Huawei to develop advanced telecom solutions.
3. **Information Technology**: Companies like Alibaba reverse-engineered Western e-commerce platforms to create localized solutions, supported by government protectionist policies.
4. **Pharmaceuticals**: Reverse-engineering patented drugs helped China develop generics and biosimilars, establishing a foothold in the global pharmaceutical market.
5. **Renewable Energy**: Firms like LONGi Solar used reverse-engineered German solar technologies to become global leaders, supported by state subsidies and low-interest loans.
6. **Defense and Aerospace**: Centralized military R&D and substantial state funding facilitated the development of advanced defense technologies.

Lessons from Japan's Strategies

Japan's success underscores the importance of precision, quality, and incremental innovation:

1. **Automotive Sector**: Post-war efforts to reverse-engineer U.S. car models enabled firms like Toyota to develop efficient and reliable production techniques.
2. **Electronics**: Companies like Sony refined reverse-engineered Western technologies to produce superior consumer electronics.
3. **Pharmaceuticals**: Firms like Takeda leveraged reverse engineering to improve Western pharmaceuticals, supported by government-backed R&D initiatives.

4. **Information Technology**: Japan's emphasis on precision engineering and computing technologies was bolstered by projects like the Fifth Generation Computer Systems initiative.

Policy Recommendations for Pakistan

To maximize the benefits of reverse engineering, Pakistan must adopt a comprehensive approach:

1. **Policy Integration**: Develop a national strategy that prioritizes reverse engineering in key sectors such as defense, pharmaceuticals, agriculture, and renewable energy.
2. **Government Support**: Provide subsidies for R&D, incentivize technology-sharing agreements, and establish public-private partnerships to facilitate innovation.
3. **Academia-Industry Collaboration**: Foster partnerships between universities and industries to create a skilled workforce capable of implementing reverse engineering techniques.
4. **Regulatory Reforms**: Streamline intellectual property regulations to balance innovation with legal compliance.
5. **Infrastructure Development**: Invest in modernizing industrial infrastructure to support the adoption of advanced technologies.
6. **Capacity Building**: Train local engineers and technicians in reverse engineering methodologies, leveraging international collaborations for knowledge transfer.

Reverse engineering offers a transformative pathway for Pakistan to achieve technological self-reliance and economic growth. By learning from the strategies of China and Japan, Pakistan can localize production, reduce import dependency, and enhance its global competitiveness. With the right policies, investments, and collaborative efforts, reverse engineering can become a cornerstone of Pakistan's industrial and economic revival.

Research Group-9: Bridging Gaps in Policy Design and Implementation Strategies in the Textile Sector of Pakistan: A Critical Analysis and Way Forward

The textile industry is a cornerstone of many economies, contributing significantly to exports, employment, and overall industrial development. In Pakistan, it is the dominant sector, constituting over 60% of the nation's total exports and contributing around 8.5% to GDP (Pakistan Bureau of Statistics, 2022). However, despite its importance, the textile industry in Pakistan faces numerous challenges that hinder its growth and competitiveness on the global stage. Issues such as outdated machinery, poor-quality cotton production, energy crises, and a lack of diversification in product offerings have plagued the sector for decades. This analysis will examine these issues, with a particular focus on the impact of the 2007 energy crisis, industrial fault lines, and policy failures that have exacerbated these challenges. Additionally, a comprehensive set of recommendations will be presented to revitalize the sector, aiming to restore Pakistan's position as a global textile leader.

The textile sector plays a pivotal role in Pakistan’s economy, with the country being the 12th largest exporter of textiles globally, and the 4th largest producer of cotton. The industry is concentrated primarily in Karachi, Lahore, and Faisalabad, producing a wide range of textile products, including cotton yarn, woven fabric, knitwear, bed linen, and ready-made garments. Key export markets for Pakistan include the US, EU, UK, Turkey, and UAE, with major global brands such as Zara, H&M, and Adidas sourcing their products from Pakistan (Survey, 2023-24).

