Print ISSN: 0215-0411 - Online ISSN : 0215-0419
Volume: 2 , Issue: 4, Winter 2023

Special Issue
Winter 2023

Khyber Journal of Public Policy

KJPP

National Institute of Public Administration

National School of Public Policy

Report of Policy Lab on Bridging Gaps in National Security Policies and their Implementation in Pakistan

پاکستان میں قومی سلامتی کی پالیسیوں کے اطلاق میں حائل رکاوٹوں کا خاتمہ

Policy Analysis & Recommendations- Part-2 of 11

Pakistan's Economic Security

Identifying strategies to strengthen Pakistan's economic resilience, trade policies, and financial stability

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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

إِنَّ اللّٰه لَا يُغَيِّرُ مَا بِقَوْمٍ حَتَّىٰ يُغَيِّرُوا مَا بِأَنفُسِهِمْ

(سورة الرعد 13:11)

بے شک، اللہ کسی قوم کی حالت نہیں بدلتا جب تک وہ خود اپنی حالت کو نہ بدلے۔

Indeed, Allah does not change the condition of a people
until they change what is in themselves.
(Surah Ar-Ra'd 13:11)

ظَهَرَ الْفَسَادُ فِي الْبَرِّ وَالْبَحْرِ بِمَا كَسَبَتْ أَيْدِي النَّاسِ لِيُذِيقَهُمْ بَعْضَ الَّذِي عَمِلُوا لَعَلَّهُمْ يَرْجِعُونَ

(سورة الروم 30:41)

خشکی اور تری میں فساد ظاہر ہو گیا ہے، لوگوں کے اپنے ہاتھوں کے کیے ہوئے اعمال کی وجہ سے، تاکہ اللہ انہیں ان کے کچھ اعمال کا مزہ چکھائے، شاید کہ وہ باز آ جائیں۔

Corruption has appeared on land and sea because of
what the hands of people have earned, so that
He may let them taste part of what they have done,
that perhaps they will return (to righteousness).
(Surah Ar-Rum 30:41)

Pakistan's Economic Security

Identifying strategies to strengthen Pakistan's economic resilience, trade policies, and financial stability

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Preface

Public policy formulation and implementation are dynamic processes that require a comprehensive understanding of national security in all its dimensions. To equip policymakers, practitioners, and scholars with the necessary analytical tools to assess and refine policy strategies, a **Policy Simulation Lab on Analyzing & Evaluating Implementation Strategies for Pakistan's National Security Dimensions** was conceptualized, designed, and mentored by **Dr. Muqeem Islam Soharwardy** in **November 2023**.

This **Policy simulation Lab** was a unique initiative aimed at critically assessing the effectiveness of policy implementation strategies across multiple domains of national security. It provided a structured environment where participants engaged in high-level problem-solving, scenario planning, and decision-making to address contemporary security challenges. The exercise was framed around a holistic approach to national security, moving beyond traditional defense mechanisms to include economic, environmental, cyber, and cultural security considerations.

The report of **Policy simulation Lab** presents the findings and recommendations of **nine Task Forces**, each dedicated to evaluating implementation strategies for a specific security dimension. These include:

1. **Energy Security** – Examining sustainable and resilient energy policies to ensure national energy independence and efficiency.
2. **Economic Security** – Identifying strategies to strengthen Pakistan's economic resilience, trade policies, and financial stability.
3. **Social Security** – Addressing social protection mechanisms, inequality, and welfare policies to promote social cohesion.
4. **Environmental Security** – Evaluating environmental policies to mitigate climate risks, resource depletion, and ecological threats.
5. **Military Security** – Reviewing the strategic defense framework, modernization efforts, and geopolitical considerations.
6. **Cybersecurity** – Assessing cybersecurity threats, digital infrastructure protection, and cyber policy frameworks.
7. **Health Security** – Developing robust public health policies to counter emerging health crises and pandemics.
8. **Food Security** – Ensuring sustainable agricultural policies, food distribution, and supply chain resilience.
9. **Cultural Security** – Analyzing policies to protect national identity, cultural heritage, and counter ideological extremism.

Each task force conducted an in-depth examination of current policy frameworks, identified key challenges, and proposed actionable strategies to enhance national security implementation. The insights gained from this simulation exercise offer valuable contributions to policy discourse and serve as a strategic guide for decision-makers.

This report is a testament to the collaborative efforts of participants, researchers, and policymakers who engaged in this exercise with commitment and intellectual rigor. It is our hope that the findings herein will serve as a valuable resource for shaping Pakistan's future national security policies in an increasingly complex global landscape.

It is hoped that this document will serve as a significant milestone in the design, implementation, and facilitation of policies, paving the way for broader economic and industrial transformation in Pakistan, انشاءالله .

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December 15, 2023

Executive Summary

In 2022, after years of consultation, Pakistan launched its National Security Policy for the 2022-2026 period. This policy marked a significant departure from previous strategies, focusing more on geo-economy than geo-strategy. By emphasizing economic security as a fundamental aspect of national stability, the policy stresses that economic growth is critical to enhancing traditional security measures like defense and human security. This integrated approach is designed to create a positive feedback loop where growth in one sector can lead to further development in the others, strengthening Pakistan's position on the global stage.

At the heart of this new framework, the policy identifies three primary economic challenges: external imbalances, vertical inequalities, and horizontal inequalities. To address these, the policy advocates for coordinated efforts in several key areas. These include boosting sustainable growth through financial reforms, encouraging investment, enhancing agricultural and industrial production, and improving fiscal management to tackle Pakistan's chronic budgetary deficits. The strategy also highlights the need to diversify Pakistan's energy mix, expand education and innovation, and position the country to better compete globally by fostering a skilled labor force.

Despite these forward-thinking goals, Pakistan's economy remains in a precarious state, with persistent issues such as a rising debt burden, trade imbalances, energy shortages, and a lack of skilled human capital. The National Security Policy, though an important step, has not yet addressed these fundamental economic challenges in a way that generates immediate, tangible results. This executive summary analyzes the key aspects of the policy, focusing on industrial production, technological advancement, export promotion, and reducing external dependence, and highlights the barriers preventing effective implementation.

Key Economic Challenges

Pakistan's economic trajectory over the past several decades has been marked by underperformance, with recurring deficits, debt, and inflationary pressures. The National Security Policy aims to redirect focus from military-centric approaches to economic stability and security. However, despite the policy's broad ambitions, the country's economic vulnerabilities persist, primarily due to fiscal mismanagement, a lack of industrial competitiveness, and low export growth. One of the most significant challenges is the fiscal deficit, which stems from higher public spending and low tax revenues, creating a cycle of debt accumulation and economic instability.

The country's balance of payments remains problematic, with a widening trade deficit fueled by rising imports and stagnating exports. This has led to mounting external debt, further deepening the fiscal crisis. As the government borrows more to cover these gaps,

inflation has surged, significantly impacting the purchasing power of the lower and middle classes. The result is widespread economic hardship, especially for the most vulnerable populations. A critical issue facing the economy is the lack of industrial diversification. Despite periodic reforms, Pakistan's manufacturing sector is still largely domestically oriented, with little export focus, which reduces its global competitiveness.

Analysis of Policy Implementation

The National Security Policy emphasizes several areas to combat these economic challenges, such as industrial growth, export promotion, and technological advancement. However, significant gaps exist between the policy's aspirations and its actual implementation. The manufacturing sector, for instance, is not equipped to drive sustainable growth, and the country has failed to develop a cohesive and comprehensive industrial policy. While the government has expressed intentions to modernize industrial policy, practical efforts remain inconsistent. For example, tariffs and energy costs continue to pose barriers to investment in export-oriented industries, and labor skills remain inadequate for modern industrial needs.

The National Science, Technology, and Innovation Policy (2022) presents another crucial aspect of the policy, aiming to foster technological and innovation-driven growth. However, it is clear that despite the policy's forward-thinking goals, Pakistan's science and technology ecosystem is underdeveloped. Key challenges include inadequate infrastructure, limited research and development (R&D) investment, and a lack of collaboration between academia and industry. For the policy to have the desired impact, the country needs substantial investment in R&D and the development of a highly skilled workforce. Without these measures, Pakistan risks falling further behind in the global race for technological innovation.

Furthermore, export promotion remains a pressing concern. Pakistan's export sector faces systemic inefficiencies that hinder its growth. The manufacturing sector is not sufficiently competitive in international markets, and trade policies have not been effective in fostering export-oriented industries. The country's reliance on oil imports continues to exacerbate the trade deficit, which further weakens the economy.

Recommendations for Policy Improvement

To overcome these barriers, several recommendations can be made. First, Pakistan must prioritize the creation of a well-defined industrial policy that addresses the high cost of energy, exchange rate instability, and the skill gaps in the labor market. By creating a conducive environment for investment in export-oriented industries, Pakistan could improve its industrial base and reduce its reliance on imports. Additionally, the government must invest in R&D and foster a culture of innovation, particularly in emerging technologies such as artificial intelligence, biotechnology, and green technologies.

Second, fiscal discipline is crucial. To address the persistent budget deficit, Pakistan needs to enhance tax revenues through comprehensive reforms and reduce public spending on non-productive sectors. This will help create a more balanced budget and reduce the growing debt burden. Furthermore, better resource management and

increased efficiency in public expenditures are necessary to ensure that government spending leads to long-term development.

Third, the government should focus on enhancing the competitiveness of its export sector. This can be achieved by improving infrastructure, reducing production costs, and developing skills among the workforce to meet global market demands. Additionally, trade policies should be reevaluated to create incentives for export-driven industries.

Lastly, Pakistan's education system must be reformed to focus on equipping the younger generation with the skills needed to thrive in the global economy. This includes emphasizing science, technology, engineering, and mathematics (STEM) education, as well as promoting innovation and entrepreneurship. Collaboration between universities and industries should be encouraged to create a more integrated innovation ecosystem.

Over the years, Pakistan's economic journey has faced several ups and downs, with periods of industrialization followed by phases of deregulation, privatization, and liberalization. Despite some periods of high growth, such as above 6% GDP growth, these advancements were not translated into sustainable development. As a result, the country has struggled to maintain competitiveness, especially in its export industry, particularly textiles, and has witnessed a steady decline in manufacturing productivity. This summary outlines the core conclusions from the economic challenges faced by Pakistan and suggests key recommendations to address these issues.

The Intertwined Fate of Governance and Economic Performance: A Comparative Analysis of Five Asian Economies- Lessons for Pakistan in the context of Oxford Public Administration Index (OPAI) 2024

This study focuses to analyze the correlation between public administration effectiveness and economic performance in five Asian economies: Malaysia, India, Pakistan, Indonesia, and Singapore. Using data from the Oxford Public Administration Index (OPAI) 2024 and economic indicators (GDP per capita (PPP) and total exports), the study explores how governance impacts economic outcomes. The core argument is that robust public administration, as reflected in the OPAI, is a significant driver of economic success.

