



TRANSITIONING PAKISTAN TO A GREEN ECONOMY BY 2030: ECONOMIC OPPORTUNITIES, GREEN JOBS, CLIMATE RESILIENCE, AND POLICY PATHWAYS

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Abstract

Pakistan faces the interconnected challenges of low and uneven economic growth, energy insecurity, unemployment, environmental degradation, and climate vulnerability. This paper develops a research framework and methodology for constructing an evidence-based Green Economics Vision 2030 for Pakistan. The study integrates environmental, development, labour, energy, and industrial economics into a single analytical structure and proposes the Pakistan Green Economy Index (PGEI), a composite measure spanning seven dimensions: green growth, clean energy, green employment, sustainable industry, green finance, environmental sustainability, and social inclusion. A mixed-method design combining time-series and panel econometrics, a national enterprise and stakeholder survey, and scenario modelling across Business-as-Usual, Moderate Green Transition, and Accelerated Green Transition pathways is proposed to evaluate the economic, employment, and environmental implications of Pakistan's green transition through 2030. Illustrative scenario projections presented here demonstrate the analytical approach: an accelerated transition is associated with faster GDP growth, larger cumulative green-job creation, and a substantially greater reduction in emissions intensity relative to a business-as-usual trajectory, although these figures are hypothetical placeholders pending empirical estimation.



The paper outlines the conceptual framework, hypotheses, data sources, econometric strategy, expected outputs, and a twenty-four-month work plan. The resulting index and policy roadmap are intended to provide policymakers, financial institutions, and industry with measurable indicators and evidence-based pathways for reconciling economic growth with environmental sustainability and climate resilience.

Keywords: green economy; green growth; sustainable development; green employment; green finance; climate resilience; Pakistan; composite index; scenario analysis

JEL Classification: Q56; Q58; O44; O13; E24; G23; Q01

1. Introduction

Economic development in Pakistan has historically been accompanied by intensifying pressure on natural resources, energy systems, and the environment. Rapid urbanization, industrialization, population growth, and changing consumption patterns have compounded challenges associated with energy demand, water scarcity, waste generation, pollution, and climate vulnerability (Government of Pakistan, 2023; World Bank, 2022). At the same time, the economy requires sustained growth, employment creation, poverty reduction, and greater industrial competitiveness. Environmental sustainability therefore cannot be pursued independently of economic development; Pakistan requires a model capable of simultaneously advancing growth, employment, productivity, investment, social inclusion, and environmental sustainability.

The green economy paradigm offers a route to reconciling these objectives. As conceptualized in the foundational United Nations Environment Programme (UNEP, 2011) report and subsequent OECD (2011) green growth strategy, a green economic transition can generate new investment opportunities in renewable energy, sustainable agriculture, the circular economy, resource-efficient manufacturing, green construction, sustainable transport, and environmental services, while reducing carbon intensity and ecological pressure. The transition is not costless, however: firms may face high upfront investment requirements, workers may require new skills, consumers may face changing relative prices, and governments may encounter fiscal and institutional constraints (Georgieva et al., 2022). An evidence-based assessment of both the opportunities and the adjustment costs associated with green economic transformation is therefore required.

This paper responds to that need by proposing an integrated economic framework for Pakistan's green transition toward 2030. The paper (a) situates the proposed research within the wider green-growth and green-finance literature, (b) develops a conceptual framework linking green finance, investment, technology, production, employment, and inclusive growth, (c) introduces the Pakistan Green Economy Index (PGEI) as a multidimensional measurement instrument, (d) specifies a mixed-method econometric and survey-based methodology, and (e) presents illustrative scenario projections that demonstrate — without yet constituting — the empirical analysis to be undertaken



once primary and secondary data are assembled.

2. Literature Review

The theoretical foundation of green economics draws on environmental and resource economics (Pearce et al., 1989), which established that sustainable growth requires accounting for natural capital depreciation alongside conventional output measures. The green growth literature subsequently formalized the idea that environmental policy and economic growth need not be in tension: Stern (2007) argued that the costs of inaction on climate change substantially exceed the costs of early mitigation, while Acemoglu et al. (2012) showed theoretically that directed technical change can be steered toward clean technologies through a combination of carbon pricing and research subsidies without permanently sacrificing long-run growth.

