

Quarterly Energy Monitor

PAKISTAN'S UPDATED NATIONALLY DETERMINED CONTRIBUTIONS:

**ENHANCING ROADMAP FOR
POWER AND TRANSPORT SECTOR
DECARBONIZATION**

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Introduction

Over the last four decades, climate change concept has received recognition as a global concern. The debate has now transformed from whether climate change is real to the discussion on urgent actions needed to counter its severe impacts, which have already begun to manifest. Climate change is impacting all countries around the globe, some more than the others, but to an extent that it has now become central to planning of any economy's sustainable growth.

In this regard, the Paris Agreement set forth the target of limiting the increase in the average global temperature to well below 2.0°C, preferably to 1.5°C, compared to pre-industrial levels, as per the recommendation of the Intergovernmental Panel on Climate Change (IPCC).¹ It requires all parties to undertake comparable actions for reducing greenhouse gas emissions as soon as possible and outlining mechanisms for responding to climate change. The so-called Intended Nationally Determined Contributions (INDCs) provide for a mechanism of assessing progress and increasing global ambition over time by a regular "global stock take".

The Paris Agreement acknowledges the different development status of countries and bases the agreement on the principle of Common but Differentiated Responsibilities and Respective Capacities (CBDRRC principle). Thus, this principle provides flexibility to the ratifying countries, especially the striving developing and less developed countries which have least contributed towards the environmental deterioration, to pursue their national development priorities, and developed countries to take the lead on climate change.

Pakistan submitted its first NDC in 2016 under the United Nations Framework Convention on Climate Change (UNFCCC) process and committed to a 20% reduction to projected Green House Gases (GHGs) emissions by 2030 under the business as usual scenario, contingent upon international funding.¹ Recently Pakistan submitted the updated version (updated NDCs), as the Paris Agreement stipulated review of the INDCs every five years. The updated NDCs offer to reduce emissions by 50 per cent by year 2030 from the current level. Following the Paris Agreement, the challenge for many countries will be to translate their mitigation ambition into effective domestic action. Based on this renewed ambition, implementation of these goals would require national and international cooperative endeavors, serious planning and actions, as well as enabling environment to meet the committed targets.

This issue of the quarterly energy monitor analyses the updated NDCs and discusses the policy landscape and existing state of play with regard to the renewed mitigation targets to counter climate change — with a focus on power sector transition and Electric Vehicles (EV) based commitments. Furthermore, the issue reflects on 'how to scientifically and reasonably achieve the outlined goals by providing an in-depth analysis of specific approaches and possible ways and means towards facilitation of the outlined targets. For carrying out the analysis, we have reviewed different policies and frameworks on climate change, power sector and transportation sector, collected from official government websites: National Electric Power Regulatory Authority (NEPRA), Alternate Energy and Development Board, Ministry of Climate Change (MoCC), National Assembly of Pakistan. We also reviewed research studies carried out by World Bank and Asian Development Bank (ADB) on the impacts of climate change in Pakistan, climate change risk profile, climate expenditure and institutional review. Further information on this subject has been gathered from news articles and reports.

¹ Pak-NDC estimates that it would cost USD 40 billion at current prices to achieve their mitigation goal, and that adaptation efforts would cost an estimated USD 7 to 14 billion per year.

Updated NDCs 2021: A Quick Snapshot

As discussed earlier, Pakistan recently submitted revised NDCs to the UNFCCC on October 21, 2021 in the run-up to the UN Climate Change Conference (COP26). The updated NDCs commit to cut 50% of its GHG Emissions by 2030. Out of the 50% proposed target of an overall reduction of projected GHG emissions by 2030 – 35% is conditional on international grant finance – whereas 15% will be from the country’s own resources. A ratchet effect could be observed in the draft when compared to the earlier draft, wherein the 2016 NDC indicated only 20% of reduction in the projected GHG emissions reductions by 2030 subject to the availability of international grants. So, unlike many countries – at least 53 – who either did not significantly enhance the ambition of their NDC or resubmitted the same draft, the revised NDCs have been an encouraging move by Pakistan.

Actions to Reduce Emissions

The pathway outlined to achieve the stated target encompasses several sectors. The following targets have been outlined in the NDC draft:

- 60% of all energy produced in the country will be generated from renewable energy (RE) resources.
- 30% of all new vehicles sold in various categories will be EVs.
- To shelve plans for imported coal-fired power plants. As per the commitments, the two new coal-fired power plants will be shelved in favor of hydroelectric power; and that a moratorium will remain in place on new coal power plants.
- Billion Trees Afforestation Project by 2040.