Comparative Analysis of Public Administration Performance (OPAI 2024)

Table 1: OPAI 2024 - Overall Rank and Scores

Country	Overall Rank	Overall Score	Strategy & Leadership	Public Policy	National Delivery	People & Processes
Singapore	1	0.85	=5	=1	1	=4
Malaysia	40	0.60	=68	61	=40	=7
Indonesia	38	0.61	=36	=36	=54	=38
India	50	0.57	=41	55	=43	=79

Pakistan	=90	0.41	=104	79	=96	=88

Table 2: OPAI 2024 - Domain and Subcomponent Rankings

Domain	**Subcomponent**	**Pakistan**	**India**	**Malaysia**	**Indonesia**	**Singapore**
Strategy & Leadership	Strategic Capacity	Low	Moderate	High	Moderate	High
	Cross-Gov. Collaboration	Low	Moderate	High	Moderate	High
	Openness & Comm.	Moderate	Moderate	High	Moderate	High
	Integrity	Low	Moderate	High	Moderate	High
	Innovation	Low	Moderate	High	Moderate	High
Public Policy	Policymaking	Low	Moderate	High	Moderate	High
	Financial Management	Low	Moderate	High	Moderate	High
	Regulation	Moderate	Moderate	High	Moderate	High
	Crisis & Risk Mgmt.	Low	Moderate	High	Moderate	High
	Use of Data	Moderate	Moderate	High	Moderate	High
National Delivery	System Oversight	Low	Moderate	High	Moderate	High
	Digital Services	Moderate	Moderate	High	Moderate	High
	Tax Administration	Low	Moderate	High	Moderate	High
	Border Services	Low	Moderate	High	Moderate	High
	Social Security	Moderate	Moderate	High	Moderate	High
People & Processes	Employee Engagement	Low	Moderate	High	Moderate	High
	Diversity & Inclusion	Moderate	Moderate	High	Moderate	High
	HR Management	Low	Moderate	High	Moderate	High
	Procurement	Low	Moderate	High	Moderate	High
	Technology & Workplaces	Low	Moderate	High	Moderate	High

Table 3: Economic Indicators (2019-2023)

Country	2019	2020	2021	2022	2023
	GDP per Capita (PPP)	Total Exports	GDP per Capita (PPP)	Total Exports	GDP per Capita (PPP)
Pakistan	5,839	23.75	5,875	22.53	5,934
India	7,034	323.25	7,333	296.07	7,694
Malaysia	29,411	238.00	29,511	234.00	30,048
Indonesia	12,345	167.68	12,345	163.31	12,967
Singapore	103,181	390.00	103,191	374.00	105,689

Correlation Analysis

Table 4: Correlation Matrix (2021 Data)

Variable	OPAI Score	GDP per Capita (PPP)	Total Exports
OPAI Score	1.00	0.96	0.72
GDP per Capita (PPP)	0.96	1.00	0.74
Total Exports	0.72	0.74	1.00

Key Findings and Interpretation:

1. **Strong Positive Correlation between OPAI Score and GDP per Capita (PPP):**
    - The correlation coefficient of 0.96 indicates a very strong positive relationship.
    - Countries with more effective public administration tend to have significantly higher GDP per capita.
    - Example: Singapore ranks high in both OPAI and GDP per capita, while Pakistan's lower OPAI scores correlate with lower economic output.
2. **Positive Correlation between OPAI Score and Total Exports:**
    - The correlation coefficient of 0.72 suggests a strong, though slightly less pronounced, relationship.
    - Effective public administration fosters a stable and predictable environment, facilitating trade and foreign investment.
3. **Positive Correlation between GDP per Capita (PPP) and Total Exports:**
    - The correlation coefficient of 0.74 reinforces the link between economic prosperity and export success.
    - Countries with higher GDP per capita often have diversified and competitive export sectors.

4. **Governance as a Driver of Economic Growth:**
    - The findings strongly support the hypothesis that effective public administration correlates positively with economic performance.
    - Correlation with exports suggests that governance plays a role in facilitating trade.
    - While correlation does not equal causation, the evidence emphasizes the importance of governance in driving economic outcomes.

Key Economic Challenges:

1. **Industrial Decline:**
    - Post-privatization, Pakistan experienced a decline in industrial productivity, especially in the export sector.
    - Rising energy costs, low investment, and lack of competitiveness have weakened industries like textiles.
2. **Policy Implementation Failures:**
    - Despite growth trends, inconsistent policies and lack of investment in human capital hinder sustainable economic development.
3. **Deindustrialization:**
    - Pakistan lacks a well-documented industrial policy to guide future growth, leading to an underutilization of its industrial potential.
4. **Social and Economic Impact:**
    - Economic growth has not translated into substantial improvements in citizens' well-being due to inadequate investment in education, health, and human capital.

Recommendations for Economic Revival:

1. **Develop a Comprehensive Industrial Policy:**
    - Create a well-documented policy addressing the manufacturing sector, innovation, and global competitiveness.
2. **Ensure Fiscal Discipline:**
    - Reduce inefficiencies, control expenditures, and focus on long-term economic sustainability.
3. **Establish Policy Consistency:**
    - Implement long-term, stable economic policies to attract foreign investment and promote industrial development.
4. **Increase Investment in Research and Development (R&D):**
    - Collaborate with universities and research institutes to foster innovation in artificial intelligence and high-tech manufacturing.
5. **Strengthen Vocational and Language Training Programs:**
    - Enhance expatriate competitiveness in international labor markets through specialized training and language courses.
6. **Promote Regional Trade:**
    - Enhance trade relations with neighboring countries and leverage initiatives like CPEC to access Central Asian markets.
7. **Improve Law and Order:**
    - Strengthen security and rule of law to attract foreign investors and restore business confidence.
8. **Diversify Oil Imports:**

    - Reduce reliance on Middle Eastern oil by sourcing from alternative suppliers like Russia, Iran, and Indonesia.
9. **Invest in Renewable Energy:**
    - Encourage solar and wind power development through subsidies and tax incentives to ensure sustainable growth.
10. **Expand Tourism and IT Sectors:**
    - Leverage Pakistan's tourism potential and IT sector growth to create jobs and generate economic benefits.

Potential for Reverse Engineering in Pakistan:

- Reverse engineering offers immense potential to address economic and technological challenges, reducing Pakistan's $54.73 billion import bill (FY 2023-24).
- Key sectors for intervention include:
    1. **Defense and Aerospace:** Institutions like PAC Kamra and POF Wah can expand technical capabilities.
    2. **Pharmaceuticals:** Developing generic medicines and biosimilars for domestic and export markets.
    3. **Agriculture:** Precision farming tools, hybrid seeds, and localized machinery to enhance food security.
    4. **Renewable Energy:** Localized solar and wind turbine production to cut energy import costs.
    5. **IT and E-Commerce:** Replicating successful global platforms for digital economic growth.
    6. **Textiles and Surgical Instruments:** Modernizing production in key export hubs like Sialkot, Faisalabad, and Gujranwala.

Lessons from China's Strategies:

- **Automotive Sector:** Joint ventures and technology-sharing agreements boosted firms like BYD.
- **Electronics:** R&D subsidies helped Huawei develop advanced telecom solutions.
- **Information Technology:** Alibaba leveraged reverse-engineering of Western e-commerce models.
- **Pharmaceuticals:** China's strategy in generics helped it dominate global markets.
- **Renewable Energy:** Firms like LONGi Solar reverse-engineered German technologies to lead the global solar industry.
- **Defense and Aerospace:** Centralized military R&D and government funding enabled technological advancements.

Lessons from Japan's Strategies:

- **Automotive Sector:** Toyota refined production techniques through reverse-engineering U.S. models.
- **Electronics:** Sony developed superior consumer electronics from Western technologies.

- **Pharmaceuticals:** Takeda Pharmaceuticals improved Western drug formulas through government-backed R&D.
- **Information Technology:** Precision engineering initiatives enhanced computing and industrial capabilities.

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.

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.

Conclusion

Pakistan's economic challenges require a strategic and multi-faceted approach to foster sustainable growth and development. The country must focus on stabilizing industrial policies, increasing investment in research and development (R&D), improving the

business environment, and diversifying energy sources to address its economic problems effectively. By adopting these measures, Pakistan can guide itself toward a more stable, competitive, and diversified economy. This will ultimately improve the quality of life for its citizens and strengthen its position in the global marketplace.

Additionally, Pakistan's National Security Policy presents an ambitious vision for the future, but its success depends heavily on effective implementation. The country must urgently address critical issues such as fiscal mismanagement, industrial stagnation, and a shortage of skilled labor. Without addressing these deep-rooted challenges, the policy will remain a set of good intentions rather than a transformative framework. By incorporating the recommendations outlined above, Pakistan can strengthen its economic security, paving the way for greater stability and prosperity.

Introduction

After thorough deliberations and consultations spanning seven years, Pakistan's first National Security Policy (2022-2026) was released in 2022. The policy rightly emphasized the shift in focus from geo-strategy to geo-economy. It was appropriately highlighted in the new doctrine that Economic Security is the lynchpin of our comprehensive national security, and increasing the size of the pie will lead to a greater allocation of resources toward traditional security (defense) and human security. In turn, these two subsets will feed back into Economic Security in a cyclical manner.

According to the doctrine, Pakistan is facing three challenges in the economic sphere: external imbalance, vertical inequalities, and horizontal inequalities. Economic security will be bolstered by overcoming these challenges through a well-coordinated approach. The focus areas of the policy are described in some detail below:

Firstly, achieving higher sustainable growth by raising saving rates, developing financial markets, and promoting agricultural and industrial growth.

Secondly, enhancing trade, investment, and connectivity by utilizing the full value of our geographical location.

Thirdly, fiscal management lies at the heart of our financial problems. To overcome the issue in fiscal management and bring down the level of public debt, revenue will be increased through tax reforms and expenditure will be reduced through efficient use of resources.

Fourthly, for enhancing energy security, the energy mix will be improved, and a market-based energy system will be promoted.

Fifthly, education, technology, and innovation are vital components of our national development. By equipping our youth with cutting-edge skills, we will be able to compete in the fast-changing world.

Lastly, we need not only skilled labor within the country but also to train our labor for global markets. The well-educated diaspora can earn greater dividends for our country.

Statement of the Problem

Pakistan's economic journey over the last 75 years has been speculative, commonplace, and, in many ways, tragic. The National Security Policy of Pakistan rightly shifted the focus from the traditional security paradigm to economic security and stability of the state. However, after its formulation and adoption, the economy is still in troubled waters. Therefore, in this study, the implementation of the proposed policy measures will be analyzed to identify the issues that hinder their successful implementation, and appropriate measures will be suggested to overcome these challenges.

Scope of the Study

During this study, the focus remained on the four dimensions of Pakistan's economy: Industrial Production, Technology and Goods Production, Export Promotion, and Reducing External Dependence. Critical issues like economic vulnerability, fiscal deficit, debt burden, energy shortages, and low human capital were evaluated in light of various frameworks and analyses provided in the TORs. Based on the issues identified, mitigation strategies were devised to diversify industries, reform the energy sector, and ensure fiscal discipline.