2. Challenges Facing the Textile Sector

a. Low-Quality Cotton Production Cotton is the backbone of Pakistan's textile industry, but the country suffers from poor-quality cotton due to outdated farming techniques and inadequate pest control. Pakistani cotton lacks the necessary length, strength, and fineness required for high-quality textile products. The dependence on imported cotton from countries like Egypt and the USA adds to production costs, making the industry less competitive.

b. Outdated Machinery and Production Methods A significant portion of Pakistan's textile industry relies on outdated machinery and traditional production methods. The use of old machinery leads to frequent breakdowns, higher maintenance costs, and inefficient production. This lack of modernization has left Pakistan lagging behind its competitors, such as China and India, in terms of product quality and technological innovation.

c. Energy Crisis The energy crisis in Pakistan has had a profound impact on the textile industry. Energy shortages, especially in the form of electricity and gas, lead to increased production costs and lower efficiency. This issue was particularly evident

during the 2007 energy crisis, when power outages and gas shortages crippled textile production in major hubs like Faisalabad and Karachi. The lack of reliable and affordable energy continues to undermine the competitiveness of the sector.

d. Over-Reliance on Cotton-Based Products Pakistan's textile sector is heavily reliant on cotton-based products, which limits its ability to capitalize on the growing demand for man-made fiber (MMF) products. MMF now dominates over 70% of the global textile market, and Pakistan's inability to invest in MMF production leaves it competing for a shrinking share of the global market for cotton-based products.

e. Regulatory and Taxation Issues Pakistan's textile industry is burdened with complex regulatory processes and high tariffs on essential raw materials. The taxation system is cumbersome, with delays in tax refunds and high turnover taxes that strain liquidity, especially for smaller firms. This hampers investment in modernization and growth.

3. Impact of the 2007 Energy Crisis on the Textile Industry

The 2007 energy crisis in Pakistan had a devastating effect on the textile sector, particularly in the major textile hubs of Faisalabad and Karachi. Power outages and gas shortages disrupted production, leading to significant delays in fulfilling export orders. Many plants shifted their operation to Bangladesh. The lack of reliable energy sources increased operational costs, which, in turn, made Pakistani textiles less competitive in the global market.

During the crisis, many textile units had to reduce production hours or shut down temporarily due to insufficient energy supply. The impact was particularly severe for small and medium-sized enterprises (SMEs) that could not afford alternative energy sources like generators. The increased energy costs not only eroded profit margins but also resulted in job losses, particularly in the labor-intensive segments of the industry, such as weaving and garment manufacturing.

4. Policy Fault Lines and Industrial Fault Lines

a. Policy Failures Pakistan's textile sector has suffered from ineffective policy implementation. Despite the introduction of the Textile Policy 2009-2014, which aimed to increase exports, improve productivity, and diversify product offerings, the targets set by the policy were not achieved. Key objectives such as technology upgrades, export incentives, and value-added production were undermined by inconsistent implementation and a lack of follow-through. The government's focus on cotton-based exports and failure to diversify into MMF products further compounded the challenges faced by the sector.

b. Industrial Fault Lines The textile industry in Pakistan is fragmented, with significant differences between large enterprises and SMEs. Large textile mills have better access to capital and technology, while smaller firms struggle with outdated machinery and inadequate infrastructure. This disparity has led to inefficiencies and an inability to scale up production to meet global demand. The concentration of the textile industry in

a few urban centers, such as Faisalabad and Karachi, has also resulted in regional disparities in access to resources, labor, and infrastructure.

5. Recommendations to Revitalize Pakistan's Textile Industry

a. Technology Upgradation and Modernization

- **Introduce low-interest financing schemes for SMEs** to upgrade machinery and adopt automation.
- **Provide incentives for the adoption of advanced manufacturing technologies**, including computer-aided design (CAD) systems and automated looms.
- **Facilitate R&D collaboration** between universities and textile industry stakeholders to foster innovation.

b. Energy Efficiency and Cost Reduction

- **Introduce regionally competitive energy tariffs** for the textile industry to reduce production costs.
- **Encourage the use of renewable energy** sources such as solar and wind to reduce dependency on grid electricity.
- **Upgrade infrastructure** to reduce power outages and improve reliability.

c. Diversification into Man-Made Fibers (MMF)

- **Reduce import duties** on key raw materials such as polyester staple fiber and purified terephthalic acid (PTA).
- **Encourage local production of MMF** through public-private partnerships and incentives.
- **Conduct training programs** to equip workers with the skills necessary for transitioning to MMF production.

d. Regulatory and Taxation Reforms

- **Simplify the taxation process** and introduce one-window operations for exporters to streamline procedures.
- **Expedite tax refund processes** to improve liquidity and cash flow for textile businesses.
- **Enhance transparency and accountability** in regulatory procedures to foster a business-friendly environment.

e. Workforce Skill Development

- **Establish technical training institutes** focused on modern textile-related courses to develop a skilled workforce.
- **Collaborate with international training organizations** to improve workforce capacity and align skills with global industry standards.
- **Introduce mandatory skill certifications** to ensure high-quality labor standards across the sector.

f. Trade Policy Reforms

- **Reconsider trade policies** to reduce tariffs on raw materials and encourage the growth of synthetic textiles.
- **Streamline import procedures** to facilitate easier access to essential inputs for textile manufacturers.
- **Enhance regional trade cooperation** to reduce trade barriers with neighboring countries and enhance competitiveness.

