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## Policy Brief #89

# Addressing Pakistan's **Energy Security** Amid Regional Turmoil



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## Abstract

The ongoing turmoil in the region driven by the geopolitical conflict, climate induced disasters such as 2022 floods, and development delays due to COVID-19 have exposed the vulnerability of Pakistan's energy sector to external shocks. Not only is this contributing to country-wide inflation, but also derailed the country from targets prescribed under the Sustainable Development Goals (SDGs). This policy brief aims to address this issue by analyzing the current challenges across energy sector value chain, identify the low-hanging fruits to provide the short-term solutions, and recommending the way forward through policy and technological solutions that can bring resilience in the country's energy sector planning. The policy brief highlights that while the energy sector growth of Pakistan has entered into an uncertain phase, a strong policy and regulatory support is required to double down on a low carbon pathway that ensures a just and equitable transition. Pakistan's energy crisis may be multifaceted but so are the solutions. The key to treading onto a path of recovery and progress lies mainly in tackling the issue from both ends, i.e. taking initiatives to address demand and supply side concerns while also addressing the governance issues of other cross-cutting themes.

**Keywords:** Sustainable Development, Energy Access, Renewable Energy, Energy Efficiency, Energy Security

## Abbreviations

|          |  |
|----------|--|
| APCMA    | All Pakistan Cement Manufacturing Association                    |
| BRI      | Belt and Road Initiative   |
| Covid-19 | Coronavirus Disease 2019   |
| CPI      | Consumer Price Index   |
| DISCOs   | Distribution Companies   |
| ECBC     | Energy Conservation Building Codes                               |
| EMS      | Energy Management Systems  |
| GDP      | Gross Domestic Product   |
| GoP      | Government of Pakistan   |
| IDF      | International Development Finance                                |
| IMF      | International Monetary Fund                                      |
| IoT      | Internet of Things   |
| MEPS     | minimum energy performance standards                             |
| NDCs     | Nationally Determined Contributions                              |
| NEECA    | National Energy Efficiency and Conservation Authority            |
| NEPRA    | National Electric Power Regulatory Authority                     |
| NESE     | National Energy Security Council                                 |
| OGRA     | Oil and Gas Regulatory Authority                                 |
| PAAPAM   | Pakistan Association of Auto Parts and Accessories Manufacturers |
| PEDO     | Pakhtunkhwa Energy Development Organization                      |
| RE       | Renewable Energy   |
| SDGs     | Sustainable Development Goals                                    |
| UN       | United Nations   |
| WHO      | World Health Organization  |

## Table of Contents

|   |           |
|---|-----------|
| <b>1. Introduction</b>  | <b>7</b>  |
| Background  | 7         |
| Scope and Methodology   | 8         |
| Need for energy security in uncertain time                                    | 8         |
| <b>2. Changing dynamics of Pakistan's energy sector</b>                       | <b>9</b>  |
| Increasing Energy Prices and Consumer Price Index (CPI)                       | 9         |
| Dilemma of Petroleum Subsidies  | 10        |
| Impact on Manufacturing and Service Sector                                    | 10        |
| Energy project development and Investment delays                              | 11        |
| Disruptions in Energy Supply Chain  | 12        |
| Inefficiency and Lack of Demand Side Management Techniques                    | 12        |
| <b>3. Frontiers of Energy Transition: Recommendations and the Way Forward</b> | <b>13</b> |
| Demand-side Measures  | 14        |
| Robust implementation and upgradation of efficiency in homes and buildings    | 14        |
| Energy Efficiency and Conservation Measures                                   | 15        |
| Social Protection Schemes for households & other demand sectors               | 16        |
| Addressing the Energy-Food Nexus  | 16        |
| Supply-side Measures  | 17        |
| Harnessing the potential of renewable energy infrastructure                   | 17        |
| Reforms through appropriate channels  | 18        |
| Robust Integration of energy planning in power sector                         | 18        |
| <b>References</b>   | <b>19</b> |
| <b>List Of Figures</b>  |           |
| Figure 1: Unit rate of Electricity Prices in Pakistan (PKR/kWh)               | 9         |
| Figure 2: Heatmap of consumer price index in Pakistan                         | 10        |

## 1. Introduction

### Background

The ongoing geopolitical conflict has had immediate consequences on energy supply chain disruption across the world. Though this conflict imperiled the economic recovery from the COVID-19 pandemic, inflation, energy, food security as well as further supply chain pressures are still among the key challenges. At the same time, the political urgency to diversify and reduce dependency on imports from the conflicting region has the potential to seriously impact and even derail plans for the transition to clean energy.