Scope Limitation:

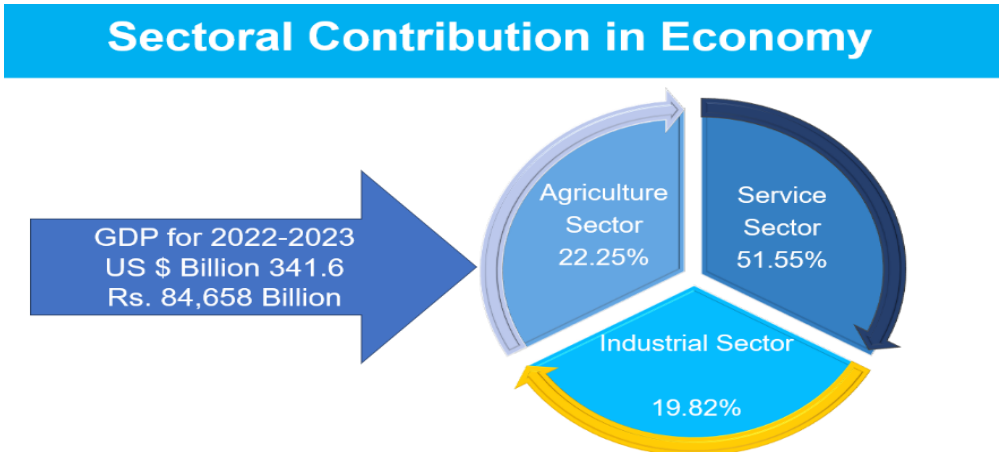
Though we were assigned the task of evaluating the implementation strategies, we either did not have access to them, or they were non-existent in codified form. Therefore, the major available policy documents were analyzed. Furthermore, the study was restricted to the four dimensions provided in the TORs.

Research Methodology

The study is qualitative in nature, and the data used is secondary. The documents consulted for data and information are the Economic Survey of Pakistan (2022-23), Annual Report of the State Bank of Pakistan, Vision 2025, National Electric Policy 2022, National Energy Efficiency & Conservation Policy 2023, National Transport Policy 2018, and the research work of eminent economists like S. Akbar Zaidi, Ishrat Hussain, and Shahid Barki. The policy documents related to Industrial Production, Technology and Goods Production, Export Promotion, and alternative sources of energy were thoroughly scrutinized. The research tools applied for issue identification were Situational Analysis, Critical Analysis, Stakeholder Analysis, SWOT Analysis, and Gap Analysis.

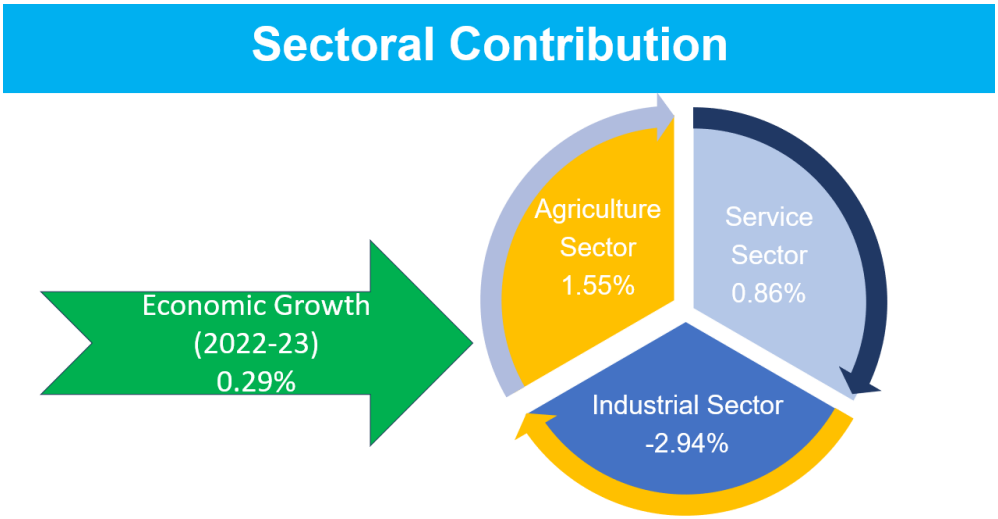
Sectoral Contributions in the Economy:

At the outset, it is appropriate to examine the structure of Pakistan's economy and its major segments. The size of Pakistan's GDP in real terms is $466 billion and Rs. [amount]. The three major sectors of our economy are agriculture, manufacturing, and services. The table below provides a clear overview of their contributions to the GDP:



Sectoral Contributions to GDP:

As shown in the previous section, the three main sectors of our economy are Agriculture, Industry, and Services. Their contributions to GDP growth in the year 2022-23 are given in the pie chart below:



Budgetary Analysis:

The fiscal deficit has consistently plagued our economy due to higher expenditure and low tax collection. The table below clearly shows this mismatch:

Consolidated Fiscal Indicators

billion Rupees; percent

	Values	
	FY22	FY23
1. Total revenue (a+b)	8,035	9,634
(a) Tax revenue	6,755	7,819
Federal	6,143	7,169
Provincial	612	650
(b) Non-Tax	1,280	1,815
Federal	1,152	1,649
Provincial	128	166
2. Total expenditure (a+b+c)	13,295	16,155
(a) Current expenditure	11,521	14,583
Mark-up payments	3,182	5,831
Defence	1,412	1,586
Non-markup	8,339	8,752
(b) Development expenditure & net lending	1,657	1,953
(c) Statistical discrepancy	116	-381
3.Overall budget balance	-5,260	-6,521
percent of GDP	*-7.9*	*-7.7*
4.Primary balance	-2,077	-690
percent of GDP	*-3.1*	*-0.8*
5. Revenue balance	-3,486	-4,950
percent of GDP	*-5.2*	*-5.8*
6. Financing (a+b)	5,260	6,521
(a) External (Net)	1,178	-680
(b) Domestic (Net)	4,081	7,201
Non-Bank	981	3,673
Bank	3,101	3,529

Source: Ministry of Finance

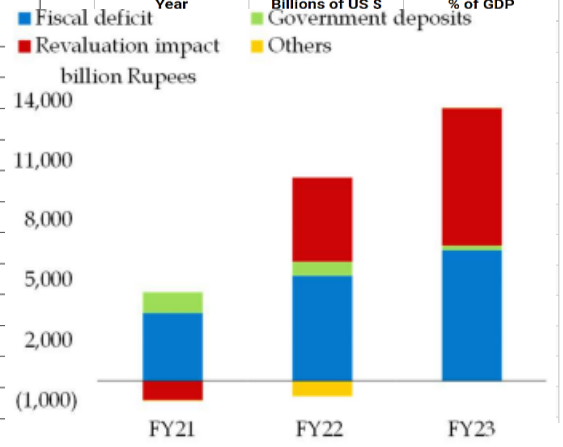
The fiscal deficit is haunting our economy consistently because of higher expenditure and low tax collection. The table below clearly shows this mismatch:

Current Account Deficit/ Trade Deficit

Pakistan has trade relations with different countries around the world and being the member of WTO, the trade transactions are considerably liberalized across our borders. Our exports are witnessing a decline and our import bill is rising. The tables below depict this situation:

Pakistan Imports - Historical Data		
Year	Billions of US $	% of GDP
2022	$82.28B	21.85%
2021	$62.66B	17.99%
2020	$52.33B	17.42%
2019	$62.62B	19.51%
2018	$67.82B	19.04%
2017	$58.51B	17.25%
2016	$50.07B	15.96%
2015	$46.13B	17.05%
2014	$45.59B	18.66%
2013	$46.37B	20.06%
2012	$45.79B	20.41%
2011	$40.52B	18.97%
2010	$34.29B	19.35%

Pakistan Exports - Historical Data		
Year	Billions of US $	% of GDP

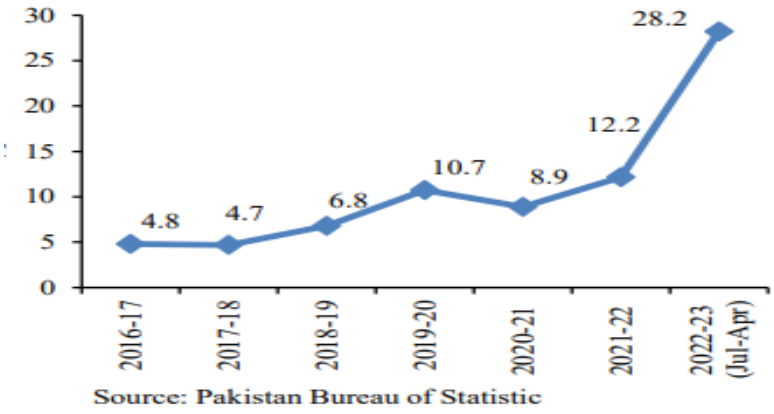


Sources: State Bank of Pakistan and Ministry of Finance

Debt Trap: The economy mired in long cycles of trade deficit and fiscal deficit and the resultant current account deficit and perennial fiscal deficit is doomed to land usin debt trap. The debt is mounting exponentially due to borrowing and exchange rate fluctuations. The worsening situation is depicted in the given table:

Inflationary Trend:

As expected, the poor economic performance and the worsening economic indicators have resulted in a crisis like situation. The CPI in Pakistan has remained very high for the last two to three years and this exorbitantly high inflation has devastating consequences for the lower and lower middle class of the society. This alarming trend of inflation is shown in the graph below:



Source: Pakistan Bureau of Statistic

Critical Analysis of existing policies pertaining to Industrial Production, Technology and Production of export goods, promotion and reducing external dependence. For the sake of this study, the policies pertaining to above four dimensions of economy have been critically evaluated.

Critical Analysis of Policies

A critical analysis of policies related to Industrial Production, Technology and Goods Production, Export Promotion, and Reducing Dependencies on Oil Imports was carried out, with the details shared below:

A. Policy for Industrial Production:

Pakistan, after experiencing industrialization in the first two decades, moved towards nationalization of industries. However, from the early 1990s, the journey towards privatization and trade liberalization was undertaken, similar to other developing countries. Despite this, privatization and liberalization did not provide a conducive environment for the private sector to invest in industry. Since 2010, Pakistan has been on a journey of deindustrialization. Due to declining exports, there has been a realization in power corridors that the country needs a comprehensive industrial policy. This was also highlighted in *Vision 2025*, which stated that a well-defined industrial policy would be prepared. However, no such document has yet been produced. There is still debate about whether such a document is needed, and if so, what its contours should be, given the worsening situation. Currently, the industry is facing allocative inefficiency, as the manufacturing sector caters only to domestic needs behind the high wall of tariffs. The rising cost of energy, the unstable exchange rate, and unskilled labor are factors that hinder the necessary investment in export-oriented industries.