The textile sector in Pakistan has immense potential but is currently hindered by a combination of policy inefficiencies, outdated technologies, and energy constraints. To regain its competitive edge in the global market, Pakistan must focus on modernizing its industry, diversifying into man-made fibers, improving energy efficiency, and reforming its regulatory and taxation frameworks. By implementing these recommendations, Pakistan can create a more resilient and competitive textile sector that will not only boost exports but also contribute to broader economic growth and job creation.

Research Group-10: Bridging Gaps in Policies and Practices for the Export Sector of Pakistan: An Evaluation for Enhancing Global Competitiveness

The export sector plays a fundamental role in Pakistan's economy, acting as a crucial driver of economic growth, job creation, and foreign exchange revenue. In a globalized economy, a nation's ability to export competitively is essential for maintaining economic stability and fostering sustainable development (Cherif & Hasanov, 2024). For Pakistan, the export sector presents a significant opportunity not only for improving the balance of payments but also for advancing industrialization, boosting productivity, and integrating with global value chains. However, despite the strategic importance of exports being recognized by successive governments, the sector continues to encounter structural challenges that hinder its growth.

Current State of Pakistan's Export Sector

Pakistan's export sector is a critical component of the national economy, contributing approximately 8-10% of the Gross Domestic Product (GDP) over the past five years (2018-2023) (Pakistan Economic Survey). Despite this contribution, Pakistan faces a persistent trade imbalance, with imports consistently exceeding exports. This trade deficit has exerted pressure on foreign exchange reserves and the value of the Pakistani rupee, making export growth a key priority for macroeconomic stability.

Over the last five years, Pakistan's export earnings have fluctuated between USD 21 billion and USD 32 billion annually. The textile sector, which accounts for approximately 60% of total exports, remains the backbone of the country's export profile. Key textile products include garments, bed linens, and cotton yarn, which are primarily exported to markets such as the United States, the European Union, and China. Despite the global disruptions caused by the COVID-19 pandemic, the textile sector managed to sustain its performance due to government support measures such as reduced energy tariffs for exporters and the reinstatement of the Generalized Scheme of Preferences (GSP+) status by the EU and the US.

However, Pakistan's export sector remains overly reliant on textiles, with other industries underdeveloped and untapped (PBC, 2022). Agriculture-based exports, such as rice, fruits, and vegetables, contribute a modest share to overall exports but hold significant growth potential. Similarly, the information technology (IT) sector has emerged as a promising industry, with IT exports surpassing USD 4.2 billion in fiscal year 2024 (PRAL, 2024), marking a significant increase from previous years. Despite this growth, Pakistan's IT exports remain far below their potential, especially when compared to regional competitors like India and Bangladesh. Other sectors with untapped potential include pharmaceuticals, engineering goods, and mineral extraction (Mulabdic & Varela, 2023).

Challenges Facing Pakistan's Export Sector

Several factors impede the full realization of Pakistan's export potential, including:

1. **Limited Value Addition**: The majority of exports, particularly in textiles and agriculture, are raw or semi-processed, reducing their profitability.
2. **Inadequate Infrastructure**: Poor transport and logistics networks hinder the efficient movement of goods to international markets.
3. **Regulatory Bottlenecks**: Complex bureaucratic procedures, inconsistent policies, and a lack of policy continuity create an uncertain business environment.
4. **Energy Supply Issues**: Frequent power outages and high energy costs reduce industrial competitiveness.
5. **Limited Investment in Research and Development (R&D)**: Insufficient focus on innovation results in a lack of product diversification and quality enhancement.
6. **Limited Market Access**: High tariffs and non-tariff barriers in key markets restrict Pakistan's export competitiveness.