So as it can be seen, major ambition for mitigation has been set for power and transport sector. Fig.1 below gives a quick snapshot of the key targets as outlined in the updated NDCs.

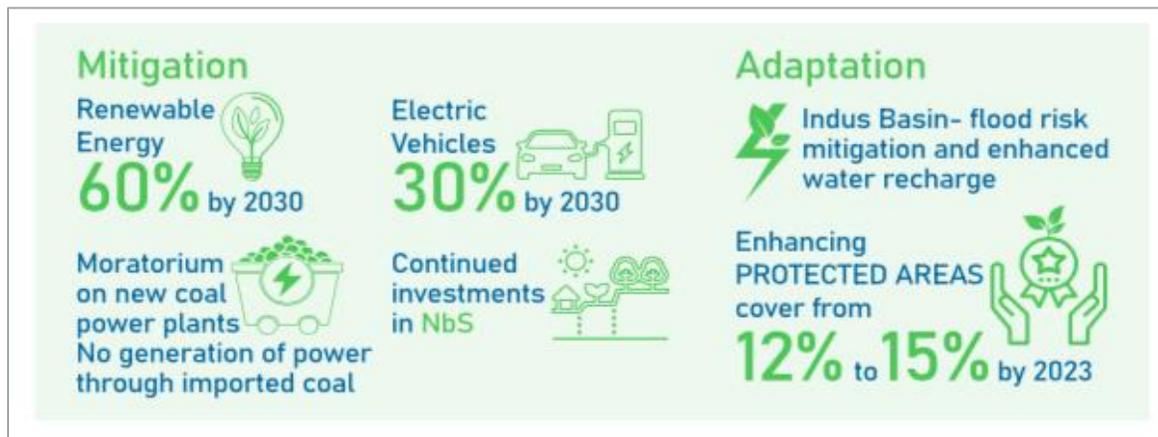


Figure 1: Pakistan's revised NDC targets

Source: Pakistan’s updated NDC 2021

Realistic & Detailed Pathway to Achieve Goals

The updated NDCs are also more specific both in specifying the targets and mode of achieving them, as well as defining the metrics to evaluate progress against the set targets. Particularly, in the climate change mitigation domain, a target of 60% energy generation from RE is set and 30% share of EVs in the transportation fleet is set to be achieved by 2030. Fig. 2 below further presents the key policy areas

identified in the updated NDCs with regards to mitigation, on which the work has begun already. The GHGs reduction target is set to be achieved following multi-pronged approach, with policies being devised for efficient use of energy, and electrification of energy needs at the consumption end along with diversification of the power generation pool with RE resources at the energy supply end.

Transition to demand side management	Electrifying off-grid communities by engaging private sector	Coal consumption for power generation to decrease by 2030	Tapping the abundant solar, wind and hydropower potential
<ul style="list-style-type: none"> National Electric Vehicle Policy for period 2020-2025 has been approved Minimum Efficiency Performance Standard is being developed for electric motors, conditioners and LED lights 	<ul style="list-style-type: none"> Result Based Finance pilot project in Punjab and Sindh was initiated to meet electricity needs of communities in remote areas through private sector investments 	<ul style="list-style-type: none"> The predicted high economic growth in the current decade is expected to increase coal consumption by 2025 and a decline will be seen after 2030 	<ul style="list-style-type: none"> The ARE Policy 2019 mandates 30% solar, bagasse and wind by 2030

Figure 2: Policy initiatives described in Pakistan's updated NDCs

Source: Pakistan's updated NDC 2021

NDC Targets and Interlinkages with Existing Policies

The past governments of Pakistan have played their part in setting the platform for climate change dialogue through participation in global conventions on the topic and formulating policies addressing climate change. Implementation of the policies has been a major challenge in reaching any noticeable success in the past. However, since the democratic journey of Pakistan has uninterruptedly continued, the national governments have been able to focus on issues such as climate change.

Although the earliest act on preserving environment namely Pakistan Environmental Protection Act (PEPA) was prepared in 1997, the year Kyoto Protocol² was passed, only after 2005 we got to see any major developments on conserving the environment. This could be because during the first decade of the 21st century, Pakistan was hard hit by natural disasters, with earthquakes in 2005 and severe floods in 2010, which claimed thousands of lives and disrupted millions of households. Besides these, the key turning points were the establishment of Ministry of Climate Change (MoCC) in 2012 and approval of 18th amendment³ in the Constitution of Pakistan, which mandated devolution of issues such as climate change to the provincial governments. Right after its establishment in 2012, the MoCC developed the first National Climate Change Policy of Pakistan (NCCP) in the same year. Through NCCP 2012, it made the requirement for establishment of local policies on climate change. However, the provincial governments have made some progress in this regard only recently and are in the process of forming sub-national policies on climate change. Currently, they are at different stages of policy development. Sindh government has prepared a draft of Sindh Climate Change Policy in 2021, Gilgit-Baltistan prepared climate change action and strategy plan in 2017, Punjab government formed an internal draft of climate change policy in 2017, the government

² The Kyoto Protocol is the first legally binding, global climate treaty, which required industrialized developed nations to reduce their GHG emissions and developing countries to adapt to the impacts of climate change.