2. Critique of National Science, Technology, and Innovation Policy 2022

The vision of this policy is national transformation through science, technology, and innovation. The mission set for the policy is to make technology and innovation the central pillars of sustainable socio-economic development, with the following

objectives:

i. Enhancing the role of science and innovation in the sustainable development of society by introducing technological tools and enhancing R&D and capacity building in colleges, universities, and industries to improve their yields in line with international standards. The government is making maximum efforts to achieve the desired results. Without adopting international trends and modern IT-based techniques, progress is far behind.

ii. Adopting a 21st-century approach to science, technology, and innovation for governance and introducing smart cities to enhance effectiveness. The importance of scientific advice to the government in both policy and science is gaining increasing prominence worldwide. Many countries have established extended scientific advisory systems to integrate science, technology, and innovation into all government departments. In Japan, the Council for Science, Technology, and Innovation was established through an act of parliament in 2001. In Pakistan, there are 80 science and technology organizations, with many more sub-organizations in the country. However, the provision of adequate human and financial resources is still a question mark.

iii. Invigorating human resources to meet the knowledge requirements through innovation. The STI policy follows a comprehensive science, technology, and innovation agenda, which requires a full complement of human capital, or knowledge workers, to move forward. The OECD's *Future of Education and Skills 2030* project proposes an OECD learning compass to describe three kinds of skills: cognitive and meta-cognitive skills, social and emotional skills, and practical and physical skills. Scientists, technologists, researchers, businessmen, and technology managers are the basic stakeholders who can play an essential role in enhancing this desired situation. This policy is intended to be applied in schools, where the teaching of scientific methods will help students become informed decision-makers in their future. The prosperity of countries nowadays depends greatly on their human capital and the learning opportunities provided to citizens throughout their lives. The Programme for International Student Assessment (PISA) was initiated by the Organisation for Economic Co-operation and Development (OECD) to produce comparable data on education policy and outcomes across countries. Countries generally monitor student learning to gauge the performance of their education systems and to assess how well their education systems prepare students to meet future challenges. Human capital produced at the school, college, or university level serves as an input resource for existing industrial and economic sectors. Researchers inspire many of the ideas, aspirations, and actions that contribute to the vitality of society and its capacity for creativity in this dynamic world. Science, technology, and innovation are the engines of welfare and development in a knowledge-based economy.

iv. Transforming knowledge into products. The modern global economy is continuously evolving due to the emergence of disruptive technologies, shorter product life cycles, and the rising frequency of new product development. The existing innovation ecosystem of the country needs strengthening through the upgrading of infrastructure, development of specialized human resources, and the promotion of a culture of innovation in both industry and academia, as outlined in the policy.

v. Focusing on emerging and frontier technologies to achieve national socio-economic goals, such as green technologies, biotechnology, nanotechnology, and intelligent vehicles. The formation of research groups, similar to the invention of the transistor, is supported. There is an increasing trend and support for scientists and researchers from both the same and different disciplines working together to create new knowledge in specialized interdisciplinary fields. Creating a civil-military R&D interface, like those in the United States, France, Britain, and China, can boost output. Countries that have established mechanisms for civil-military R&D collaboration have been successful in creating a synergistic effect on the development of technologies for both civil and defense purposes. Key areas of focus include artificial intelligence, the Internet of Things, 3D printing, augmented/virtual reality, smart robotics, blockchain, materials, big data/data mining, green technologies, and space technologies.

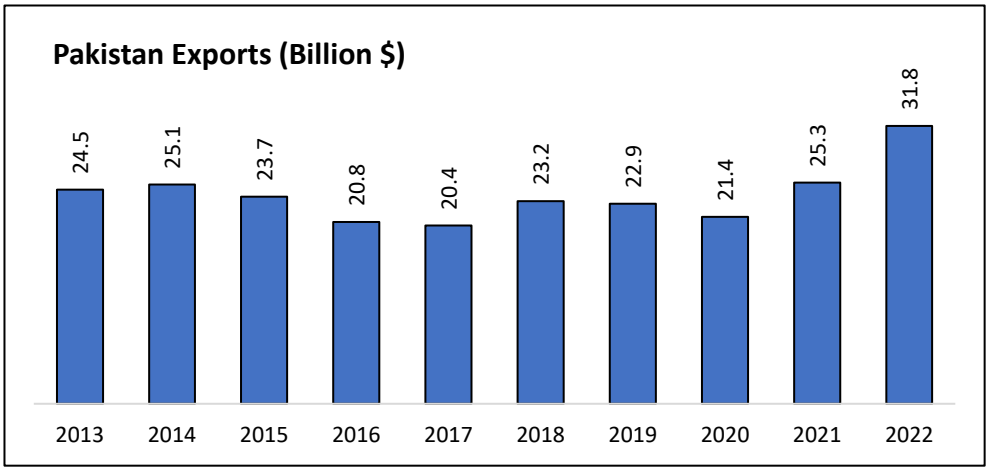
vi. Revitalizing science diplomacy to safeguard national scientific, societal, and diplomatic interests with other countries. Science diplomacy refers to the use of collaboration between countries and regions in the field of science.

vii. Ensuring the implementation of the policy through mechanisms like steering committees and advisory boards, with effective coordination among them. A steering committee, chaired by the Federal Minister for Science and Technology, and including representatives from various stakeholders in both the federal and provincial governments, has been constituted to ensure the policy is implemented in its true sense.

EXPORT PROMOTION

Pakistan's export performance has remained weak over the past two decades. The manufacturing sector of Pakistan consists of Large Scale Manufacturing, Small & Medium Scale Manufacturing, and Slaughtering. The manufacturing sector constituted around 12 percent of the country's GDP in 2021-22, which has remained almost stagnant for the past decade. Furthermore, exports have stagnated, primarily in low-value, low-tech, and traditional commodity products, which have inhibited export value growth. With the economy's GDP growth being import-based and consumption-led, this predicament has led to a persistent widening of the current account deficit.

The share of Pakistan's manufacturing sector has remained stagnant at around 12 percent of GDP for the past decade due to structural bottlenecks, high costs of doing business, energy supply constraints, limited access to credit—especially for SMEs—lack of sophisticated or latest technology, an unskilled workforce, low investment in research and development, low product and market diversification, absence of a dynamic industrial vision and policy, an unfair competitive environment involving government interference in business, smuggling threatening legitimate businesses, and low product quality in comparison to international standards. The overall political and macroeconomic environment, along with infrastructure deficits, are additional contributing factors to the sluggish growth of the sector. Pakistan's exports for the financial year 2022-2023 were $31.8 billion, while imports for the same period were high at $80.1 billion, resulting in a gap of $50 billion between imports and exports.



Foreign Direct Investment (FDI), remittances, and exports are three key avenues that hold the solution to the country's economic woes, with exports standing out among these as a key factor in addressing concerns. Pakistan's growth model must be reoriented toward export-led growth in order to tackle the chronic boom-and-bust cycles and provide a stable macroeconomic environment, which will, in turn, foster an environment conducive to FDI. According to global research, 60 percent of the countries that experienced Total Factor Productivity (TFP) growth of more than 3 percent grew at 8 percent or more. On the other hand, lower TFP growth rates were associated with lower GDP growth rates. In the case of Pakistan, the average TFP growth has been 1.5 percent. To improve production and, consequently, exports, Pakistan must enhance its Total Factor Productivity.

Challenges Affecting Pakistan's Export Growth:

i. **High Cost of Doing Business**: The cost of setting up new businesses and running existing facilities has increased in Pakistan, particularly over the last ten years. Exporters in Pakistan face intense competition from countries like Bangladesh, India, and Vietnam. This trend is supported by the latest statistics released by the World Bank (Figure 2). It can be observed that, despite having higher levels, businesses in Pakistan and Turkey have seen no major relief, unlike most of their peers and competitors, where the cost of doing business has substantially reduced in recent years. In Pakistan, this cost is mainly associated with higher inflation and interest rates in recent years, as well as the adverse security situation in the country. Moreover, the rising energy prices in Pakistan over the past ten years have also contributed to the increase in the cost of doing business.

ii. **Availability of Electricity**: Frequent electricity outages have been another important structural obstacle to promoting exports from Pakistan over the last decade. Compared to its peers and competitors, these outages have translated into substantial output losses for various sectors of Pakistan's economy, including the export sector. Although government efforts to ensure an uninterrupted electricity supply to the industrial sector have led to modest improvements in recent years, there is still significant room for progress. Power projects under the China-Pakistan Economic Corridor (CPEC) will further help reduce Pakistan's energy woes in the coming years, which will help restore the country's export competitiveness.

iii. **Lack of Women's Participation in the Labor Force**: Over the past decade, the role of female participation in the labor market has significantly increased worldwide. Particularly in low- and middle-income economies, their participation in the manufacturing sector plays an important role in supporting firms by increasing the labor pool, which also helps achieve potential levels of manufacturing capacity. Pakistan, despite having half of its working-age population consisting of females, has the lowest female participation rate in the labor force compared to regional and other peer countries.

iv. **Lack of Foreign Direct Investment (FDI) and Technological Advancement**: Pakistan, with its high ratio of young population, tends to have a lower level of savings compared to overall investments in the economy. To finance this gap, the country consistently depends on external financial flows to avoid pressures in the external sector. FDI inflows are generally considered one of the most stable sources of external

financing. Uninterrupted FDI flows, particularly in value-added sectors, help improve export revenues through technological transfers and advancements in labor skills. Pakistan is considerably lagging behind its peers and competitors in attracting FDI flows. Additionally, the overall environment in the country has not been conducive enough to attract FDI inflows into exportable sectors. This is despite the presence of sizable setups providing opportunities for economies of scale amid rising domestic demand from the growing middle class. Sectors such as leather and its products, pharmaceuticals, sports goods, transportation, dairy, and textiles have potential for attracting foreign investment to boost the country's exports.

v. **Meager Spending on Education and Research**: In this era of globalization, countries with a skilled and educated labor force perform better in terms of competitiveness than those with a large proportion of unskilled labor and lower education levels. The experience of East Asian economies is a relevant example. In this regard, Pakistan is even behind its regional competitors. For instance, in the last decade, the average public spending on education in South Asian countries stood at 3.1 percent of GDP, compared to 2.4 percent in Pakistan. Similarly, countries that have successfully transitioned from low-income to middle- or high-income economies, such as most East Asian countries, invested heavily in research and development. As a result, they achieved high and sustainable economic growth and generated higher levels of high-value-added exportable surpluses with economies of scale. With an average of 0.3 percent of GDP, Pakistan's research and development expenditure is considerably low compared to regional and other peer countries. Specifically, according to the latest figures, South Asian countries, on average, spend 0.7 percent, while low- and middle-income economies spend 1.3 percent of GDP on research and development (Source: WDI-World Bank).

vi. **High Tariffs on Imports**: While higher tariff rates could help curb unnecessary imports, tariffs on imported raw materials could impact the country's export performance. With the increasing importance of global value chains at different stages of production, the share of exports made up of imported inputs has also increased, and Pakistan is no exception. Estimates suggest that around 20 percent to 30 percent of imported inputs are used at different stages of production in Pakistan, despite the significant importance of imported inputs in production.

vii. **Market Diversification**: According to the IMF's direction of trade statistics, Pakistan has slightly diversified its destinations over the last decade. The prominence of the US and European markets in Pakistan's exports has reduced. However, Pakistan still appears to be under-exporting to large and fast-growing emerging economies worldwide. Specifically, Pakistan's exports to Germany, Japan, Hong Kong, Brazil, Russia, and India are below what could be expected based on their share in world imports. Besides the US and European markets, with which the country is currently trading under the GSP-Plus status, Pakistan also trades heavily with members of the Gulf Cooperation Council (GCC).

viii. **Product Diversification**: Similar to diversification in export markets, product diversification is helpful in reducing the vulnerability of the country's export portfolio to extreme volatility in export prices. Pakistan's product diversification is better than Bangladesh's, but it lags behind other regional economies and competitors. In fact, the number of exported items by Pakistan has actually decreased during the last five years,

while its competitors have shown expansion. However, as mentioned earlier, the real problem arises from Pakistan's chronic reliance on resource-based exports. The availability of cotton, rice, and hides and skins largely determines the country's export growth in a given year. In the case of textile exports, the country's major export, Pakistan could also take advantage of this potential opportunity through timely investments in increasing its educated and skilled labor force, which will be capable of meeting new challenges.

ix. **Access to Finance**: Financial inclusion in Pakistan is rudimentary compared to countries that have enacted export-led growth models. Even the country's regional competitors have performed better in most areas related to access to finance.