For developing countries such as Pakistan, the average GDP growth in 2022 has slowed by 0.5% while its share, which is being spent on energy-end uses, has increased from around 9% in 2020 to over 16% in 2022 (Organization for Economic Cooperation and Development [OECD] 2022). This economic impact has further trickled down where an average household is spending around 20% more income on energy products as compared to the previous year. This is mainly being driven by increased fuel cost due to which electricity prices in Pakistan have increased from PKR 14.5/kWh in 2019 to almost PKR 25/kWh in 2022 (depicting a percentage increase of almost 72.5%) (Rehman 2023). This depicts a percentage increase of almost 72.5%. Resultantly, Pakistan experienced a rising inflation up to 27.2% (year on year basis) in August 2022 that remained as high as 24% till September 2022 (Trading Economics 2023). Energy and food prices contribute 35-45% to this overall inflation (Noor 2023).

The impact of rising global energy prices has been reflected on the external side of the economy as Pakistan's trade deficit is widening. As a result, the government is striving to reduce imports and relying on domestic energy supplies. Although the current account deficit shrank by more than 50% during the first five months of FY-2023 with value recorded at \$0.28 billion in November 2022 (Pakistan's current account deficit 2022), this has also seriously impacted the energy access and transition towards clean energy targets prescribed under UN SDGs. The large population of Pakistan that previously had access to electricity is no longer able to afford it. Thus, this economic crisis coupled with project development delays resulting from COVID-19 and climate-induced disasters has posed an enigma to the energy sector with no "win it all" solution.

Coupled with socio-economic developments hindered by COVID-19 pandemic, the current conflict has also derailed the countries from their 2030 targets of Sustainable Development Goals (SDGs). As of 2022, almost 670 million people globally were expected to be without access of electricity by 2030, which is 10 million more than anticipated before the outbreak of pandemic (World Health Organization [WHO] 2023). The gap was further widened after the 2022 conflict, as 20 countries with least access to electricity hold 76% of the population. Almost 90 million people in Asia and Africa, who had electricity access, are no longer able to afford it (World Bank 2022). The increased focus towards coal-based power plants in Pakistan also highlights a major threat that further investments in new fossil fuel infrastructure might lock-in uneconomic practices, perpetuate existing risks and increase the threat of climate change, thus eventually derailing the country from achieving its climate-related goals.

### Scope and Methodology

In the backdrop of the energy crisis of Pakistan mentioned in the previous section, this policy brief identifies the major challenges to Pakistan's energy sector, their impact on Sustainable Development Goals, particularly SDG-7, and what key actions are required to mitigate the impact on both supply and demand end. Key research questions addressed in this policy brief include:

- How is the current increase in energy prices impacting Pakistan's energy access and affordability?
- What are the best policy and technological solutions that can be adopted by Pakistan to address its current energy crisis?
- What are the low hanging fruits, which Pakistan must address to achieve the targets prescribed under SDG-7?

To meet these objectives, this policy brief uses an analytical framework approach that is based on i) Secondary data analysis based on desk/literature review and a policy dialogue on "Tackling the policy challenges for Pakistan's energy security in the backdrop of increasing fuel prices". Through this mix method approach, we have also incorporated the recommendations of key stakeholders, including public and private sectors, civil society, academia, and international experts.

### Need for energy security in uncertain time

The conflict in Ukraine has exacerbated the already existing strains in global energy markets. Fuel importing countries are faced with a strict challenge of diversifying

their supply chains in a market with soaring energy costs, thus eventually pushing millions towards energy insecurity. In Pakistan, a substantial share of the industrial sector has either scaled back their production or suspended operations due to high production cost and unfavorable market conditions. Furthermore, both residential and industrial sectors are facing power and gas shortages despite a record increase in their costs. Unless immediate solutions are implemented to substitute the cut-off supplies, industrial growth would decline, jobs would reduce, unemployment would increase, and people would keep on struggling to meet their energy demands.

## 2. Changing dynamics of Pakistan's energy sector

### Increasing Energy Prices and Consumer Price Index (CPI)

In 2022, Pakistan has observed historic increases in oil, gas, and electricity prices. From December 2021 (Gulrez 2021) to December 2022 (Rehman 2022), the petrol and diesel prices in the country have increased from PKR 145.8 and PKR 142.6 to PKR 214.8 and PKR 228 respectively, depicting an average percentage increase of 47%. Similarly, the prices of gas have also experienced a similar trend. Between January 2022 to early 2023, Oil and Gas Regulatory Authority (OGRA) approved a 74.4% hike in natural gas prices (Jamal 2023). Earlier, at the end of 2022, OGRA had already approved almost 45% increase in gas prices (Bhutta 2022). Electricity prices have also witnessed a rapid increase, with latest approval given by National Electric Power Regulatory Authority (NEPRA) to increase electricity rates by PKR 3.3 for K-Electric consumers (Kiani 2023). However, depending on the units consumed, the unit cost in Pakistan can substantially vary as shown in Figure 1 based on January 2023 rates.