³ The 18th Amendment to the Constitution of Pakistan was passed in 2010 and mandated the devolution of 47 federal subjects to the provincial level, including 'environmental pollution and ecology'.

of Khyber Pakhtunkhwa finalized the draft of its climate change policy in 2016 and Balochistan has also been recommended an implementation framework to tackle climate change by local stakeholders.

In addition, two important policies that will be foundational in bringing this clean and green transition include Alternative and Renewable Energy Policy 2019 (ARE Policy 2019) and National Electrical Vehicle Policy 2019 (NEVP 2019). ARE Policy aims at increasing the share of RE in the power generation mix to 25% by 2025 and 30% by 2030, whereas the NEVP 2019 aims at 30% electric vehicles share in the transportation fleet by 2030 and 90% by 2040. In the coming sections of this monitor, we will analyze these policies with reference to the submitted updated NDCs of Pakistan. Moreover, the National Electricity Policy 2021 and Draft National Electricity Plan 2022 also envision optimal utilization of indigenous resources along with affordable and environment friendly outcome for the consumers. Access to affordable, secure and sustainable energy are broad and overarching goals, attainment of which will crystallize the vision of the government for the power sector.

<p>NDC targets by 2030</p> <p>60% RE share in the power mix</p> <p>30% share of EVs</p> <p>Shelving imported coal power projects</p>	<p>Pakistan Climate Change Act 2017</p> <p>Targets:</p> <ul style="list-style-type: none"> • Meet Pakistan’s obligations under international climate change conventions • Address impacts of climate change through adequate plans, policies, programs and projects
<p>National Electric Vehicle Policy 2019</p> <p>Targets:</p> <ul style="list-style-type: none"> • 30% electric cars share by 2030 and 90% by 2040 • 50% electric two and three-wheeler vehicles share by 2030 and 90% by 2040 • 50% electric buses share by 2030 and 90% by 2040 • 30% electric trucks share by 2030 and 90% by 2040 	<p>NEECA Draft Strategic Plan 2019</p> <p>Targets:</p> <ul style="list-style-type: none"> • First phase: Institutionalize energy efficiency and conservation at provincial levels • Second phase: Development of Minimum Performance Efficiency Standards, labeling schemes, mandating energy audits of buildings and industries • Third phase: ensure implementation of the plan
<p>National Electricity Policy 2021</p> <p>Targets:</p> <ul style="list-style-type: none"> • Competitive and least cost generation capacity expansion • Indigenization of power generation fuels • Development of only run-of-river hydropower projects • Formation of provincial electricity policies 	<p>Alternative & RE Policy 2019</p> <p>Targets:</p> <ul style="list-style-type: none"> • On-grid non-hydro RE generation at least 20% by 2025, and at least 30% by 2030 • procurement of Alternative and RE projects through auctions • future withdrawal of exemptions on import duties of ARETs to promote localization of technology <p>Integrated Generation Capacity Expansion Plan 2021</p> <p>Targets:</p> <ul style="list-style-type: none"> • Minimal reliance on imported fuels • Increased share of hydropower • 16% share of variable RE in the generation mix <p>Updated National Climate Change Policy 2021</p> <p>Targets:</p> <ul style="list-style-type: none"> • Steer towards less carbon intensive development • Strengthen coordination of climate change at different tiers of the government • Promote public and private sector investment on climate change mitigation and adaptation

Table 1: Policies and Plans before and after the Paris Agreement ratification

Table 1 above shows the relevant policies and frameworks, along with the envisaged targets, that have been formed after the Paris Agreement was ratified by Pakistan. These policies have set targets that should enable achievement of commitments in the updated NDCs. A coordinated effort at national and sub-national levels is primary to fulfilling these targets. The Pakistan Climate Change Act 2017 (PCC Act 2017), vested with the responsibility of coordinating, supervising and guiding the mainstreaming of climate change concerns into decision making, officiates the need of better coordination. It further requires establishing an inclusive council comprising members from provincial governments, federal government and civil society organizations to meet, discuss and check progress on climate change goals, which will ensure equitable development on this front.