A parallel literature has examined the employment implications of environmental transitions. The International Labour Organization (ILO, 2018) estimated that a global shift toward sustainable energy and resource use could generate net employment gains once job losses in carbon-intensive sectors are weighed against job creation in renewable energy, agriculture, and the circular economy, though the distribution of gains and losses across sectors, skill levels, and regions remains uneven. Green finance has emerged as a complementary strand: D'Orazio and Popoyan (2019) documented the growing use of macroprudential and green-credit policies by central banks and regulators to mobilize capital toward low-carbon investment, while Loiseau et al. (2016) reviewed the circular-economy literature and highlighted persistent gaps in measurement and indicator development.

Composite indices have become a common tool for benchmarking countries' green-economy performance, including the Global Green Economy Index and various OECD green-growth indicator sets. However, cross-country indices are generally not tailored to the structural characteristics of a specific developing economy such as Pakistan's, where textiles, agriculture, and light manufacturing dominate export earnings, energy supply is heavily import-dependent, and climate vulnerability is exceptionally high (Eckstein et al., 2021). Existing Pakistan-focused research has tended to examine individual dimensions — carbon emissions, renewable-energy adoption, climate change impacts, or agricultural sustainability — largely in isolation, leaving a gap for an integrated framework that simultaneously connects green investment, technology, employment, industrial competitiveness, social inclusion, and environmental sustainability within a single measurable structure. The present study addresses that gap.

3. Research Problem and Knowledge Gaps

Pakistan currently lacks a comprehensive, measurable, and economically grounded framework for evaluating its transition toward a green economy. Without such a framework, policymakers face difficulty determining which green sectors merit priority, how much investment is required, where green-employment opportunities are concentrated, which industries can become globally competitive on the basis of environmental upgrading, how green policies affect households and vulnerable groups, how green investment can be financed, and which policy pathway is



economically feasible by 2030. Six specific gaps motivate the research design:

- Measurement gap: absence of a multidimensional index designed specifically to track Pakistan's green economic transformation.
- Economic impact gap: insufficient integrated evidence on how green policies affect GDP, investment, employment, and productivity.
- Employment gap: the potential scale and sectoral distribution of green jobs in Pakistan remain insufficiently quantified.
- Finance gap: limited integrated analysis of the financing mechanisms required to support the green transition.
- Industrial competitiveness gap: the potential of green transformation to enhance export competitiveness requires further investigation.
- Policy gap: absence of an evidence-based roadmap translating green-economy principles into implementable economic policy for 2030.

4. Research Questions, Objectives, and Hypotheses

4.1 Main Research Question

How can Pakistan transition toward a green, inclusive, and climate-resilient economy by 2030 while maintaining economic growth, employment generation, and industrial competitiveness?

4.2 General Objective

To develop an evidence-based Green Economics Vision 2030 for Pakistan that integrates sustainable economic growth, green employment, environmental sustainability, industrial competitiveness, green finance, and climate resilience.

4.3 Specific Objectives

- Develop a baseline assessment of Pakistan's green economy.
- Construct the Pakistan Green Economy Index (PGEI).
- Identify priority sectors for green economic transformation.
- Estimate the contribution of green sectors to economic growth.
- Estimate the potential for green employment generation.
- Analyze the relationship between economic growth and environmental sustainability.
- Examine barriers to green technology adoption by firms.
- Assess green investment and financing requirements.
- Investigate the role of green finance in sustainable investment.
- Assess opportunities for green industrialization and exports.
- Analyze the distributional and social effects of green policies.
- Develop alternative economic scenarios for 2030.
- Identify priority policy interventions.
- Develop a Green Economics Policy Roadmap, 2026–2030.

4.4 Hypotheses

H1. Green investment has a positive and significant effect on sustainable economic growth in Pakistan.



H2. Greater renewable-energy adoption improves environmental sustainability while supporting economic development.

H3. Green technology adoption improves firm-level productivity and competitiveness.

H4. Green-sector development has a positive effect on employment generation.