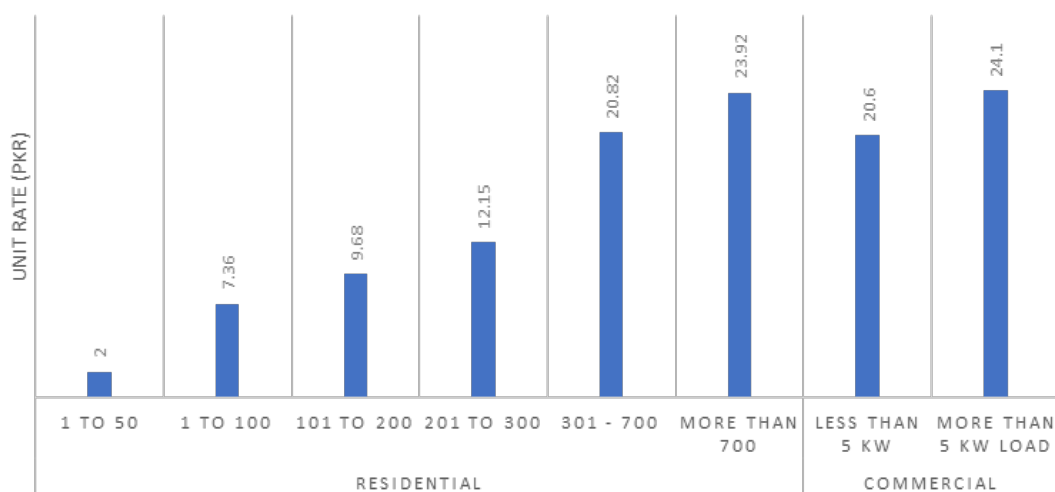


Figure 1: Unit rate of Electricity Prices in Pakistan (PKR/kWh)

The volatility of energy market highlighted above had a multi-dimensional impact, resulting from gas shortage, power outages due to payment issues, inflation, industrial slowdown, and the fiscal budget for subsidies. Pakistan's annual inflation in December 2022 was 24.5%. Starting in June 2022, Pakistan's CPI has remained above 20% in all months, reaching the highest value of 27.26 in August. In December 2022, the CPI was 24.5% (Trading Economics 2023). Figure 2 describes the heatmap of CPI for different components, including housing, water, electricity, gas, and other fuels that cumulatively constitute a weightage of 23.6% (State Bank of Pakistan 2022).

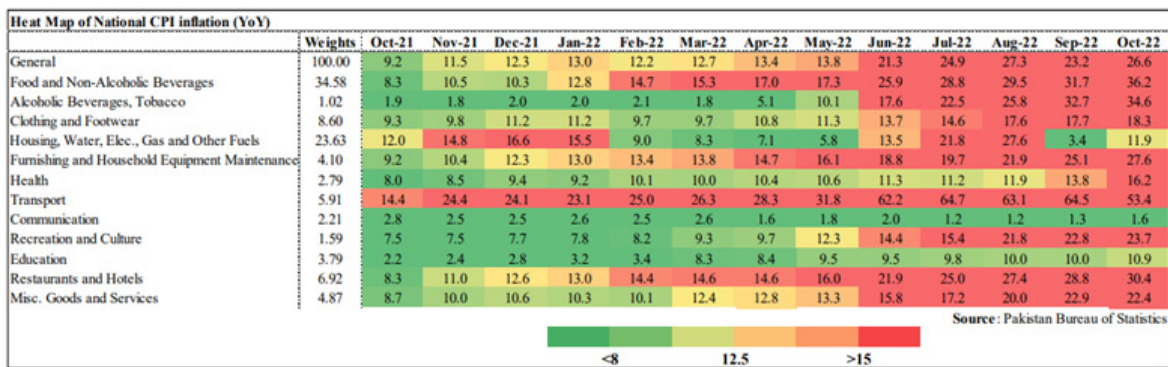


Figure 2: Heatmap of consumer price index in Pakistan

## Dilemma of Petroleum Subsidies

The market prices of petroleum products in Pakistan have mostly been controlled by the government through subsidies that reduce the burden on consumer ends. However, in mid-2022, Pakistan had to remove the subsidies on petroleum products as a condition imposed by International Monetary Fund (IMF) to secure its \$6 billion programme so as to avoid the sovereign default on international payments. Resultantly, the petrol and diesel prices had to be increased by 66% and 92% respectively in a span of just one month (IMF to release \$900m 2022). In following months, the demands for both gasoline and diesel dropped by 12% and 16% respectively (Siddiqui 2022).