Strategic Interventions & Recommendations for Strengthening Exports

To unlock the full potential of Pakistan's export sector, strategic interventions are required. The following measures can enhance the sector's competitiveness and long-term sustainability:

Enhancement of Strengths

1. **Complete Value Chain Development**: Encourage vertical integration in textiles to improve quality, reduce costs, and increase efficiency.
2. **Leveraging Trade Agreements (GSP+)**: Strengthen compliance with international standards to maintain and expand preferential market access.
3. **Employment Generation**: Invest in workforce training programs to enhance skills and ensure a steady supply of skilled labor.
4. **Raw Material Sustainability**: Promote sustainable cotton farming and explore synthetic fiber alternatives to mitigate dependency risks.
5. **Cost-Effective Labor Utilization**: Balance competitive wages with productivity-enhancing automation to ensure long-term sectoral growth.
6. **Government Support**: Advocate for tax incentives, subsidies, and infrastructure development to facilitate sector expansion.
7. **Strengthening the Domestic Market**: Promote local brands and increase domestic consumption of textile products.

Elimination of Weaknesses

1. **Ease of Doing Business**: Simplify regulatory frameworks and introduce one-window operations for business facilitation.
2. **Reducing the Cost of Business**: Provide subsidies and tax relief to improve industrial profitability and attract investment.
3. **Infrastructure Development**: Enhance transportation and logistics networks through public-private partnerships.

4. **Tariff Rationalization**: Negotiate favorable trade agreements and reduce tariffs on essential imports for export industries.
5. **Reducing Dependence on Cotton**: Encourage diversification into synthetic fibers and blended fabrics to mitigate raw material constraints.

Capitalizing on Opportunities

1. **Product Diversification**: Expand into high-value-added and non-traditional textile products such as technical textiles and fashion apparel.
2. **Technological Advancements**: Invest in R&D, digital transformation, and data-driven decision-making to enhance efficiency and competitiveness.
3. **Sustainability and Green Initiatives**: Promote environmentally friendly practices, invest in renewable energy, and obtain green certifications to attract eco-conscious markets.

Mitigating Threats

1. **Energy Security**: Invest in renewable energy sources and improve energy efficiency in industrial processes.
2. **Managing Competition**: Maintain competitive pricing through efficiency improvements and focus on high-quality production.
3. **Environmental Compliance**: Adopt sustainable manufacturing practices and adhere to global environmental regulations.
4. **Expanding Market Access**: Leverage trade agreements, explore new export destinations, and form international partnerships.

Propositions

Given the critical role of the export sector in Pakistan's economic stability and growth, a comprehensive policy framework is needed to overcome structural barriers and enhance competitiveness. Key recommendations include:

- **Promoting Export Diversification**: Reduce over-reliance on textiles by developing high-potential sectors such as IT, pharmaceuticals, and engineering goods.
- **Strengthening Infrastructure**: Invest in transportation, energy, and digital infrastructure to support exporters.
- **Enhancing Policy Consistency**: Ensure long-term trade policy stability to attract investment and improve business confidence.
- **Supporting Small and Medium Enterprises (SMEs)**: Provide targeted support to SMEs to enable their participation in global trade.
- **Facilitating International Market Integration**: Strengthen diplomatic and trade relationships to secure better market access.

With the right strategic interventions, Pakistan has the potential to transform its export sector into a key driver of economic prosperity. By addressing structural weaknesses, capitalizing on emerging opportunities, and ensuring policy coherence, Pakistan can achieve sustained export-led growth and strengthen its position in the global economy.

Research Group-11: Bridging Gaps in Energy, POL, Gas/LNG Policies and Strategies: Supporting Industrial Development in Pakistan

Pakistan's energy sector, encompassing electric energy, petroleum, natural gas, coal, and renewable sources like wind and solar, is a cornerstone of national development. It directly influences industrial growth, economic progress, and socio-economic advancement. However, the sector faces persistent challenges, including institutional inefficiencies, fragmented legislative frameworks, capacity constraints, and policy gaps. These issues hinder its ability to support sustainable industrial growth and economic stability. Rising fossil fuel costs and supply uncertainties have further emphasized the need for renewable energy sources to reshape industrial practices, enhance energy efficiency, and reduce environmental impact.

This research critically evaluates Pakistan's energy sector, focusing on its alignment with industrial development goals. It examines the sector's capacity, preparedness, outputs, and governance frameworks, while identifying strengths, weaknesses, opportunities, and threats through SWOT, EETH, and BETH analyses. The study also employs the Oxford Index of Public Administration (OIPA) to assess governance and service delivery mechanisms. A comparative GAP analysis with India and Bangladesh highlights deficiencies and offers actionable lessons from their policy actions.