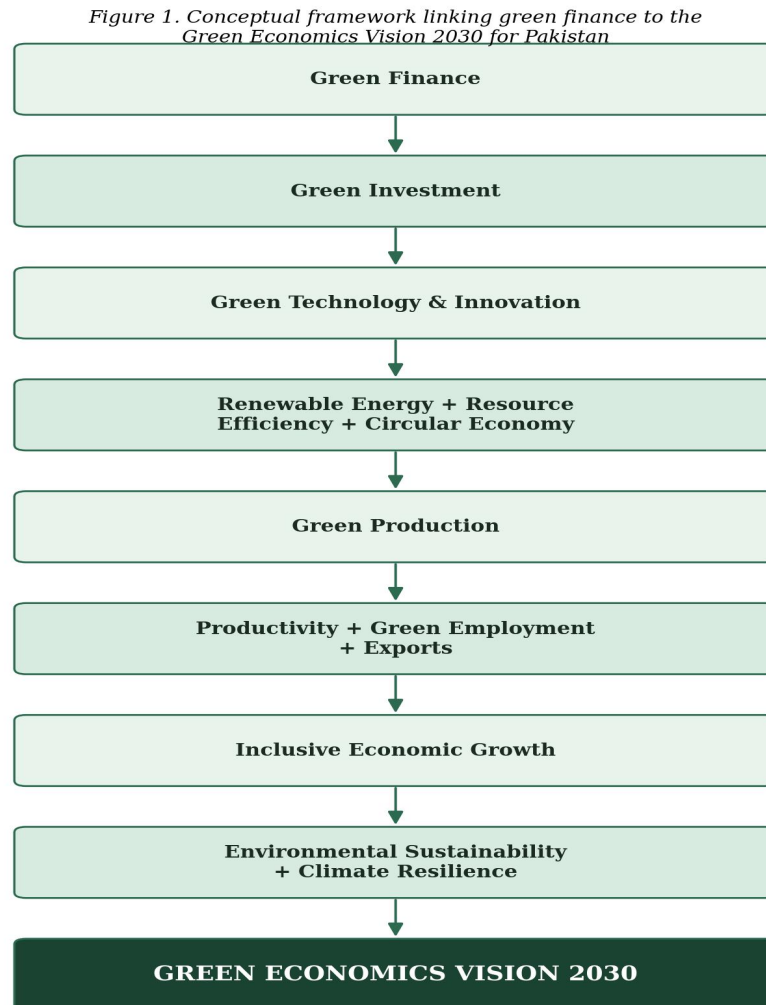
H5. Access to green finance significantly increases the probability of firms adopting environmentally sustainable technologies.

H6. Resource efficiency and circular-economy practices improve economic productivity.

H7. Green economic policies can reduce environmental degradation without compromising long-run economic growth.

5. Conceptual Framework

The conceptual framework (Figure 1) traces a causal pathway from green finance through green investment and technology adoption to renewable energy, resource efficiency, and circular-economy practices. These inputs are hypothesized to raise green production, which in turn supports productivity, green employment, and export growth. The cumulative effect is inclusive economic growth accompanied by improved environmental sustainability and climate resilience — jointly constituting the Green Economics Vision 2030. Social inclusion, poverty reduction, and regional equity are modelled as cross-cutting dimensions that condition outcomes at every stage of the pathway, consistent with the inclusive-green-growth literature (OECD, 2011; UNEP, 2011).



Note. Social inclusion, poverty reduction, and regional equity are treated as cross-cutting dimensions influencing every stage of the framework.

Figure 1. Conceptual framework linking green finance to the Green Economics Vision 2030 for Pakistan.

6. Methodology

6.1 Research Design

A mixed-method research design is proposed, combining quantitative economic analysis with qualitative stakeholder evidence. The design has three components: (a) secondary-data analysis and index construction, (b) econometric estimation of the growth–environment–employment relationships specified in Section 4.4, and (c) a national enterprise and stakeholder survey to capture firm-level barriers and incentives that are not observable in aggregate data.