Sectoral Strategy/Prime Focus of Government

The government's prime focus is on SME development, workforce skill development, technology upgradation, industrial infrastructure development/establishment of SEZs, facilitating innovation, enhancing the competitiveness of locally manufactured products in international markets, encouraging foreign direct investment (FDI), promoting exports through new/better market access, competitive incentives, and facilitating G2G, B2C, and C2C interactions.

The aim is to boost productivity, earnings potential, and competitiveness by focusing on five foundations of productivity, namely:

i. Investing in Science, Research, and Innovation;
ii. Skill development;
iii. Upgrading infrastructure;
iv. Improving the business environment, including reducing the cost of doing business;
v. Creating better job opportunities.

4. Policy Initiatives for Reducing Dependencies on Oil

The Pakistani economy has several external dependencies, such as trade, remittances, external loans, foreign investment, and foreign aid. While some of these dependencies are beneficial for the economy, others, such as the imbalance in trade and debt payments, are responsible for the current economic challenges. While all of these factors require detailed discussion, we will confine ourselves to the import of oil, which constitutes a major component of our import bill.

Pakistan imports petroleum and petroleum products mostly from Middle Eastern countries. Currently, the total need for oil consumption in the country is 19 million tons, of which 80% is imported. For the financial year 2022-23, the oil import bill was $17.014 billion, which constitutes 20.67% of the total $82.28 billion import bill. Pakistan primarily imports crude oil from the UAE (56%), Saudi Arabia (34%), and Kuwait (4%). It imports refined petroleum products from the UAE (52%), Kuwait (17%), and Oman (6.6%). Last year, Pakistan imported 154,000 bpd of crude oil from Russia.

Traditionally, Pakistan has been dependent on Saudi Arabia and the UAE for its oil imports. Since Pakistan is a net importer of petroleum products, it can save foreign

exchange by importing petroleum products at lower prices and refining crude oil at domestic refineries. The data further shows that Pakistan has placed all its eggs in a single basket, importing oil from just three Middle Eastern countries. There is a dire need for diversification to minimize the security risk to our economy. Transportation uses 59%, electricity uses 32%, and industry uses 8% of petroleum products. Pakistan often buys from these countries due to deferred payment terms and trade relations.

Impact on the Economy:

a. **Loss of Foreign Reserves:** Pakistan has to spend around one-third of its budget on importing petroleum products, which is the largest chunk of the budgetary allocation. The expenditure over the last three years is as follows:

b. **Rising Oil Prices and Inflation:** Rising prices of petroleum impact the economy at both macro and micro levels, causing inflation and unemployment. The oil price fluctuations have a decisive impact on the economic development of the country, causing price increases and negatively affecting economic growth in both the long and short term. Rising inflation in commodities, as petroleum is used in manufacturing and transportation, affects almost all products.

c. **Impact on Developmental Programs:** The huge expenditure on the petroleum import bill directly hits the Public Sector Development Program (PSDP). Development expenditure gets cut with every rise in petroleum product prices. Furthermore, the costs of projects also increase due to the rising market prices of materials and equipment.

d. **Geopolitical Threats:** The Middle East has been a flashpoint between major powers, with local rivalries that could result in the disruption of oil transportation. Any such disruption would severely impact our economy.
Such an exorbitant loss of foreign reserves is neither bearable nor sustainable. Therefore, strategies to manage the issue in light of the policies are required.

Strategies to Manage the Issue in Light of the Policies

Decreasing Dependency on Fuel:

1. **Exploring Other Petroleum Markets:** To safeguard our economy from external geopolitical shocks, Pakistan must search for other potential suppliers of oil outside the Middle East. Russia has already been approached for the supply of its cheap crude oil, which is encouraging. It would be better if a proper agreement is signed for long-term supply. Iran is another viable option, where oil can be pumped through a pipeline. Additionally, Indonesia, Brunei, Algeria, and the Central Asian states could be other possible contenders. Malaysia can also provide petroleum products. However, if the option is confined to Russia only, the country may face risks from US sanctions, compatibility issues with Russian crude and our refineries, higher transportation costs, and delayed payment issues.
2. **Exploration:**
   Focus on indigenous onshore and offshore energy exploration.
   A few years ago, exploration was conducted in the southern region of Khyber Pakhtunkhwa, with encouraging results in discovering oil and gas in several areas.

There is a need for further extensive exploration in this area, as well as in the newly merged districts and Balochistan. In the coming years, the demand for oil and gas will increase, which will exert further pressure on our economy if not properly managed. Law and order issues in the past have hindered exploration missions in the tribal belt, an area expected to be rich in oil and gas. Although law and order is still not ideal, providing full security to companies exploring in these areas could yield positive results in a short time.

3. **Transport Sector:**

The transport sector consumes about 60% of imported oil. Therefore, necessary steps should be taken to reduce consumption by implementing the national transport policy and National Electric Policy, which include:

a. **Shift from Private Transport to Public Transport and Road Freight to Rail Freight:**

The National Transport Policy aims to overhaul rail, air, trucking, mass transit, pipeline networks, urban transport, and maritime businesses in an integrated manner to meet the challenges of the growing population and developing national economy. An increased focus will be placed on providing public transport services and integrating them with other modes. For freight, the predominant use of road transport will be gradually shifted to rail and pipelines, with better integration of agriculture and industry to rail stations, dry ports, and pipelines. Rural roads will remain vital for providing accessibility to local communities and public services, while urban roads will be designed to support efficient urban transport.

b. **Import and Use of Energy-Efficient Vehicles:**

The transport sector consumes a significant portion of imported oil. While the world is moving towards electric, hybrid, and hydrogen-driven vehicles, we lag far behind. Second-hand vehicles are often imported, which have already completed their specified lifespan. These vehicles are highly inefficient in fuel consumption. Section 5.3 (Transport Sector) of NEEC deals with the import and use of electric and hybrid vehicles and the mandatory certification for their use on roads. However, this is not being selectively implemented. The need of the day is to strictly enforce this section regarding the import of vehicles and issuance of road permits.

Power Sector:

The power sector uses 32% of the total fuel consumption. To mitigate the present situation, the following strategies are suggested:

a. **Subsidize Alternative Means of Electricity Generation, such as Solar and Wind:** The world is rapidly moving towards clean alternative energy sources. Maximum efforts should be made to transform our economy into a green economy. Investors should be encouraged with tax exemptions and subsidies to invest in solar and wind energy sources. Companies with expertise should be invited to establish factories manufacturing solar panels and wind turbines in the country. The newly established Economic Zones under CPEC can be an option to attract foreign investors and companies.

b. **Establish Coal Power Plants Running on Local Coal:**

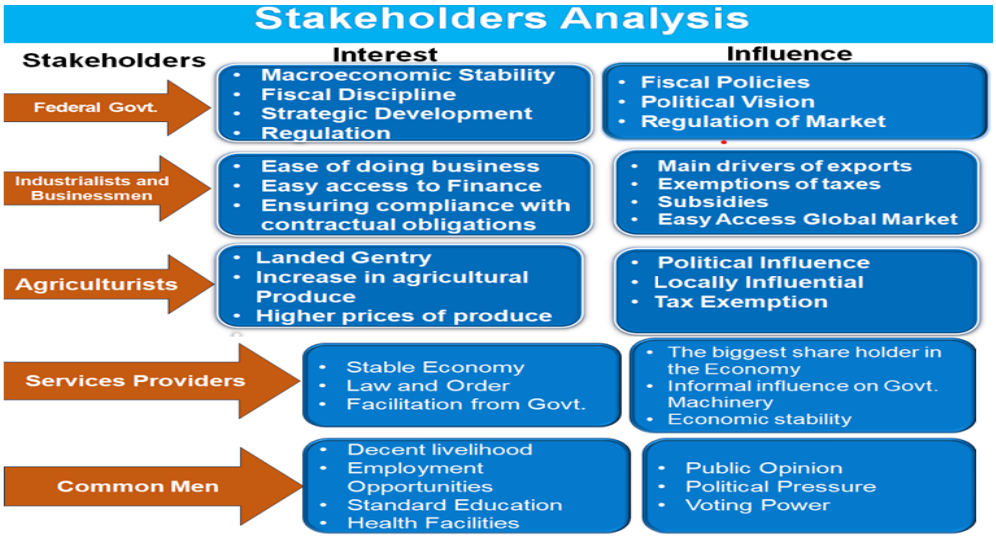
Some regions of the country are rich in coal. Local coal-based electricity plants should be set up to produce cheaper electricity for industries. However, all environmental protocols should be followed while establishing these plants (Section 5.1.6 of NEEC).

c. **Timely Completion of Mega Power Projects:**

Currently, Pakistan is building several major hydroelectric projects. The cheap electricity generated from these, coupled with skilled labor, can bring about an industrial revolution in the country. Maximum efforts should be made to complete these projects on time. Local disruptions and agitations have been observed, so all stakeholders should be engaged and made to realize the importance of these projects for the country's economy. If completed on time, they will play a crucial role in our economic security and development.

Stakeholders Analysis

Analysis of the stakeholders have been carried out in the given chart on next page.



SWOT Analysis

SWOT analysis of three institutions i.e Ministry Industries and Production(table-1), M/o Science and Technology (Table-2) and Trade Development Authority (Table-3) has been carried out in the below tables

SWOT of Ministry of Industry and production

Strengths	Weaknesses
1. Policy formulation Body 2. Strong organizational structure with 26 attached bodies 3. Low cost of production	1. Bureaucratic hurdles 2. Inefficiencies in industrial revival of the country 3. Lack of innovation and unskilled labour
Opportunities	**Threats**
1. Huge opportunity to utilize the youth bulge 2. Establishment and promotion of Knowledge based and value added industry 3. Industrial diversification to cater for the diversified need of the global market 4. Establishment of Small and medium size enterprises	1. Increasing competition at global level. 2. Political Instability 3. Frequent policy Changes 4. Brain drain from the country

Table 01

SWOT Analysis of Ministry of Science and Technology

Strength	Weaknesses
1. Strong organizational structure with 17 attached formation 2. Policy making and strategic planning 3. Government backing 4. Strong Liaison/link with universities and students	1. Bureaucratic hurdles 2. Brain Drain 3. Low utilization of the capabilities of the graduates 4. Weak coordination with industries
Opportunities	**Threats**
1. Optimum utilization of the science graduates 2. Technology transfer 3. Guiding and facilitating industry on shifting to knowledge based products	1. Political instability 2. Lagging behind in technological fields as compared to the regional countries 3. Lack of consistent budgetary allocation

Table -2

SWOT of Trade Development Authority of Pakistan

Strengths	Weaknesses
1. Strong Organizational Structure 2. Government Support 3. Strong Resource Network in form of Pakistan embassies 4. Strong market knowledge Guidance to the businessmen	1. Failure in export promotion 2. Bureaucratic way of doing business 3. Weak connections with the businessmen 4. Low profile/ Non activism
Opportunities	**Threats**
1. Harnessing huge export opportunities 2. Signing of free trade agreements with regional and friendly countries 3. Guiding the exporters for value addition of their products 4. Export Diversification	1. increasing competitive global market 2. Security situation in the country 3. Political Instability in the country 4. Fluctuating nature of the Global market in wake of Ukraine war.