Situational Analysis

Installed Capacity and Energy Mix

Pakistan's total installed electricity capacity stands at 42,131 MW, with thermal sources (59.4%) dominating the energy mix, followed by hydel (25.4%), nuclear (8.4%), and renewables (6.8%). Despite this capacity, peak demand hovers around 27,000 MW, indicating a significant surplus. This excess capacity leads to higher per-unit electricity costs due to capacity payments for unused power, exacerbating financial strains on the sector.

The energy mix is heavily reliant on imported fossil fuels, with petroleum, LNG, and coal imports costing billions annually. Thermal energy, the most expensive source, contributes nearly 60% of total production, perpetuating high energy prices and inflation. Limited investment in renewables and hydel energy further exacerbates this dependency.

Challenges in the Energy Sector

1. **High Energy Costs**: Electricity prices have risen by 116% over the past eight years, making Pakistan's industrial sector less competitive compared to regional peers like India and Bangladesh.

2. **Transmission and Distribution Losses**: Transmission losses stand at 18.31%, far exceeding NEPRA's target of 11.77%, resulting in annual losses of Rs. 591 billion. Aging infrastructure requires significant investment for upgrades.
3. **Circular Debt**: The power sector's circular debt reached Rs. 2.393 trillion in 2024, while the gas sector's debt stands at Rs. 2.89 trillion. This debt exacerbates fiscal deficits, deters investment, and leads to higher tariffs.
4. **Capacity Payments to IPPs**: Capacity payments to Independent Power Producers (IPPs) are estimated to reach Rs. 2.1 trillion by 2025, significantly inflating electricity costs.
5. **Gas Sector Challenges**: The gas sector faces monopolistic practices, high tariffs, and reliance on expensive LNG imports. Circular debt, unaccounted-for gas (UFG) losses, and stagnant exploration activities further strain the sector.
6. **Solarization Trend**: Rising electricity tariffs and supply uncertainties have driven domestic and industrial consumers toward solar energy, reducing demand from the national grid and threatening the financial viability of IPPs.

Consequences of Energy Sector Challenges

1. **Higher Inflation**: Energy costs constitute 36.61% of the Consumer Price Index (CPI), directly impacting the cost of living and industrial production costs.
2. **Industrial Decline**: Over 8,000 businesses have closed operations in recent years, with many relocating to countries like Dubai. The textile sector, a key export contributor, has been particularly hard-hit.
3. **Fertilizer Production Crisis**: Gas shortages have disrupted fertilizer production, leading to increased imports and further strain on foreign exchange reserves.
4. **Economic Competitiveness**: High energy costs and inefficiencies have eroded Pakistan's industrial competitiveness, contributing to stagnant exports and economic growth.

Legal, Institutional, and Policy Analysis

Pakistan's energy sector is governed by a complex regulatory framework involving federal and provincial ministries, with key bodies like NEPRA, OGRA, and PPIB overseeing generation, distribution, and tariff fixation. However, overlapping mandates, inter-governmental conflicts, and inefficiencies hinder effective governance.

1. **Private Power and Infrastructure Board (PPIB)**: While PPIB facilitates private sector investment, its role overlaps with provincial energy departments, creating administrative inefficiencies.
2. **NEPRA**: Despite its role in tariff setting, NEPRA has weak control over distribution companies (DISCOS) and has failed to introduce competitive market mechanisms.
3. **OGRA**: OGRA's centralized decision-making has led to disputes over gas allocation and infrastructure development. Its failure to engage private companies in gas distribution has perpetuated inefficiencies.
4. **Integrated Generation Capacity Expansion Plan (IGCEP)**: The IGCEP 2024-34 reduces the share of renewable energy, contradicting national policy targets and increasing reliance on costly hydropower projects.