6.2 Data Sources

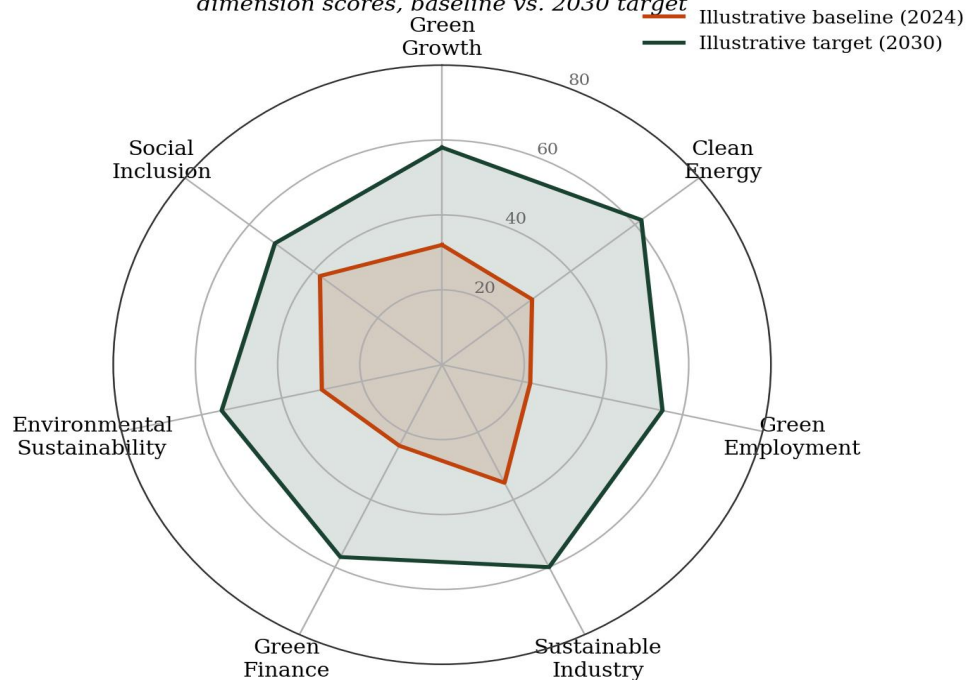
Secondary data will be obtained, subject to availability, from the Pakistan Bureau of Statistics, the State Bank of Pakistan, the Ministry of Finance, the Planning Commission, the Ministry of Climate

Change and Environmental Coordination, the Ministry of Energy, provincial departments, international development institutions, and international economic and environmental databases (e.g., World Bank World Development Indicators, IEA, and IRENA).

6.3 The Pakistan Green Economy Index (PGEI)

A principal contribution of the proposed research is the construction of the Pakistan Green Economy Index (PGEI), a composite measure spanning seven dimensions: green growth (green GDP, resource productivity), clean energy (renewable-energy share, energy efficiency), green employment (green jobs, green skills), sustainable industry (clean technology, resource efficiency), green finance (green investment, sustainable financing), environmental sustainability (emissions, waste, water), and social inclusion (poverty, inequality, regional equity). Indicator normalization and dimension weighting will follow established composite-indicator methodology (e.g., min–max normalization with either equal or principal-component-derived weights), to be selected on the basis of methodological testing and data availability, following the OECD/European Commission (2008) Handbook on Constructing Composite Indicators. Figure 2 illustrates the intended structure of the index using hypothetical dimension scores; empirical values will be computed once the underlying indicators have been compiled and validated.

Figure 2. Pakistan Green Economy Index (PGEI): illustrative dimension scores, baseline vs. 2030 target



Note. Values are illustrative placeholders that demonstrate the seven-dimension index structure; empirical dimension scores will be estimated once national data are compiled.

Figure 2. Pakistan Green Economy Index (PGEI): illustrative dimension scores, baseline vs. 2030 target



(hypothetical, for structural demonstration only).

6.4 Econometric Strategy

The quantitative component will draw on time-series econometrics, panel-data techniques, the autoregressive distributed lag (ARDL) bounds-testing approach, and vector error-correction modelling (VECM) where cointegration is established, alongside panel-regression environment-growth models. The final specification will be determined after the data structure and stationarity properties of the underlying series have been established, with robustness and sensitivity analysis conducted throughout.

6.5 Enterprise and Stakeholder Survey

A national survey of firms, with particular focus on small and medium enterprises (SMEs) and export-oriented industries, will investigate green-technology adoption, environmental investment, energy efficiency, resource efficiency, access to finance, perceived costs, government incentives, regulatory barriers, green skills, export requirements, and willingness to undertake green investment. A complementary green-jobs analysis will estimate employment opportunities in renewable energy, solar energy, sustainable agriculture, waste management, recycling, the circular economy, green construction, electric mobility, sustainable manufacturing, environmental services, and sustainable tourism, together with the associated skills and human-capital requirements.