Furthermore, the ARE policy 2019 sets power sector specific goals for RE development, which sync with the envisioned 60% RE share in the power mix in the NDCs. The National Electricity Policy 2021, also targets for inclusion of cheap and competitive sources of energy generation in the power mix — the criteria that variable RE fulfills meritoriously. The objective of increased RE contribution is further augmented by updated NCCP 2021, which aims for less carbon intensive, climate resilient economic development and engaging both public and private sectors in the process. The National Electric Vehicle Policy 2019 sets transport sector specific targets that also align well with the NDC targets.

The updated NCCP 2021 also reiterates the need for better coordination between tiers of the government on climate change action, which will be an important aspect in materializing implementation of policy goals, in line with the PCC Act 2017. Given that various public and private sector organizations are engaged in the climate change action, a coordinated effort is also imperative in achieving synergies and avoid duplication of efforts. Figure 3 displays the national level organizations that are directly engaged on climate change action in Pakistan.

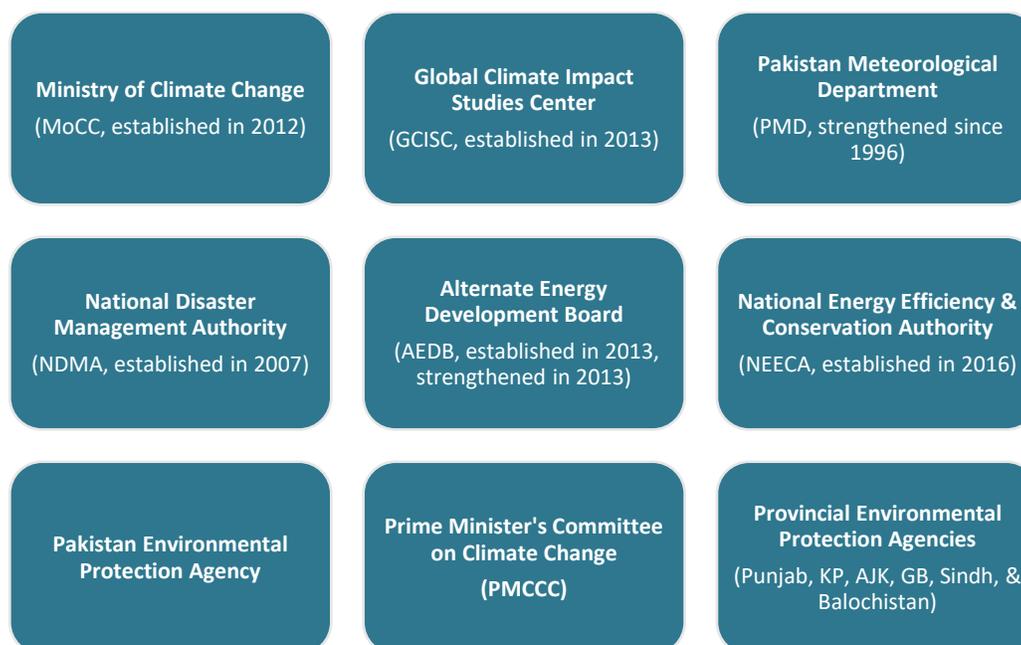


Figure 3: Existing climate related institutes in Pakistan

Source: NEPRA, AEDB, NEECA, MoCC

Mitigation Ambition and the Need for Policy Alignments

The existing policy landscape, with relevant policies either already developed or being developed and relevant institutions already in place, presents a lucrative opportunity for achieving the decarbonization targets in the country. Although the country leadership is primarily prioritizing the adaptation action for climate change adverse impacts, which is evident from various policy documents and allocation of majority climate change budget to adaptation initiatives such as Ten Billion Trees Tsunami Program, the mitigation action is gaining momentum from the favoring market dynamics. The economically and environmentally feasible RE-based generation resources are competing with historically cheap coal and fossil fuels-based generation resources on a global scale. The three significant mitigation areas outlined in the NDCs to reduce GHG emissions are as following:

1. Increasing the RE share in the energy mix
2. Decreasing the reliance on coal-based power generation
3. Electrifying the transport sector