## Impact on Manufacturing and Service Sector

The economic crisis and the increasing energy cost has also severely impacted Pakistan's manufacturing sector. For the industrial sector, this has led to a decrease in exports and productivity. Since industries are closing, offices are being shut down, factory productions have stopped, many corporates have to lay down their employees. The apparent example for this in case of Pakistan was the unemployment rate, which increased from 4.4% in 2020 to 6.5% in 2021. Further in 2022, driven by substantial loss from the flooding, almost 2.6-3.6 million people lost their livelihoods (International

Labor Organization 2022). This includes a large informal workforce (Small and Medium Enterprises, agriculture employments) and other vulnerable segments such as women and youth.

The year 2022 in Pakistan ended with a partial shutdown of textile, the country's biggest export industry with a percentage share of 46%, including the Kohinoor spinning mill, Suraj cotton mills, and others (Aslam 2023). This has also rendered almost 2.5 million people jobless. Furthermore, the textile industry, in the first quarter of 2023, notified that the sector is currently operating at 50-55% below their optimum capacity, resulting in a loss of around \$1.42 billion (year on year basis) (Alam 2023). Most textile owners registered that their cost of production has increased by 100% due to high power tariffs (an increase from PKR 18 to PKR 36/unit) and the increase in cost of petroleum products. Owing to increasing trade deficits, the sector also experienced curbs on opening letters of credit (LCs) for raw material imports.

The sales in cement sector also fell significantly between July-December 2022. As per the reports of All Pakistan Cement Manufacturing Association (APCMA), the total dispatch recorded by the cement industry in this period was 20.7% less than the sales in previous year (Cement crumbles 2023). Similarly, for rest of the sectors, 2022 was a bumpy year dominated by lowest sales over a decade. The reports of Pakistan Association of Auto Parts and Accessories Manufacturers (PAAPAM) highlighted that the sales of tractors have also decreased by almost 67% in 2022 (Ahmad 2022).

### Energy project development and Investment delays

Project development in the energy sector has been hampered by both restrictions in the flow of investments and the construction delays due to multiple reasons. Lockdowns imposed in COVID-19 has restricted the movement of Chinese labour as well as trained personnel for project development activities happening in Pakistan. The investment delays and shifts under Belt and Road Initiative (BRI) of China is the apparent example of these disruptions. In its (Chinese) efforts to manage the financial risks, 80% of Chinese overseas investments in 2022 (first half) have gone into oil and gas sector. In the same period, Chinese outlays in Pakistan have dropped by 56% (Standish 2022) whereas for Russia (one of the key beneficiaries under BRI), they have dropped to almost "Zero". A report (Green Finance and Development Centre (GFDC), 2022), shows that there might be some "revaluations of political risks" from Chinese end, given the political changes in Pakistan.

## Disruptions in Energy Supply Chain

Along with other Asian countries, the supply of renewable energy technologies in Pakistan is based mainly on China that dominates the solar PV as well as wind energy market. As of 2022, China is a home to top 10 solar PV suppliers and seven out of 10 wind manufacturers are Chinese companies. With the COVID-19 induced lockdown in China that caused supply chain disruptions, mining and development delays, the demand and supplies are mismatching, consequently leading to increase in cost and shortage of demand. Under these conditions, there is a need for re-evaluation of sustainability and reliability of RE technology trade of Pakistan. Extending RE supply chain network could make a better economic case as local electricity mix for most countries is less carbon intensive than China. This diversification would however require bringing cost competitiveness through financial incentives and manufacturing support.

## Inefficiency and Lack of Demand Side Management Techniques

Energy efficiency and demand side management has been broadly missing from Pakistan's energy planning landscape, while the key focus remained on supply side interventions. This has led to wasteful use of energy in all key demand sectors (residential, industrial, commercial, and transport) leading to following issues:

- **Increased air conditioning and refrigeration load during summers:** In 2022, the disparity between summer and winter load in Pakistan exceeded 15,000 MW (around 30,000 MW in peak summer and 12,000 MW in winter). The larger chunk of capacity is, therefore, kept idle during the larger portion of the year causing further increase in the power tariffs (capacity payments).
- **Inefficient construction techniques:** Despite efficient construction materials such as hollow blocks and material readily available, the reliance of construction industry is still on conventional construction techniques that either do not comply with Pakistan's Energy Conservation Building Codes (2013) or else these codes are not effectively monitored. Furthermore, residential as well as commercial sectors have limited capacity and understanding of applying passive and active energy conservation techniques that could potentially lead to significant energy savings.
- **Nonconventional biomass use:** Almost 33.3% of Pakistan's energy supplies are coming from traditional use of biomass resources in rural areas. This inefficient use not only contributes to environmental emissions (open burning) but is also a major health hazard for the rural population.
- **Energy infrastructure damage:** Climate induced disasters such as recent floods of 2022 has had a significant impact on both large and especially small-scale

power plants. According to Pakhtunkhwa Energy Development Organization (PEDO), around 105 mini hydropower plants were destroyed by the floods, with an estimated cost of PKR 480 million. Furthermore, numerous gas pipelines in Balochistan were damaged, cutting off supply to the UCH Power Station, which supplies 932 MW of electricity to the country.

### 3. Frontiers of Energy Transition: Recommendations and the Way Forward

Global efforts to mitigate and adapt to climate vulnerabilities and supply affordable and reliable energy across the population has undergone a gradual progress over the past years. Developing countries such as Pakistan are still vulnerable to climate induced disasters despite contributing less than 1% share in global GHG emissions. On the other hand, these climate vulnerabilities have adverse socio-economic losses that have limited their fiscal space to adapt to socio-economic challenges such as the one posed on energy supply chain by the recent geopolitical conflict. In the backdrop of this geopolitical turmoil and key challenges highlighted in the previous sections, the energy transition of Pakistan has entered into an uncertain phase, which would require strong policy and regulatory support to double down on a low-carbon pathway. Under the three main pillars of energy transition that are i) economic growth, ii) environmental sustainability, and iii) energy security and affordability, there are multiple unknowns, requiring immediate actions as well as a long-term strategy to build resilience against upcoming external shocks.

Firstly, Pakistan has been using a “short-sighted” and a “Just in time approach” to address its energy security concerns since the past few years. A common example is the nature of long-term contracts GoP did with Independent Power Producers (IPPs). While it did provide some short-term relief for energy supplies, it has led to an economic trap in the form of increasing circular debt (PKR 2.4 trillion in 2022), high-capacity payments, and a limited power evacuation capacity; all that is highly dependent on high cost imported fossil fuels. The challenges of using this approach are further apparent in this uncertain time since the current security concerns are prompting the country to shift back to coal-based power (a step being considered by other countries as well). To address this challenge, the way forward lies in shifting to more of a “Just in case” approach with a sufficient reserve capacity based on indigenous resources, storage infrastructure and policy/regulatory support to incentivize the investments required to develop technological solutions. Hence, not putting “all eggs in a single basket” by diversifying energy mix, using energy efficiency and conservation measures, improving supply chains, the security issues can be addressed.

Secondly, the energy transition overview provided above requires a transition cost. As identified under Pakistan's Nationally Determined Contributions (NDCs), a clean energy transition would require \$101 billion by 2030 and an additional \$65 billion by 2040. Bridging this gap requires mobilizing both public and private finance, and de-risking the investments that are flowing in the energy sector. Globally, this has been addressed through low benchmark interest rates and monetary policy support. However, in the backdrop of high inflation, increasing interest rates, high supply chain cost, and rising commodity prices; the competitiveness of RE projects against fossil fuels has been impacted. Hence to maintain the cost competitiveness of new renewable energy-based systems, it is critical to de-risk the investments, providing regulatory and policy support, improve credit worthiness for the RE developers and establish clean demand signals.

Thirdly, the imbalance of energy deficit impact must be addressed by developing long-term solutions that may ensure affordability of energy for the vulnerable segments of the community. Lastly, the measures taken for demand side management at the consumer end are extremely important for the broader energy transition goals. Best practices across the world have demonstrated that social behaviour and awareness to conserve energy is possible in the short run. While Pakistan has started making progress in these areas with energy conservation plan that was introduced by government at the start of 2023, the conservation measures still need close monitoring and effective implementation. Broadly, Pakistan needs a balanced energy transition approach. While the energy sector is currently not immune to any similar shocks, navigating it amid the uncertain time is essential.

Pakistan's energy crisis may be multifaceted but so are the solutions. The key to treading onto a path of recovery and progress lies mainly in tackling the issue from both ends, i.e. taking initiatives to address demand and supply side concerns while also addressing the governance issues of other cross cutting themes.