6.6 Scenario Modelling

Three alternative pathways to 2030 will be modelled. Under Business-as-Usual, existing policies and investment trends continue. Under Moderate Green Transition, gradual expansion occurs in renewable energy, green finance, energy efficiency, the circular economy, and green skills. Under Accelerated Green Transition, substantial investment is directed toward renewable energy, green infrastructure, green technology, green transport, sustainable agriculture, the circular economy, green industry, and green finance. Scenarios will be assessed against GDP, employment, poverty, investment, exports, energy security, emissions, and resource efficiency. Figure 3 presents illustrative, hypothetical projections for GDP growth, cumulative green-job creation, and emissions-intensity change under the three pathways, intended solely to demonstrate the scenario-comparison approach; actual estimates will be produced from calibrated scenario or computable general equilibrium (CGE) models once data collection is complete.

Figure 3. Illustrative 2030 scenario projections under three green-transition pathways

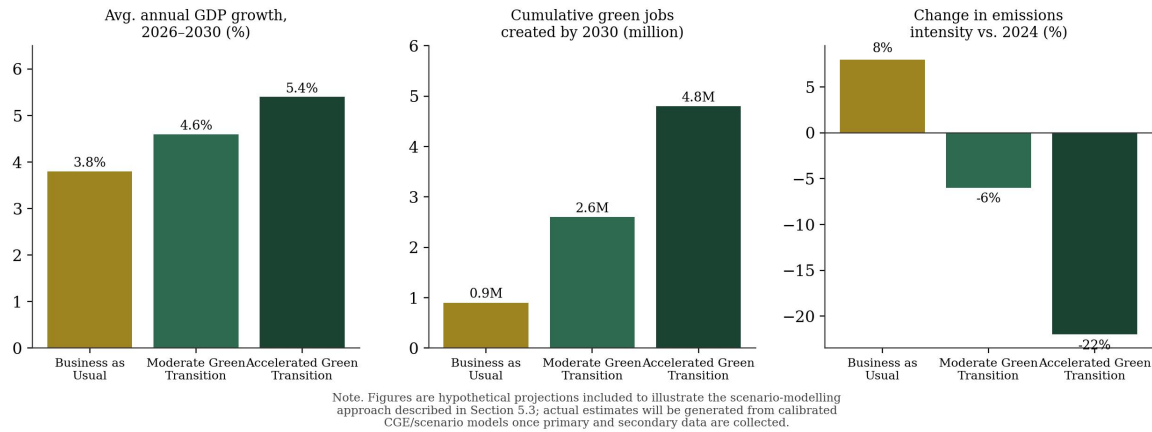


Figure 3. Illustrative 2030 scenario projections under three green-transition pathways (hypothetical values for methodological demonstration).

7. Work Plan

The proposed research programme spans 24 months, structured into nine sequential and partially overlapping phases, from literature review and framework design through data collection, index construction, econometric analysis, the enterprise survey, scenario development, policy-framework validation, stakeholder consultation, and final dissemination (Figure 4; Table 1).