Aligning NDCs with Power Sector Decarbonization Targets

In the updated NDCs, as a climate change mitigation strategy, Pakistan has committed itself to an ambitious target of 60% RE share in the power generation mix by 2030.⁴ ARE policy 2019 provides a roadmap for realizing the untapped potential of RE in Pakistan, by promoting the alternative and renewable energy technologies (ARETs) defined as RE resources other than hydropower, which includes biogas, biomass, wind, solar, energy from waste, fuel cells, battery storage etc. Under this policy, non-hydro RE sources will take 20% share in the power mix by 2025 and 30% share by 2030. However, the recently approved Indicative Generation Capacity Expansion Plan (IGCEP) does not concur with ARE policy 2019 and accommodates only 16% share of ARETs by 2030, as compared to a 30% share committed under ARE policy 2019. The final approved IGCEP instead has provisioned for inclusion of hydel projects in the definition of RE and amendment of the ARE policy 2019 suitably.ⁱⁱ Moreover, the projects under net-metering have also been made part of the on-grid ARETs targets of 25% and 30% by 2025 and 2030, respectively.ⁱⁱⁱ

The implications of these mandated amendments are detrimental to harnessing the true potential of solar and wind energy resources, which are abundantly available in Pakistan. These policy moves will tighten the room for development of solar and wind projects in line with ARE policy 2019. Moreover, if the amendments become effective today, the 2030 targets of ARE policy 2019 would have already been met, because of high existing share of hydel power (28%) in the national grid. The hefty reliance on hydel energy for meeting the climate change mitigation targets is also not reliable. This is because due to their gigantic infrastructural and upfront cost requirements, they often run into delays and cost overruns. Therefore, diversification of the RE portfolio should be an important consideration. Increasing the share of solar and wind energy generation is also indispensable for reasons beyond environmental sustainability. The effective utilization of these resources will not only get us closer to achieving the mitigation targets, but also help in addressing the socioeconomic disparities in the country. The economic development, which is correlated with access to electricity, can be ensured in remote, sparsely populated and grid disconnected areas, through off-grid solar, wind and hybrid RE electrification solutions.

⁴ As of 2021, the Variable Renewable Energy (VRE) share (excluding hydro) in the power mix stands at 6% (solar: 1%, wind: 4%, bagasse: 1%).

Pakistan also committed to shelve its imported coal power projects in the updated NDCs. This is a welcoming move, however, the use of local coal is still an integral part of Pakistan’s energy sector expansion planning, with the latest committed local coal power project to be commissioned by June 2023, as indicated in the IGCEP. Besides this, the already committed imported coal power projects under the China Pakistan Economic Corridor (CPEC) are also expected to come online during 2021 to 2030 and 82% of the planned local coal power projects will also become operational during this period. Therefore, considering 30-40 years useful life of coal power plant, the local coal extraction and utilization for power generation is expected to continue until year 2053-2063. The IGCEP corresponds with the commitment of using local coal reserves, stating indigenization of the power sector as an overarching goal for achieving energy security. Besides power generation from coal, coal liquefaction and gasification plants are also under consideration by the government. However, this enhanced focus towards utilization of local coal reserves will increase the GHGs emissions significantly.

	Installed capacity (as of 2021)	Installed capacity (by 2030)	Capacity addition (between 2021 and 2030)
Imported coal	3690 MW	4920 MW	1230 MW
Local coal	660 MW	3630 MW	2970 MW

Table 2: Imported and Local Coal Power Additions

Source: IGCEP 2021

On the other hand, over 40 countries have committed at COP26 to a complete coal phase out by 2030 and 2040, depending on their development status. Pakistan could also have joined this group as all the necessary pre-conditions for enabling such transition seem plausible in the case of Pakistan. According to key lessons accumulated by International Energy Agency (IEA) on coal phase-outs around the world, following conditions enable smooth transition:

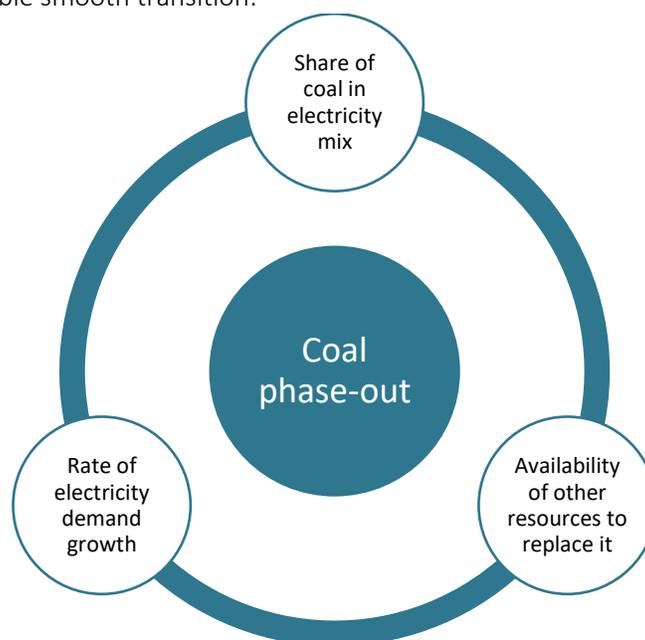


Figure 4: Conditions to consider for phasing-out coal^{iv}

Source: <https://www.iea.org/commentaries/key-lessons-for-phasing-out-co2-emitting-coal-plants-from-electricity-sectors>