## Demand-side Measures

### Robust implementation and upgradation of efficiency in homes and buildings

- **Recommendation 1:** There is a need to develop Minimum Energy Performance Standards (MEPS) for household appliances that are consumed regularly such as motors, lights, fans, air conditioners, refrigerators, water, space heaters, etc. should be included in the mandatory list. On top of that, the Mandatory Labeling Regime

should be enforced. For implementation, they should be properly regulated and fast-tracked in Pakistan to avoid wastage and lessen the burden on the national grid.

- **Recommendation 2:** Energy consuming appliances should be labelled based on their energy performance to encourage users to choose more efficient options. To this end, standards in labelling regimes should also be developed to avoid malpractices such as greenwashing.
- **Recommendation 3:** Energy Conservation Building Codes (ECBC) need to be updated to improve the energy performance of buildings as they are currently one of the top consumers of energy in Pakistan. The government and regulators should encourage the use of more sustainable construction materials (e.g. eco-friendly construction blocks and cement, insulation, double-glazed windows, etc.) while ensuring that building designs incorporate passive techniques where possible.
- **Recommendation 4:** The use of pre-paid meters should be tested to improve consumption efficiency. The government, in collaboration with DISCOs, should launch pilot projects to assess their feasibility for different applications, such as industrial, residential, and commercial use. This will also help boost understanding of the concept within the country and determine the most effective method to encourage its use on a large-scale.
- **Recommendation 5:** To reduce environmental hazards and heating consumption in rural households, clean appliances such as High Efficiency Low Emission (HELE) heaters can be promoted for the households through awareness campaigns and financial schemes (subsidies or banking schemes) that can reduce their comparatively higher capital cost.

### Energy Efficiency and Conservation Measures

- **Recommendation 1:** Behavioural change is a primary component of the process. The timings of commercial activities need to be altered to fit better with energy peaking hours with penalties imposed in case of non-compliance. Similarly, the variation in tariff with time of day and season should follow a similar pattern. The approach of 'nudging product design' may also be used to encourage behavioural change; for example, electricity and natural gas bills can be incorporated with messages on the importance of saving energy and the various methods that may be used to do so.
- **Recommendation 2:** Industrial facilities, with outdated equipment, should be upgraded to increase production efficiency and avoid unnecessary energy losses. Furthermore, regular energy audits should be made mandatory, and the government should devise a mechanism that trains personnel concerned and ensures transparent implementation and reporting.

- **Recommendation 3:** There is a need to develop internal benchmarks for different Industrial subsectors in the country to analyze where that sector currently stands. These classified and identified subsectors may form special technical cells within their associations that could work jointly with academia and other R&D organizations to develop technical solutions.
- **Recommendation 4:** Under the legal framework of NEECA's Act 2016, obligate industries to save energy, conduct energy audits, adopt Energy Management System (EnMS) and report on their energy performance.
- **Recommendation 5:** The grant process for energy-efficient appliances need to be improved, even though we know that spending on efficiency reduces pressure on consumers and reduces energy imports. Until their import duty rate is reduced and prices fall, we will not be able to accelerate the installation of energy-efficient appliances in Pakistan.
- **Recommendation 6:** To reduce peak load from the system, demand response schemes such as shifting from peak-hour consumption to off-peak power and issuing calls to reduce load from large consumers can be promoted.
- **Recommendation 7:** Designs of buildings, which can improve energy efficiency of the building envelopes through the integration of technologies (such as Artificial Intelligence and Internet of Things) should be added for the commercial and industrial setting consumers.

### Social Protection Schemes for households & other demand sectors

- **Recommendation 1:** Existing social protection schemes such as running under Benazir Income Support Programme can be expedited through targeted subsidies to replace inefficient appliances with advanced technologies that can conserve energy.
- **Recommendation 2:** Social safety nets and protection schemes in Pakistan must be further expanded to “non-standard beneficiaries”, which cannot afford energy at high prices. For managing the increased financing needs, “burden arrangement” programmes can be used such as consumption smoothing assistance.
- **Recommendation 3:** To manage the sudden increase in electricity and gas prices, the regulatory authorities (NEPRA and OGRA) can device mechanisms through which the additional costs are spread over a longer period of one or more years, especially in high-demand months.
- **Recommendation 4:** Both formal and informal industrial sectors must keep employment at the centre of economic recovery plan. To ensure smooth functioning, the policy and fiscal support provided to these industries must remain consistent.