Propositions & Recommendation

1. **Enhance Renewable Energy Integration**: Increase the share of solar and wind energy in the energy mix to reduce reliance on expensive thermal and hydropower sources.
2. **Reform Regulatory Frameworks**: Streamline the roles of NEPRA, OGRA, and PPIB to reduce overlaps and improve governance.
3. **Address Circular Debt**: Implement measures to reduce transmission losses, improve bill recovery, and renegotiate IPP contracts to alleviate financial strains.
4. **Upgrade Infrastructure**: Invest in modernizing transmission and distribution networks to reduce losses and improve efficiency.
5. **Promote Private Sector Participation**: Encourage private investment in renewable energy projects and gas distribution to foster competition and efficiency.
6. **Focus on Domestic Exploration**: Prioritize local oil and gas exploration to reduce reliance on expensive imports and enhance energy security.
7. **Development of Independent Electricity Market**
   Implement the Competitive Trading Bilateral Contracts Market (CTBCM) framework to allow private sector power generators and buyers to trade electricity independently. This will encourage private investment in coal and wind energy, ensure competitive pricing, and enhance revenue predictability.
8. **Renegotiation of Power Purchase Agreements (PPAs) with IPPs**
   Expand renegotiations with remaining IPPs, including Chinese IPPs, to delink capacity payments from USD to PKR and reduce fixed rates of return. This will lower capacity payment charges, reduce electricity tariffs, and boost industrialization.
9. **Introduction of Smart Metering**
   NEPRA should mandate smart metering across DISCOs to curb theft, improve recovery rates, and reduce line losses. This will enhance operational efficiency and financial health of DISCOs.
10. **Privatization of DISCO Feeders**
    Privatize DISCO feeders in a phased manner to improve recovery rates, reduce theft, and enhance operational efficiency. This will also help reduce circular debt.
11. **Independent Boards for DISCOs**
    Introduce market-based specialist management for DISCO boards under the State-Owned Enterprise (Governance and Operations) Act, 2023, to improve governance and efficiency.
12. **Removal of GST on Capacity Payments**
    Exempt capacity payments from GST, as per Supreme Court orders, to reduce electricity tariffs, lower circular debt, and promote industrialization.
13. **Reduction of Taxes in Electricity Tariffs**
    Eliminate or reduce federal excise duty, sales tax, withholding tax, and income tax on electricity tariffs. Offer surplus energy to industrial consumers at cost rates during off-peak seasons to boost industrial activity.
14. **Implementation of WACOG Law 2022**
    Enforce the Weighted Average Cost of Gas (WACOG) law to include local and imported gas costs in pricing. This will stabilize gas prices, reduce circular debt, and encourage the use of surplus RLNG.
15. **Private Sector Ownership in New Gas Discoveries**
    Allow private sector ownership in unallocated gas fields to attract FDI, reduce gas

circular debt, and increase local production, leading to lower electricity tariffs and enhanced industrialization.

16. **Gradual Shift of Gas from CPPs to Efficient Gas Plants**
    Phase out gas supply to captive power plants (CPPs) gradually, shifting it to more efficient gas-based generation plants. This will ensure industrial continuity while increasing reliance on the national grid.
17. **Operationalization of Special Economic Zones (SEZs)**
    Accelerate the development of SEZs and provide necessary infrastructure to attract industrial activity, increasing electricity demand and reducing tariffs.
18. **Upgradation of Transmission Lines Under PPP Mode**
    Upgrade transmission lines in phases, prioritizing peak demand gaps and industrial zones. This will reduce transmission and distribution losses and control circular debt.
19. **Promotion of Electric Vehicle (EV) Policy**
    Provide recharging infrastructure, subsidies, and tax exemptions for EVs to reduce oil imports and increase electricity demand, leading to lower tariffs.
20. **Reduction of Management Fee on LNG/RLNG Imports**
    Lower the 2.5% management fee on LNG/RLNG imports to make it more affordable for domestic and industrial use, enhancing its utilization for power generation.
21. **Promotion of Energy Conservation and Efficiency**
    Launch energy efficiency programs, such as subsidizing LED bulbs, to promote clean and efficient energy use.
22. **Resolution of Federal-Provincial Disputes**
    Utilize the Council of Common Interests (CCI) to resolve disputes between federal and provincial governments over power generation and transmission.
23. **Revision of IGCEP 2024-34 to Promote Renewable Energy**
    Align the Integrated Generation Capacity Expansion Plan (IGCEP) with the Alternative & Renewable Energy (ARE) Policy 2019 by increasing renewable energy targets to 30% and reducing reliance on costly hydropower projects.
24. **Revival of Oil & Gas Exploration Sector**
    Rationalize the Windfall Oil Levy and provide security to exploration companies in KPK and Baluchistan to attract investment, reduce oil imports, and lower electricity tariffs.
25. **App-Based Theft Reporting System for UFG Reduction**
    Introduce an app-based theft reporting mechanism and deploy smart meters to reduce Unaccounted for Gas (UFG) losses and improve consumption monitoring.

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