Power generation from coal is fairly recent in the case of Pakistan, with the oldest coal power plant being only four years old.^v The total installed generation capacity from imported coal is 11% and local coal is 2% as of 2021. The potential from power generation from RE resources is also immense, with solar and wind resources available abundantly across the country, particularly along the national grid for on-grid development. For off-grid electrification too, solar, wind and hybrid RE technologies are the most suitable options. Pakistan's economic activity is also envisaged to be growing at 7% annually in the INDCs, which implies a growing demand for electricity in the country during 2021 – 2030. Hence, committing to a complete phase-out of coal, at least in the power generation sector, is practical. The ADB is taking the lead in enabling this transition in Southeast Asia (Philippines, Indonesia and Vietnam), where coal is the primary fuel for power generation. ADB aims to support, study and pilot Energy Transition Mechanism (ETM) for transitioning away from coal through early retirements of existing coal power projects.^{vi} Pakistan has also been reached out for this study, with the scope of work extending to retirement of diesel and furnace-oil based plants besides coal power plants.^{vii}

Germany Coal Phase-out Plan ^{*viii}

1. Coal phase-out planned in three stages
 - i. By 2022: power generation from anthracite and lignite coal be reduced to 15GWs each
 - ii. By 2030: power generation be further reduced to 8GW from anthracite and 9GW from lignite
 - iii. By 2038: complete cessation of power generation from coal
 - iv. Schedules be reviewed in 2026, 2029 and 2032 for coal exit
2. Voluntary and mandatory reductions
 - Anthracite coal plants
 - i. Initial reduction in coal power generation be voluntary and after 2027 it will be mandated
 - ii. Plant operators to receive financial compensation in return for capacity volume reductions, however, compensation will reduce every year to incentivize early action, and no compensation after 2027
 - Lignite coal plants
 - i. Each operating plant is communicated a specific date to end operations, and compensation the plant will get is also determined
3. Ban on new coal plants after August 14, 2020
4. Designation of a lignite-fired power plant as essential to operate until 2038
5. Coal power plant workers aged 58 and above at the time of decommissioning will receive compensation for up to 5 years maximum until they are eligible for pension

Figure 5: Germany coal phase-out plan

^{viii} Source: <https://www.loc.gov/item/global-legal-monitor/2020-08-31/germany-law-on-phasing-out-coal-powered-energy-by-2038-enters-into-force/>.

Once Pakistan will make a determination to look for energization beyond imported and local coal, there are examples internationally that can be followed to materialize coal phase-out in the country. Germany has rolled out a detailed coal phase-out plan, achieving the goal in stages. Southeast Asian countries, besides sharing the same development status as of Pakistan's and dependence on coal, have committed to coal

phase-out. The commitment has to be in place, as a first necessary step, in moving towards GHGs reduction, and when Pakistan can develop sustainably relying on renewables right from the beginning of its development trajectory, it should take this green energy path.

Mitigation Ambition in Transport Sector

The updated NDCs have set up a target of transition to 30% EVs by 2030 and 90% by 2040 in the transportation fleet of passenger vehicles and heavy-duty trucks. This target aims to achieve decarbonization in the transport sector and additionally will serve as a tool for energy demand side management.

There are three kinds of EVs which can penetrate in the market depending on the availability of relevant infrastructure. Battery electric vehicles (BEVs) fully operate on electricity, whereas, the hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs) have the options of both operating on electricity and gasoline. The main advantage of BEVs is that they emit zero GHGs emissions, improving the air quality, and additional advantage is their ability to store energy. During off-peak hours, they can store the otherwise available idle generation capacity and thus reduce the burden of capacity payments that are made to generation companies.

Pakistan has stepped forward in harnessing the benefits of EVs and developing a local market for EVs. The NEVP 2019 formulated for the period 2021 – 2025 is focused particularly on promotion and adoption of BEVs and facilitating the market of BEVs in the country. The policy will be complemented by the minimum efficiency performance standards (MEPS), which are being developed for electric motors, air conditioners and LED lights by National Energy Efficiency & Conservation Authority.