## Addressing the Energy-Food Nexus

- **Recommendation 1:** Pakistan's economic recovery plan must support the local stakeholders in agri-food chain to access long-term financing for RE based solutions such as solar tube wells, pumps, and drying mechanisms.
- **Recommendation 2:** The sustainability and energy-food nexus can be addressed by conducting research and development around "seed technologies"; through which agriculture yield can be increased leading to efficient food production.
- **Recommendation 3:** For building capacity and awareness around RE-based agro-food sector, international development finance must be mobilized to bridge the funding gap and technology transfer. For private and local finance, first loss and partial credit schemes may be used to raise awareness and create experience within the sector.
- **Recommendation 4:** Energy and agriculture policies should be synchronized to develop synergies and reduce conflicts, especially between land and water. A holistic approach should be developed that integrates energy, climate, land, and water to address competing uses and co-locate the use of energy with other land uses to increase productivity.
- **Recommendation 5:** Energy and climate policies that can accelerate the adoption of energy transition technologies (incl. RE) must ensure its cross-sectoral impacts on other sectors such as water, land, and economy.

## Supply-side Measures

On the supply side, the most obvious solution to Pakistan's energy crisis, especially in light of the impacts of the current conflict in Ukraine, is to switch from fossil fuels to renewable energy systems sooner rather than later. To facilitate this, the following actions may be taken:

### Harnessing the potential of renewable energy infrastructure

- **Recommendation 1:** The installation of distributed renewable energy systems should be encouraged through community-based programs. The Government should complement this with the provision of incentives and restructuring of tariff schemes to facilitate consumers and reduce grid consumption.
- **Recommendation 2:** The limitations associated with the country's grid and transmission network should be dealt with at the earliest. Grid efficiency needs to be increased while transmission losses need to be minimized; at the same time, the area covered by the grid needs to be increased in order to achieve the energy access goals laid out in SDG-7. To accomplish this task, the involvement of private sector

should be increased; relevant public sector organizations could outsource a few 'model' projects to the private sector to assess the role it can play in bringing forth timely and cost-effective solutions to the issue.

- **Recommendation 3:** The government should create avenues to facilitate the local manufacture of renewable energy equipment as without doing so, providing consumers with a cheaper alternative to fossil fuels would be practically impossible. This action, combined with the use of indigenous fuel sources, is crucial to the reduction of power tariffs and thus increasing energy affordability and access.
- **Recommendation 4:** To provide an enabling environment to the private sector, the government entities must develop a "Principle of Subsidiarity" where it should dictate what can be done efficiently at the consumer scale. Similar barriers and challenges must be addressed for the international and local investors by providing the ease of business.

### Reforms through appropriate channels

- **Recommendation 1:** The academic sector, in collaboration with the research and development organizations concerned, should explore the availability and effective use of biofuels, e.g, biomass, bioethanol, waste-to-energy solutions, etc. These resources hold tremendous potential for distributed generation, especially in rural areas and regions that are hard to access through the national grid.
- **Recommendation 2:** A National Energy Security Council (NESC) should be formed with the mandate to take action to ensure the country's energy security. The council should work on the development of contingency plans for the energy sector that can help avert risk in due time, in case the fuel supply chain is disrupted in a manner similar to the impact of the current conflict in Ukraine. Similarly, it should also handle the appointment of all relevant boards (a role that is currently played by ministries) to ensure a more stable governance model; one that is independent of the country's continually changing political scenario.
- **Recommendation 3:** Non-Governmental Organizations and public sector working on energy access should work together with community-based organizations to develop financial models that incentivize the land affected people through lower bills, tax exemptions, and other social benefits.

### Robust Integration of energy planning in power sector

- **Recommendation 1:** A bottom-up approach is required to cater to the integrated planning of the power and energy sector; this should be undertaken with the goal of creating individual plans for the generation and transmission system, as well as the fuel and system supply chains.

- **Recommendation 2:** The national power generation and distribution plans should be synchronized well with provincial plans to achieve a synergistic effect and ensure energy equity across the country. This will also help control the overall environmental impact of the power sector and decrease reliance on imported fuels.
- **Recommendation 3:** Affordability is the biggest barrier to electricity consumption in Pakistan, as was seen more clearly upon the removal of subsidies on petroleum and associated products in 2022. Investing more in e-mobility and renewables will also help with peak shaving and bringing down the cost of electricity to ultimately increase access. As a result, the government could focus on shifting subsidies from fossil fuels towards clean energy sources, where necessary, as it will provide consumers with an economic incentive to opt for clean energy sources as well.