Figure 4. Twenty-four-month work plan

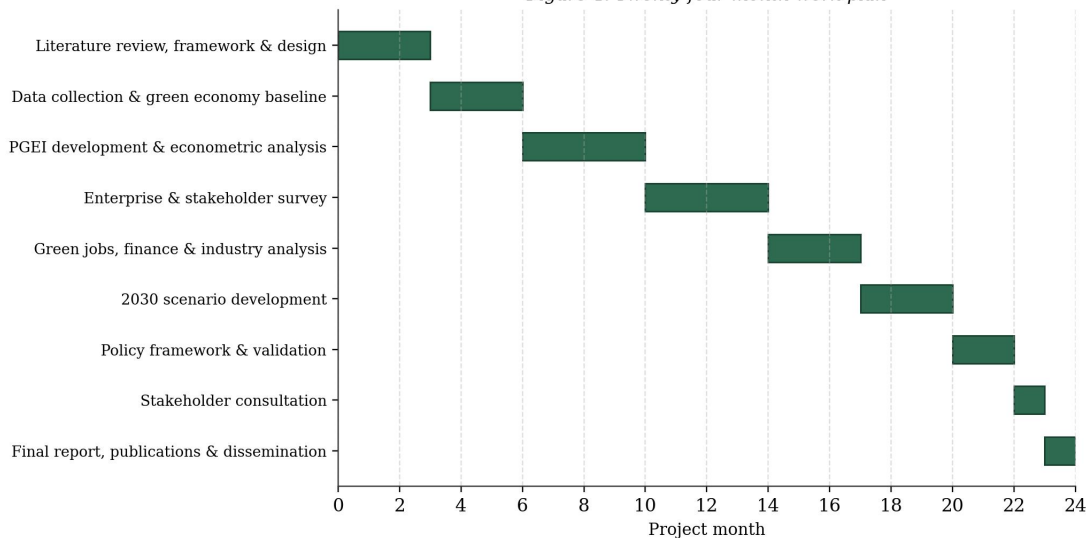


Figure 4. Twenty-four-month work plan.
Table 1. Work plan by project month

Months	Activities
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Months	Activities
1–3	Literature review, framework, and research design
4–6	Data collection and green-economy baseline
7–10	PGEI development and econometric analysis
11–14	Enterprise and stakeholder survey
15–17	Green jobs, finance, and industry analysis
18–20	2030 scenario development
21–22	Policy framework and validation
23	Stakeholder consultation
24	Final report, publications, and dissemination

8. Expected Outputs and Policy Implications

The programme is designed to deliver both academic and policy-facing outputs. Major research outputs include a Pakistan Green Economy Baseline Report, the PGEI itself, a Green Jobs Potential Assessment, a Green Finance Framework, a Green Industry Competitiveness Report, a Green Transition Scenario Model, a Green Skills Framework, a Green SME Policy Framework, the Green Economics Vision 2030, and a Green Economics Policy Roadmap for 2026–2030. On the academic side, the project targets three to five peer-reviewed publications, including manuscripts on the measurement of Pakistan's green economy, green growth and sustainable development, green jobs and inclusive growth, green finance and sustainable investment, and green industrialization and export competitiveness.

Table 2. Key performance indicators

Indicator	Target
Green Economy Index	1 validated composite index
Major research reports	5+
Policy briefs	4+
Peer-reviewed research papers	3–5
Stakeholder consultations	3+
Industry/SME survey	National sample
Policy dialogues	1–2
Green Economics Roadmap	1
2030 scenario model	1

Findings are expected to be directly relevant to the Federal Government, the Ministry of Finance,



the Planning Commission, the Ministry of Climate Change, the Ministry of Energy, the State Bank of Pakistan, provincial governments and Planning & Development Departments, financial institutions, industry associations, SMEs, and development partners. Rather than offering only theoretical recommendations, the project is designed to provide measurable indicators, economic evidence, and policy scenarios that can be directly incorporated into national development planning.

9. Discussion

The principal innovation of the proposed research is an integrated, Pakistan-specific framework connecting green growth, green jobs, green finance, green industry, climate resilience, and social inclusion within a single measurable structure. The PGEI is intended to provide a mechanism for tracking green economic transformation over time, while the 2030 scenario model will allow policymakers to compare alternative pathways and their implications for economic and social outcomes. As the illustrative projections in Figure 3 suggest — pending empirical validation — an accelerated transition pathway is likely to combine higher growth with larger employment gains and steeper reductions in emissions intensity, consistent with the broader green-growth literature (Acemoglu et al., 2012; ILO, 2018), though realizing these gains in practice will depend on the pace of green-finance mobilization, firms' technology-adoption decisions, and the design of complementary skills and social-protection policies to manage distributional effects during the transition.

Several risks are anticipated. Data gaps will be mitigated through the use of multiple national and international sources; low survey response will be addressed through institutional and industry partnerships; the conceptual difficulty of measuring green jobs will be addressed by developing an operational green-job classification; policy uncertainty will be managed through scenario-based modelling; interdisciplinary coordination will be supported through clearly defined work packages; and potential delays in international collaboration will be mitigated through early memoranda of understanding. Beyond the 24-month funding period, the PGEI can be updated periodically to monitor progress toward 2030 and beyond, and the resulting dataset, policy framework, and analytical model can support future research on climate economics, green finance, energy transition, green entrepreneurship, environmental policy, and labour-market transformation.

10. Conclusion

This paper has outlined the conceptual framework, methodology, and expected outputs of a research programme to develop the first integrated, evidence-based Pakistan Green Economy Index and an accompanying 2030 policy-scenario framework linking green growth, employment, finance, industrial competitiveness, environmental sustainability, and social inclusion. The proposed Green Economics Vision 2030 rests on five pillars — green growth, green jobs and skills, green industry, green finance, and climate-resilient and inclusive growth — and is intended to guide Pakistan's transition toward a green and climate-resilient economy through measurable indicators, economic evidence, and policy scenarios rather than theoretical recommendations alone. Future work will report the empirical PGEI estimates, econometric results, and calibrated scenario projections once



the data-collection and survey phases described in Section 7 have been completed.

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