Implementation of NEVP 2019 is crucial in meeting the penetration targets of EVs in the updated NDCs. Table 2 below shows the medium-term and long-term penetration targets set for BEVs in the NEVP 2019. It is to be noted that the penetration targets are set on new sales and existing fossil fuel vehicles (FFVs) will still be on road emitting CO₂. Hence, there is also a need for regulating efficiency of the existing fleet of transportation and bringing the behavioral shift towards acceptability and adoption of EVs in place of FFVs. Furthermore, the potential users of EVs will have to be educated on fundamentals of EVs, so that concerns such as range anxiety could be brushed off. This will also facilitate the rapid adoption of EVs because once early adopters of EVs share their positive experience within their circles, the acceptability of EVs will enhance. Also, since the major shift will be coming from two-wheeler and three-wheeler vehicles, government should also be working on socioeconomic stability of these segments of the population, alongside providing them with financing options, to make their shift to EVs.

EV penetration targets	Medium-term targets	Long-term targets	Ultimate targets
	Five years	2030	2040
Cars (including vans, jeeps and small trucks)	100,000	30% of new sales (Approx. 60,000)	90% of new sales

Two and three wheelers four wheelers of United Nations Economic Commission for Europe* 'L' category	500,000	(approx. 900,000)	90% of new sales
Buses	1000	30% of new sales	90% of new sales
Trucks	1000	30% of new sales	90% of new sales

Table 3: EVs Penetration Targets NEVP 2019

Source: NEVP 2019

Setting the right incentives is crucial for the development of EVs market in Pakistan — particularly in the earlier years of introducing EVs. The government’s assistance in the form of tax relief subsidies, reduction of custom duties and waiver of registration fees among other benefits, can scale up this transition and make it quick. A notable success story in this regard is EV adoption in Norway. Norway provided plenty of fiscal incentives in the form of reduction of sales tax and registration fees, toll charges and provided free parking spots to EVs as compared to FFVs for development of its EVs market. Currently, it has reached the highest EVs penetration levels in the world, reaching over 75% EV sales share in 2020.^{ix}

Considering the energy efficiency gains, reduced requirement for maintenance and zero tailpipe carbon emissions of EVs, Pakistan is already making an effort towards its early and wider adoption. In its new Auto Industry Development and Export Policy (AIDEP 2021-2026), sales tax on local EVs has been reduced from 17% to 1%, and custom duty has been fixed at 1% for export of specific parts of EVs.^x Table 4 below presents the envisaged phases of EV development and custom duties in each phase in NEVP 2019.

Years 1 and 2 (Introduction)	Years 3 and 4 (Local assembly)	Years 5, 6, 7 (Manufacturing and Export)
Used EVs (15% custom duty)		
Completely Knocked Down (CKDs) electric vehicles’ components (1% GST and no Registration Fee)	CKDs (1% GST and no registration fee)	
The custom duties of CKDs and their indigenization will be in line with prevailing Auto Policy 2016 - 2021		
Completely built units (of localized EV-specific parts) 25% custom duty and 1% GST	Completely built units (of EV-specific parts) 1% custom duty and 1% GST	
EV specific components and schedule 1% custom duty and 1% GST		

Table 4: Phases of EV Technology Development

Source: NEVP 2019

The implementation of NEVP 2019 should be ensured particularly in the transport sector electrification while addressing the concerns in the market related to the new technology adoption. We present some specific recommendations in this regard:

- Firstly, the desirable penetration rates for all three types of EVs in each identified phase of its development in the country should be predefined. Given that each BEV, HEV and PHEV have their respective benefits and integration requirements, devising the strategies for their deployment according to their specific needs thus become significant to avoid any unintended consequences. For example, in the case of HEVs and PHEVs, with the flexibility of fuel options/switching for ride, a heavy upfront cost in establishing charging infrastructure is not required as much as in the case of BEVs. The regulation, similarly, will also require to be more clearly articulated in the case of BEVs, such as what time of the day vehicles can be charged, how much time it will take to fully charge the vehicle, how many vehicles can attach to a charging station, how many parking spaces are available at different charging stations, the range of distance that can be covered in one charge, etc.
- Secondly, for promoting the local production of EVs, the government should proactively incentivize the production of BEVs because of their relatively simpler design compared to the HEVs and PHEV. However, specific standards should be devised regarding manufacturing of batteries for use in electric motors, including their safety measures. This is crucial because vehicle performance can be hampered at high temperatures and different environmental conditions, affecting the chemical balance in the battery and could result in accidents. Furthermore, if Pakistan mandates the local manufacturing of EVs, the manufacturers will have to be financially incentivized as well, as in the case of China the reduction in financial incentives resulted in decline of EVs sales.^{xi}
- Thirdly, for EV charging, the power distribution companies should create incentives and appropriate measures for vehicle owners to charge their vehicles at times that do not burden/or disrupt the operations of national grid, increasing the peak load. Given that Pakistan has excess generation capacity and a demand-supply gap of over 3,000MW as per the updated NDCs, the optimal use of this excess available capacity should be made, by making vehicle owners to charge their vehicles during off-peak hours. The possible tools to influence the vehicle owners could be through charging them extra rates when recharging their vehicles during peak hours or charging them discounted rates when they recharge during off-peak hours.
- Lastly, access to clean and affordable electricity should be ensured to all urban, rural, peri-urban and remote communities, as it is directly related to their economic development and will later facilitate them in adoption of technologies run on electricity such as EVs, electric stoves and electric heaters.