Table -3

Comparison with two developed and two developing countries.

Comparison of Pakistan with developed countries like South Korea and Singapore and developing countries like Bangladesh and Vietnam shows that the country is lagging behind on all critical socio economic indicators. Details is as follow

TABLE NO. 1:-
Shows Socio Economic Indicators of Pakistan

Socio-Economic Indicators of Pakistan

Socio-economic Indicators	Rate/Numbers/Amount
Population	241.49 Millions (2.4%)
GDP Size	US $ Billions 341.6 Rs. 84,658 Billions
GDP Growth Rate (2023)	0.29%
Per Capita Income	$1597
Population Blow Poverty Line	95 Millions
HDI Ranking	161 out of 192
Literacy	62.8 %
Female literacy	48%
Unemployment rate	6.3%
Without access to Sanitation	79 Millions
Population without Access to clean drinking water	21.7 Millions
Infant mortality	55.77 deaths/ 1000 live births
Maternal Mortality	186/100,1000

TABLE NO. 2:-
Shows Socio Economic Indicators of South Korea

Comparative Analysis with South Korea	
Socio-economic Indicators	Rate/Numbers/Amount
population	51.78 Millions
GDP Size	$ 1.84 Trillion
GDP Growth Rate	2.6%
Per Capita Income	$ 35,600
Population Blow Poverty Line	14.4%
HDI Ranking	17 out of 192
Literacy	98.2%
Female literacy	98.1%
Unemployment rate	3.2%
Without access to Sanitation	79 Millions
Without Access to clean drinking water	0%
Infant mortality	1.7 deaths/ 1000 live births
Maternal Mortality	1.7 deaths/ 100,000

TABLE NO. 3:-
Shows Socio Economic Indicators of Singapore

Comparative Analysis with Singapore	
Socio-economic Indicators	Rate/Numbers/Amount
population	5.70 Million
GDP Size	$ 597 Billion
GDP Growth Rate	3.8%
Per Capita Income	$ 104998
Population Blow Poverty Line	0%
HDI Ranking	09 out of 192
Literacy	96.8%
Female literacy	97.2%
Unemployment rate	2,1%
Without access to Sanitation	0%
Without Access to clean drinking water	0%
Infant mortality	2.4 deaths/ 1000 live births
Maternal Mortality	8 deaths/ 100,000

TABLE NO. 4:-

Shows Socio Economic Indicators Of Bangladesh

Comparative Analysis with Bangladesh

Socio-economic Indicators	Rate/Numbers/Amount
population	165.16
GDP Size	446,35 Billion $
GDP Growth Rate	7.2%
Per Capita Income	2,621 $
Population Blow Poverty Line	18.7%
HDI Ranking	129/192
Literacy	74.70
Female literacy	71.3%
Unemployment rate	4.7%
Without access to Sanitation	31,3%
Without Access to clean drinking water	14,1%
Infant mortality	28.2/1000
Maternal Mortality	165/100,000

TABLE NO. 5:-

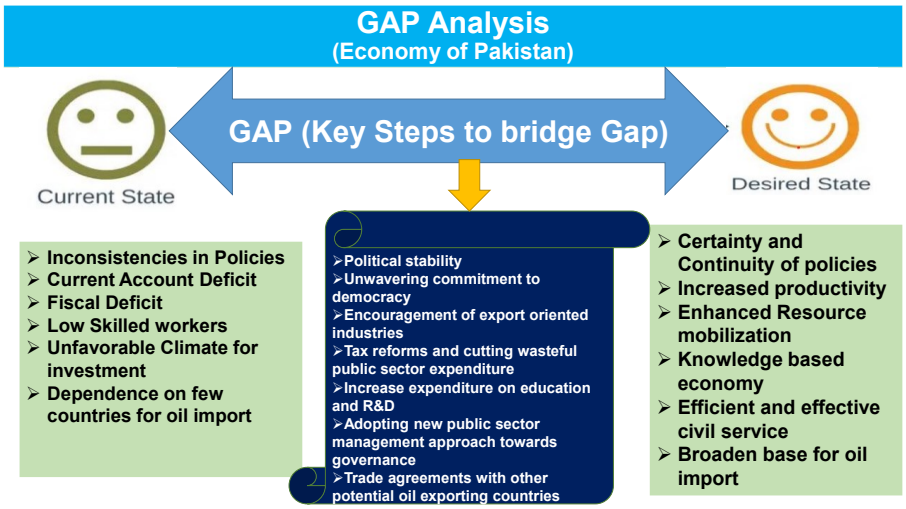
Shows Socio Economic Indicators Of Vietnam

Comparative Analysis with Vietnam

Socio-economic Indicators	Rate/Numbers/Amount
population	229.018 million
GDP Size	US 1.12 Trillion
GDP Growth Rate	5.34%
Per Capita Income	US $ 4920
Population Blow Poverty Line	21.9%
HDI Ranking	161 out of 192
Literacy	60.3%
Female literacy	48.7%
Unemployment rate	6.3%
Without access to Sanitation	79 Millions
Without Access to clean drinking water	22% Millions
Infant mortality	60.1% deaths/ 1000 live births
Maternal Mortality	186 deaths/ 100,000

GAP ANALYSIS:

Gap analysis of Pakistan economy has been carried out in the table given below.



Issues and Challenges:

The issues and challenges faced by Pakistan's economy are as follows:

Dependencies on Oil Imports

1. Dependency on a few countries for oil imports
2. Energy-inefficient, old vehicles
3. Air pollution
4. Subsidy on petroleum products
5. Volatile oil prices

Industries

1. Shortage of skilled and qualified labor
2. Poor and obsolete infrastructure
3. Taxation and tariffs
4. Law and order situation
5. Energy/power crises

Export Promotion

1. Complex export procedures
2. Poor industrial base
3. Trade barriers imposed by developed countries
4. Low-quality products
5. Exchange rate fluctuations

Technology and Good Production

1. Lack of IT experts
2. Broadband connectivity issues
3. Lack of research and development culture
4. Brain drain
5. Lack of government support

Conclusion

In light of the above discussion, the following three conclusions can be drawn. After a decade of industrialization, followed by nationalization, deregulation, and export orientation, we moved toward privatization and liberalization in the early 1990s—partly due to our own initiatives and partly because of the WTO regimen. As a result,

our industrial productivity declined in the subsequent decades, with a gradual decline in exports from 2010 onward.

The major reason for this decline is the failure to increase the competitiveness of our export industry, particularly textiles, as well as low investment in the manufacturing sector, higher energy costs, and low human capital. The government also failed to provide the necessary stewardship to attract investment in export-oriented industries. We still lack a well-documented industrial policy, and in a literal sense, we are in a phase of deindustrialization, without fully exploiting our industrial base.

Now, should we reverse course or move forward toward the services sector for economic development? Though our terms of reference (TORs) are specifically focused on increasing productivity, a cursory look at the performance of various sectors reveals that we can harness the potential of services in this post-industrial era. Our banking sector, tourism industry, and telecom and IT sectors can help improve our situation.

The economic journey of Pakistan over the last 75 years has been spectacular yet commonplace, and, in many ways, tragic. As shown in socio-economic indicators, despite maintaining a growth rate above 6% consistently in some decades, the results were not translated into the well-being and development of the general population. Therefore, the prosperous periods were short-lived because no investment was made in human capital to make economic progress sustainable.

Recommendations

1. The first recommendation is to have a well-documented policy for the industrial sector.
2. The second policy recommendation is to ensure fiscal discipline in the public sector.
3. Consistency in Government Policies:
   Frequent changes in policies, often stemming from political rivalries, have inflicted significant harm on Pakistan. With each change in government, the policies of the previous administration are typically reversed. This unstable policy environment creates an inhospitable atmosphere for foreign investment and industrial development. Over the past few years, we've witnessed policy adjustments across various sectors, from trade and export-import to fiscal matters, often without meaningful input from key stakeholders. Consequently, both investors and industrialists are leaving the country, and Pakistan finds itself struggling to compete on the global stage, even with nations ranked much lower in the region. It is imperative for policymakers, especially those in the political arena, to recognize the adverse consequences of such short-term thinking. To foster economic growth and ensure the country's stability, it is crucial that Pakistan adopts enduring, long-term, and investor-friendly policies to attract investment for the revival of economic growth.

4. Increase investment in Research and Development:
   The government needs to invest heavily in R&D to promote innovation and create a knowledge-based economy. This innovation can lead to the creation of cutting-edge products and services, enhancing the country's global competitiveness.

Countries that invest more in R&D are leading the world, as their products are more value-added and sophisticated compared to others. The government should, therefore, take all stakeholders on board and establish liaison with universities and other research institutes for this purpose. Furthermore, these entities should be linked with industries for mass production of their products. Another area where the government should intervene is Artificial Intelligence, both for economic and other purposes.

5. Special vocational training and language programs for the youth:
   It has been observed that many Pakistani expatriates working in foreign countries are unskilled, limiting their employment options to manual labor. Moreover, they lack proficiency in English or the native language of the country they work in. These workers earn less compared to Indian and Bangladeshi workers, who are generally more skilled and proficient in English. Therefore, it is necessary for the government to arrange special vocational or skill development programs for Pakistani workers. Periodic language courses should also be offered to improve their job prospects in foreign markets, leading to higher remittances and enhanced economic security for Pakistan.
6. Efforts for Regional Trade:
   The government should renew its efforts to normalize relations with all its neighbors, treating trade as a top priority. The China-Pakistan Economic Corridor (CPEC), along with trade corridors to Central Asian countries, could be a real game-changer.
7. Improving Law and Order Situation:

   Peace is essential for the progress and development of a country. Pakistan has been in a war-like situation since the Afghan War. However, the last two decades have been devastating for the economy due to terrorism and violence. The loss to the economy has been in the billions. Investors and industrialists have shifted to safer locations like Dubai and other Middle Eastern countries. Industrial plants have been closed, and workers have become unemployed. Now that the U.S. has left Afghanistan, the government must seize this opportunity to establish rule of law and good governance, while also attracting foreign investors and entrepreneurs by offering incentives and facilities.

8. Pakistan should diversify its oil import options by approaching other countries like Russia, Iran, and even Indonesia and Malaysia. The current limited options of importing all its oil from three Middle Eastern countries—Saudi Arabia, UAE, and Kuwait—make Pakistan vulnerable to external shocks. The region is already volatile, and further local and global conflicts could increase the risks. Any disruption in hydrocarbon transportation lanes would have a devastating impact on Pakistan's economy. To safeguard the economy from such eventualities, it is recommended that Pakistan expand its oil import options. Countries like Russia have already been selling crude to Pakistan at lower prices, and similar agreements could be made with Indonesia, Iran, and Central Asian states.
9. We must explore alternative methods of energy production. Renewable energy sources like solar and wind should be prioritized. Industries should be established within the country. Investors should be encouraged through subsidies and tax exemptions to set up their factories in Pakistan. Incentives should also be provided to consumers for installing solar and wind energy systems.