## References

- Ahmad, D 2022, Bumpy year ahead as tractor industry braces for lowest sales in 15 years, viewed 18 February 2023, <https://profit.pakistantoday.com.pk/2022/12/06/bumpy-year-ahead-as-tractor-industry-braces-for-lowest-sales-in-15-years/>
- Alam, K 2023, "Production cuts continue in industrial sector", viewed 20 February 2023, <https://www.dawn.com/news/1729824>
- Aslam, B 2023, "Decline of Textile Industry", viewed 10 February 2023, <https://dailytimes.com.pk/1049865/decline-of-textile-industry/>
- Bhutta, Z 2022, "Over 300% raise in gas tariff proposed" viewed 20 January 2023, <https://tribune.com.pk/story/2376774/over-300-raise-in-gas-tariff-proposed>
- Cement crumbles against economy 2023, The Express Tribune, viewed 20 February 2023, <https://tribune.com.pk/story/2394290/cement-crumbles-against-economy>
- Green Finance and Development Centre 2022, China Belt and Road Initiative (BRI) Investment Report H1, viewed 15 January, 2023, <https://greenfdc.org/china-belt-and-road-initiative-bri-investment-report-h1-2022/>
- Gulrez, A 2021, "Petrol Prices in Pakistan December 2021", viewed 20 January 20, 2023, <https://www.incpak.com/national/petrol-prices-in-pakistan-december-2021/>
- IMF to release \$900m when govt removes fuel price caps 2022, Business Recorder, viewed 05 February 2023, <https://www.brecorder.com/news/40175996/imf-to-release-900m-when-govt-removes-fuel-price-caps>
- International Labor Organization 2022, "3.6 million jobs may have been affected by the floods in Pakistan", ILO, viewed 20 January 2023, [https://www.ilo.org/islamabad/info/public/pr/WCMS\\_857171/lang--en/index.htm](https://www.ilo.org/islamabad/info/public/pr/WCMS_857171/lang--en/index.htm)
- Jamal, S 2023, "Natural gas prices set to increase in Pakistan", viewed 01 February 2023, <https://gulfnnews.com/world/asia/pakistan/natural-gas-prices-set-to-increase-in-pakistan-1.93155865>
- Kiani, K 2023, "Neptra okays up to Rs4.46 per unit hike in tariff for Karachi", viewed 20 February 2023, viewed <https://www.dawn.com/news/1731560#:~:text=The%20decision%20was%20taken%20unanimously,October%2C%20November%20and%20December%202022>
- Noor, SA 2022, "Pakistan inflation in perspective", viewed January 20, 2023, <https://bit.ly/3IGoh9B>
- Organization for Economic Cooperation and Development 2022, "War in Ukraine: The Policy Challenges", OECD, viewed 15 January 2023, <https://www.oecd.org/ukraine-hub/en/>
- Pakistan's current account deficit shrinks to \$0.28bn in November: SBP 2022,

Business Recorder, December 16, viewed January 20, 2023, <https://www.brecorder.com/news/40214919>

- Rahman, S 2022, "Latest petrol price in Pakistan", viewed 20 January 2023, <https://bit.ly/3ZPvThh>
- Rehman, JU 2022, "Demystifying Pakistan's high electricity prices", Pakistan Today, September 4, 2022, viewed 15 January 2023; t: <https://profit.pakistantoday.com.pk/2022/09/04/demystifying-pakistans-high-electricity-prices/>
- Siddiqui, S 2022, "Petrol, diesel sales fall after end of subsidy", viewed 20 September 2022, <https://tribune.com.pk/story/2364262/petrol-diesel-sales-fall-after-end-of-subsidy>
- Standish, R 2022, "Why Is Chinese Investment Drying Up in Russia and Pakistan?", viewed 20 January 2023, <https://www.rferl.org/a/china-investment-russia-pakistan-standish/31967420.html>
- State Bank of Pakistan 2022, "Inflation Monitor October 2022", viewed 02 January 2023, [https://www.sbp.org.pk/publications/Inflation\\_Monitor/2022/Oct/IM\\_Oct\\_2022.pdf](https://www.sbp.org.pk/publications/Inflation_Monitor/2022/Oct/IM_Oct_2022.pdf)
- Trading Economics 2023, "Pakistan Inflation Rate", viewed 20 January 2023, <https://tradingeconomics.com/pakistan/inflation-cpi>
- Trading Economics 2023, "Pakistan Inflation Rate", viewed 20 January 2023, <https://tradingeconomics.com/pakistan/inflation-cpi>
- World Bank Group 2022, "Tracking SDG 7 - The Energy Progress Report 2022", viewed December 01, 2022, <https://www.worldbank.org/en/topic/energy/publication/tracking-sdg-7-the-energy-progress-report-2022>
- World Health Organization 2022, "Tracking SDG7: The energy progress report 2022", WHO, viewed 10 February 2023, <https://bit.ly/3EQxgUy>