10. Focus on Tourism and the IT Sector to fully utilize the opportunities offered by these two sectors.

Logical Framework for Implementation of Two Policy Recommendations:

1. The first and foremost important policy recommendation is to have a well-documented policy for the industrial sector. It should be formulated by taking all stakeholders on board. Without stewardship from the state, in the form of a well-documented policy, our economic ills will hardly be addressed. Below is the logical framework for this policy recommendation:

Overall Objective	Logic	Indicators	Mean of verification	Assumptions
Specific Objective	Enhancing Industrial Productivity	Increase in share of Industry in GDP and Exports	GDP Growth	Low productivity
Outputs	Greater productions of goods for export	• Increase in numbers of industrial units • Increase in exports	KPIs for industrial performance	Non-competitive exports
Activities	• nsuring market competition • nforcement of contracts • rotection and subsidies on the basis of performance	Increase rate of employment By industry	Changing Job market dynamics	Inefficient industrial sector
Inputs	• ood economic governance • killed Labor • abor Laws	Sound Macroeconomic policy	Enactment of relevant laws and their implementation	Government stewardship

Annexure: A

Technical Note

From Imitation to Innovation: Lessons from China's Reverse Engineering Model for Economic, Industrial, and Agricultural Development –

"A Guiding Framework for Pakistan Science, Technology, and Innovation Policy"

Introduction

China's transformation from an imitator of foreign technology to a global innovation powerhouse provides valuable lessons for Pakistan, particularly for Khyber Pakhtunkhwa (KP). This process evolved through three key stages:

1. **Early Imitation** – Copying and replicating existing foreign technologies.
2. **Technology Absorption and Adaptation** – Modifying and improving imported technologies.
3. **Independent Innovation** – Developing indigenous, cutting-edge solutions.

KP must strategically adopt **reverse engineering** as a core pillar of its **Science, Technology, and Innovation Policy 2025** to accelerate industrial, economic, and agricultural development. This will require a structured approach involving universities, R&D institutions, and the private sector to create a sustainable ecosystem for technological innovation.

Strategic Framework for Reverse Engineering in KP

1. Establishing Reverse Engineering Units in Universities and R&D Institutions

- University departments in **science, technology, engineering, and agriculture** will set up specialized **Reverse Engineering Labs (RELs)**.
- These labs will focus on identifying, analyzing, and replicating advanced technologies from global markets, particularly China.
- Faculty and students will collaborate with government-funded R&D entities to enhance local technological capacity.

2. Industry-Academia Collaboration & Business Model

- The KP government will **purchase selected products for reverse engineering**.
- University and R&D centers will **disassemble, analyze, and develop improved versions** of these products.
- Universities will work in partnership with **the KP Chamber of Commerce and Industry** to **mass-produce and commercialize** reverse-engineered products.
- Local industries will be encouraged to adopt these innovations for large-scale production.

3. Financial Model and Profit Distribution

Profits from commercialization will be distributed as follows:

- **25% to Students** (Encouraging research and innovation among youth)
- **25% to Faculty Members** (Incentivizing academic contributions)
- **25% to University Departments** (Enhancing lab infrastructure and research facilities)
- **25% to Research Endowment Fund** (Sustaining long-term innovation initiatives)

4. Implementation Plan and Targets

- **Year 1:** Reverse engineering of **50 products**.
- **Year 2-3:** Scale up to **300 products** in various industries, including **agriculture, manufacturing, energy, and digital technologies**.
- **Year 4+**: Transition from imitation to product innovation and commercialization at a global scale.

Expected Outcomes

1. **Technological self-reliance** – Reduced dependency on imported technology.
2. **Industrial Growth** – Strengthening of local manufacturing and SME sectors.
3. **Job Creation & Skill Development** – Hands-on training for students and professionals.
4. **Economic Growth** – Higher exports through indigenous technological advancements.

Reverse engineering has been a critical tool in China's economic rise, and KP can leverage this model to drive its own **technological and industrial transformation**. Through university-led R&D, strong industry linkages, and a structured financial model, KP can move from **imitation to innovation**, setting a new direction for Pakistan's economic and technological future.

Action Plan: The KP government should immediately launch a **pilot project** in key universities to test and refine this model before full-scale implementation. By aligning

academic research with industrial needs, KP can establish itself as a center of technological excellence in Pakistan.

China's Transformation: From Technology Imitation to Innovation Leadership

China's journey from imitating foreign technology to driving innovation can be broadly divided into three stages: early imitation, technology absorption and adaptation, and independent innovation; with the early stages heavily focused on copying existing technologies, gradually transitioning to modifying and improving them, and finally reaching a point where China is actively developing cutting-edge technologies of its own.

1. Early Imitation (Pre-Reform Era):

- **Focus on basic manufacturing:**

  During the early post-revolution period, China primarily concentrated on replicating basic industrial technologies from abroad to build its manufacturing base, often through joint ventures with foreign companies.

- **Low R&D investment:**

  Research and development activities were limited, with the main focus on understanding and adapting existing technologies.

- **Quality control issues:**
  Due to the emphasis on quick replication, initial products often faced concerns regarding quality and reliability.

2. Technology Absorption and Adaptation (Reform Era):

- **Increased R&D investment:**

  Following economic reforms in the 1980s, China started investing more significantly in research and development, focusing on improving existing technologies and developing localized variations.

- **Reverse engineering:**

  A common practice where Chinese companies would disassemble foreign products to understand their design and functionality, then modify and improve upon them.

- **Focus on cost-effectiveness:**
  The goal was to produce high-quality products at competitive prices by optimizing production processes and materials.

3. Independent Innovation (Present Day):

- **National Innovation Strategy:**

  The Chinese government actively promotes a "national innovation-driven development strategy" aiming to move beyond imitation and become a leader in key technological fields.

- **High-tech sectors:**

Investment in emerging technologies like artificial intelligence, renewable energy, biotechnology, and advanced manufacturing is significantly increasing.

- **Intellectual property focus:**

  Greater emphasis on developing and protecting intellectual property rights to incentivize original research and development.

- **Global competition:**
  Chinese companies are now actively competing on the international stage with their own innovative products and technologies.

Key factors contributing to China's shift from imitation to innovation:

- **Government support:**

  Significant government funding and policy initiatives directed towards research and development

- **Education development:**

  Focus on building a strong scientific and technical workforce

- **Market size:**

  A large domestic market provides incentives for companies to invest in innovation

- **International collaboration:**
  Partnerships with foreign companies and research institutions facilitate knowledge transfer

A list of agricultural machinery suitable for reverse engineering:

1. Tractors and Power Units

- **Compact Utility Tractors** (for small-scale farming)
- **Row-Crop Tractors** (for fieldwork)
- **Four-Wheel Drive Tractors** (for heavy-duty farming)
- **Mini Tractors** (for orchards and vineyards)
- **Electric Tractors** (for sustainable farming)

2. Tillage Equipment

- **Plows** (Moldboard, Disc, Chisel)
- **Rotavators** (Rotary Tillers)
- **Harrows** (Disc Harrow, Chain Harrow)
- **Subsoilers** (for deep tillage)

3. Planting and Seeding Equipment

- **Seed Drills** (Pneumatic, Mechanical)
- **Planters** (Row Planters, Precision Planters)

- **Transplanters** (for rice, vegetables)
- **Broadcast Seeders**

4. Irrigation Equipment

- **Sprinkler Systems**
- **Drip Irrigation Systems**
- **Center Pivot Irrigation Systems**
- **Irrigation Pumps** (Diesel, Electric)

5. Harvesting Machinery

- **Combine Harvesters** (Wheat, Rice, Corn)
- **Forage Harvesters** (Choppers, Silage Machines)
- **Sugarcane Harvesters**
- **Cotton Pickers**
- **Potato & Root Crop Harvesters**

6. Crop Processing Machinery

- **Threshers** (Multi-crop, Paddy, Maize)
- **Milling Machines** (Rice Mill, Flour Mill)
- **Grain Cleaning and Sorting Machines**
- **Oil Expellers** (for oilseed extraction)

7. Fertilizer and Pesticide Application Equipment

- **Fertilizer Spreaders** (Broadcast, Precision)
- **Boom Sprayers**
- **Drone Sprayers** (for precision agriculture)
- **Hand-Held and Tractor-Mounted Sprayers**

8. Hay and Forage Equipment

- **Balers** (Round, Square)
- **Mowers** (Sickle Bar, Rotary)
- **Hay Rakes and Tedders**
- **Silage Packing Machines**

9. Post-Harvest Processing Equipment

- **Grain Dryers**
- **Cold Storage Units**
- **Fruit and Vegetable Grading Machines**
- **Packaging Machines**

10. Smart and Autonomous Agriculture Equipment

- **GPS-Guided Tractors**
- **Automated Greenhouse Systems**

- **Agricultural Drones** (for monitoring, spraying)
- **AI-Based Weed Removal Robots**

….

A list of technology products suitable for reverse engineering across different domains:

1. Consumer Electronics

- **Smartphones** (Apple, Samsung, Xiaomi, etc.)
- **Tablets & Laptops** (MacBook, Surface, ThinkPad)
- **Smartwatches & Wearables** (Apple Watch, Fitbit)
- **Wireless Earbuds & Headphones** (AirPods, Bose, Sony)
- **Gaming Consoles** (PlayStation, Xbox, Nintendo Switch)
- **Smart TVs & Display Panels**
- **VR & AR Headsets** (Meta Quest, HTC Vive)

2. Computer Hardware

- **Microprocessors (CPUs, GPUs)** (Intel, AMD, NVIDIA)
- **Motherboards & Chipsets**
- **Solid-State Drives (SSD), Hard Drives (HDD)**
- **RAM Modules (DDR4, DDR5)**
- **Graphics Cards**
- **Power Supply Units (PSU)**

3. Networking & Communication Devices

- **Wi-Fi Routers & Mesh Networks**
- **Modems & Optical Fiber Transceivers**
- **5G Base Stations & Small Cells**
- **Satellite Communication Equipment**
- **IoT Gateways & Smart Home Hubs**

4. Industrial & Embedded Systems

- **Microcontrollers & Development Boards** (Arduino, Raspberry Pi)
- **Programmable Logic Controllers (PLC)**
- **Sensors & Actuators (LiDAR, Ultrasonic, IR)**
- **Automated Robotic Arms**
- **Industrial Drones**

5. Automotive & Transportation Technology

- **Electric Vehicle (EV) Batteries & BMS**
- **EV Motor Controllers & Power Electronics**

- **Autonomous Driving Systems (Tesla, Waymo)**
- **Infotainment & Navigation Systems**
- **LiDAR & Radar Systems**

6. Medical & Health Tech

- **MRI & CT Scanners**
- **Blood Glucose Monitors**
- **Portable ECG Devices**
- **Smart Insulin Pumps**
- **Wearable Health Trackers**

7. Renewable Energy & Power Tech

- **Solar Inverters & Microinverters**
- **Wind Turbine Control Systems**
- **Energy Storage Systems (Battery, Hydrogen Fuel Cells)**
- **Smart Grid Technologies**

8. Security & Surveillance Tech

- **Biometric Authentication Systems (Fingerprint, Face Recognition)**
- **CCTV & AI-Powered Surveillance Cameras**
- **Smart Door Locks & Access Control Systems**
- **Cybersecurity Hardware (Firewalls, VPN Devices)**

9. Military & Aerospace Technology

- **Drones & UAVs (Reaper, Bayraktar TB2)**
- **Missile Guidance Systems**
- **Radar & Sonar Systems**
- **Jet Engine Components**
- **Satellite Navigation Systems (GPS, Galileo, BeiDou)**

10. AI & Cloud Computing Hardware

- **AI Accelerator Chips (TPUs, NPUs)**
- **Edge AI Devices (Jetson, Coral)**
- **Quantum Computing Processors**
- **Data Center Servers & Storage Systems**

A List of Targeted Food Crops and Fruits for Reverse Engineering: A Categorized Approach to Gene Copying and Modification

1. Staple Food Crops (Grains & Cereals)

Crop	Leading Country	Traits for Reverse Engineering
Hybrid Rice (Super Rice)	China, Vietnam	High yield, drought resistance
Genetically Modified Corn (GM Maize)	USA, Brazil	Pest resistance (Bt Corn), drought tolerance
Wheat (Drought-Tolerant Varieties)	USA, China	Climate resilience, rust resistance
Sorghum (High-yield Varieties)	USA, Brazil	Heat tolerance, high biomass production
Barley (Malt & Feed Varieties)	USA, China	Disease resistance, cold tolerance

2. Legumes & Protein-Rich Crops

Crop	Leading Country	Traits for Reverse Engineering
Soybeans (GM & Hybrid Varieties)	USA, Brazil, China	Herbicide tolerance, high protein content
Peanuts (Aflatoxin-Resistant Varieties)	China, USA	Disease resistance, improved oil content
Lentils & Chickpeas (Drought-Resistant Varieties)	USA, China	Heat & drought tolerance
Black Beans & Red Kidney Beans	Brazil, USA	High protein yield

3. Root & Tuber Crops

Crop	Leading Country	Traits for Reverse Engineering
GM Potatoes (Pest-Resistant Varieties)	USA	Late blight resistance
Cassava (High Starch Varieties)	Brazil, Thailand	Disease resistance, improved productivity
Sweet Potatoes (Nutrient-Enriched Varieties)	China, USA	High beta-carotene content

4. Oilseed Crops

Crop	Leading Country	Traits for Reverse Engineering
Canola (GM Varieties with Omega-3 Enrichment)	USA, China	High oil content, herbicide resistance
Palm Oil (Hybrid Varieties)	Thailand, Brazil	High oil yield, pest resistance
Sunflower (Drought-Resistant Hybrid)	USA, China	High oil yield

5. Fruits (Tropical & Temperate)

Crop	Leading Country	Traits for Reverse Engineering
Banana (Disease-Resistant Varieties)	Thailand, Brazil	Fusarium wilt resistance
Mango (Hybrid & Export-Quality Varieties)	Thailand, Brazil	Long shelf life, high sugar content
Pineapple (Sweet & Juicy Varieties)	Thailand, Brazil	High yield, disease resistance
Dragon Fruit (Red & White Flesh Varieties)	Vietnam, Thailand	High antioxidant content
Durian (Non-Odorous & Export-Friendly Varieties)	Thailand	Improved shelf life
Strawberries (GM Large Berry Varieties)	USA	Extended shelf life, climate resilience
Apples (GM Varieties - Arctic Apple)	USA, China	Non-browning, extended freshness
Grapes (Wine & Table Varieties)	USA, China	Pest resistance, high sugar content

6. Cash Crops (High-Value Agriculture)

Crop	Leading Country	Traits for Reverse Engineering
Coffee (Disease-Resistant Arabica & Robusta)	Brazil, Vietnam	Rust resistance, climate adaptation
Cocoa (High-Yield Varieties)	Brazil, USA	Disease resistance, enhanced flavor
Tea (High-Quality Green & Black Varieties)	China, Vietnam	Increased antioxidants, pest resistance
Sugarcane (High Sucrose Content Varieties)	Brazil, Thailand	High sugar recovery rate

Crop	Leading Country	Traits for Reverse Engineering
Cotton (GM Bt Cotton)	USA, China	Pest-resistant, high fiber quality

7. Vegetables (Hybrid & GM Varieties)

Crop	Leading Country	Traits for Reverse Engineering
Tomatoes (Non-Spoiling GM Varieties)	USA, China	Longer shelf life, disease resistance
Capsicum (High Vitamin C Varieties)	China, Thailand	Improved taste, pest resistance
Carrots (Beta-Carotene-Rich Varieties)	USA, China	Higher nutritional value
Onions (Disease-Resistant & Non-Tearing Varieties)	USA, Brazil	High yield, better storage
Cabbage (Heat-Resistant Hybrid Varieties)	China, Vietnam	Pest-resistant, high yield

Reverse Engineering Approach:

- **Gene Sequencing & CRISPR Technology:** Identify genes responsible for desirable traits in target crops and apply gene editing to local varieties.
- **Hybridization & Selective Breeding:** Cross-breed high-performing strains for higher yield and resistance.
- **Biotechnology & GMO Replication:** Copy proven GMOs from **USA, Brazil, China** for commercialization.
- **Climate Adaptation:** Modify genes to suit local climates for **drought, pest, and disease resistance**.

Annexure: b

Technical Note:

The Importance and Role of Input-Output Model

in Industrial Development for Pakistan

Background

Pakistan's industrial sector faces significant challenges, including fragmentation in governance, policy incoherence, and a lack of integration across industries. To address these issues and ensure sustainable industrial growth, the adoption of advanced planning tools like the Input-Output (I-O) Model is essential. This model provides a structured approach to planning and resource allocation, enabling effective industrial development by analyzing interdependencies among various sectors. By applying the I-O Model, Pakistan can create a unified framework to eliminate fragmentation and achieve industrial prosperity.

Understanding the Input-Output Model

The Input-Output Model, pioneered by Nobel laureate Wassily Leontief, is a quantitative economic technique that captures the relationships between different industries within an economy. It identifies how the output of one sector serves as an input for another, creating a detailed matrix of inter-industry dependencies. This model helps policymakers and planners:

1. **Identify Critical Industries**: Highlight sectors with significant backward and forward linkages, ensuring resources are prioritized where they generate maximum impact.
2. **Optimize Resource Allocation**: Ensure efficient use of resources across industries to reduce waste and inefficiencies.
3. **Forecast Economic Outcomes**: Simulate the effects of policy decisions, technological advancements, and external shocks on the industrial ecosystem.

Techniques for Using the I-O Model in Industrial Development

1. **Sectoral Analysis**:
    - Use the I-O matrix to identify key industries with high multipliers, such as energy, steel, and textiles, which influence multiple downstream sectors.
    - Example: Analyze how investments in steel manufacturing impact construction, automotive, and machinery sectors.
2. **Import Substitution Planning**:
    - Identify intermediary goods currently imported and prioritize their domestic production by analyzing the dependency matrix.
    - Example: Develop local capacity for EV battery components and semiconductor manufacturing, reducing reliance on imports.

3. **Export Diversification**:
    - Determine sectors with untapped export potential by assessing global supply-demand dynamics and aligning them with domestic production capabilities.
    - Example: Use the I-O model to expand Pakistan's presence in renewable energy products, such as solar panels and wind turbine components.
4. **Supply Chain Optimization**:
    - Map supply chains to identify bottlenecks and inefficiencies.
    - Example: Enhance logistics for the textile industry by integrating raw material suppliers, dyeing units, and garment manufacturers.
5. **Regional Industrial Planning**:
    - Develop specialized industrial zones tailored to regional strengths by analyzing regional I-O data.
    - Example: Promote surgical instrument manufacturing in Sialkot, leveraging existing expertise and global demand.

Examples of Successful Implementation

1. **China**:
    - China's use of I-O models enabled the development of interlinked industrial clusters, such as the electronics hub in Shenzhen and the automotive industry in Guangzhou. These clusters facilitated innovation, reduced production costs, and increased global competitiveness.
2. **Germany**:
    - Germany's precision engineering and automotive sectors thrive due to integrated industrial ecosystems supported by rigorous I-O analysis. The model helps maintain strong linkages between R&D, component manufacturing, and final assembly.
3. **South Korea**:
    - South Korea's rise as a global electronics and shipbuilding leader is rooted in targeted investments guided by I-O models. The government identified key sectors with high multiplier effects and aligned policies to strengthen them.

Benefits of the Input-Output Model for Pakistan

1. **Eliminating Fragmentation**:
    - The I-O model fosters coordination among federal, provincial, and local governments by providing a unified framework for industrial planning.
    - Example: Aligning policies for textile manufacturing in Punjab and Sindh to avoid duplication and inefficiencies.
2. **Enhancing Policy Coherence**:
    - Provides a data-driven foundation for policy decisions, ensuring alignment with national priorities and global trends.
3. **Boosting Domestic Production**:
    - Identifies opportunities for import substitution and value addition, reducing reliance on foreign goods and services.

4. **Promoting Regional Development**:
    - Tailors industrial strategies to regional strengths, ensuring balanced economic growth.
5. **Attracting Investment**:
    - Provides clear insights into sectoral dynamics, making Pakistan an attractive destination for both domestic and foreign investors.

Implementation Roadmap for Pakistan

1. **Develop National and Regional I-O Matrices**:
    - Establish comprehensive I-O tables capturing inter-industry relationships at national and provincial levels.
2. **Institutional Capacity Building**:
    - Train policymakers, economists, and planners in the application of I-O models for industrial strategy development.
3. **Strengthen Data Collection Mechanisms**:
    - Invest in reliable data collection systems to ensure accurate and up-to-date I-O analysis.
4. **Create Policy and Investment Frameworks**:
    - Design policies based on I-O findings, focusing on high-impact sectors.
5. **Engage Stakeholders**:
    - Collaborate with industry leaders, academia, and international organizations to refine strategies and ensure successful implementation.

Policy Conclusion:

The Input-Output Model offers a powerful tool for addressing the fragmentation and inefficiencies plaguing Pakistan's industrial sector. By leveraging this approach, Pakistan can identify critical industries, optimize resource allocation, and align industrial policies with national and global priorities. Success stories from countries like China, Germany, and South Korea demonstrate the transformative potential of I-O models in fostering industrial development. Adopting this model is not just an option but a necessity for building a prosperous and industrially advanced Pakistan.

Overall Objective	Logic	Indicators	an of verification	Assumptions
Specific Objective	Sound fiscal discipline	Controlling budget deficit	• Economic survey • SBP reports	• Budget deficit is ruining public finances
Outputs	Bridging the gap between expenditure and revenue	• ncreased Revenue • ecrease expenditure	Certification of Accounts	Prodigal use of public finances
Activities	• Doing away with wasteful public sector expenditure • Enhancing tax revenue	• Civil Service Reforms • Marketisation • Privatization	• Performance Auditing	• Governme nt is acting like employme nt Bureau
Inputs	• Efficient utilization of public resources • Pension Bill	• Decrease in salary bill • Decrease in pension bill • Increase in taxes	Privatization and marketization policies implementation	Uneconomical, inefficient and ineffective use of public resources

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