NDC Implementation: Potential Constraints and Way Forward

Pakistan has policies in place and relevant institutions to carry out the tasks, while frameworks are also being developed. However now, implementation of policies has to be ensured.

Implementation constraints

In the case of Pakistan, the relevant policies already exist and many specific policies are being developed. So, the implementation and regular evaluation of the policies remain a big challenge in successful achievement of the NDCs. In the past, we see policies preserving the environmental integrity were formed, even penalties were set for non-compliance with the mandated actions, but ground action was still missing. The heads of noted organizations such as World Wildlife Foundation have also pointed towards this missing aspect of non-action and poor implementation of policies like PEPA. Therefore, it is imperative that the policies are implemented within the prescribed timeframe and roadmaps be formed in alignment with the set targets. For example, as per the current ARE policy 2019, by 2025 the share of non-hydro RE should reach at least 20% by 2025, but as of 2021 the share has reached only 6% and as per the IGCEP it only reaches up to 16% by 2025. This mismatch in policies and plans will hamper the effectiveness of these policies and delay the timeline to achieve set targets.

Coordination Constraints

Coordinated and concerted efforts in achieving the climate change targets in another important factor. The actions have to concur both at national and sub-national levels, and also within different sectors, so that the co-benefits of remedial actions are realized. However, integration of climate change efforts remains a challenge. The updated NCCP and PCCA have inbuilt clauses for progress meetings in which the provincial committees present their work to the federal committees on climate change, but only biannually. They also have set reporting requirements, but no consequences for non-compliance have been described in these policies. Furthermore, given the different resources mix of each province, and socioeconomic dynamics, bringing all the relevant policy stakeholders on a same page is also a concern. For example, in the case of IGCEP provinces had reservations on certain aspects, but the approval of the IGCEP went ahead nonetheless.

Macroeconomic constraints

The evolving macroeconomic dynamics of the country can also impact the effectiveness of the policies that are essential in achieving the targets in NDCs. Particularly, for a developing country such as Pakistan, with soaring debt-to-GDP ratios, reaching 92.7% in the fiscal year 2019-2020^{xiii}, the external conditions by the debt providers such as International Monetary Funds, can dictate the policy reform process in the country. The external conditions, in the case of Pakistan, have recently hampered the environment friendly reforms by the country, as new taxes have been imposed on renewable energy technology sales and imports, as well as on electric vehicles. These changes, however being protested, for the time being are impacting the stakeholders of the users of RE technologies and EVs and are against the targets set in the respective ARE policy 2019 and NEVP 2019.

To conclude, the commitment towards climate change mitigation and adaptation measures needs steady resolve and dedicated action, while addressing the possible constraints in the way. Especially, in power

sector, where economic and financial turmoil has been keeping the relevant government institutions on the toes, a strong agenda for sustainable development should be pursued with rising shares of renewable energy and retiring of fossil-fuels-based generation technologies. The proactive approach in dealing with provision of sustainable and affordable energy and environmental conservation, will help reaping benefits for both current and future generations. Furthermore, the indigenization of abundantly available natural resources such as solar and wind, should become a national priority, as it does not only help in providing sustainable means for energy, but also bridges the socioeconomic gaps that exist in our country because of energy poverty. As per the updated NDCs about 40 million people in the country still lack access to electricity. Thus, renewable energy provides options for electrification in both on-grid and off-grid area. The electrification of our energy uses will be the most sustainable way forward.

The aggressive approach of the current government towards electrification of our transportation means is a right step in this direction. New policies and frameworks have been introduced to promote adoption of electric vehicles. However, any counter policies, in the face of external constraints, can halt the process of sustainable economic development in Pakistan. Thus, conducive policy environment with firm vision for sustainable development, delineated roadmaps for mitigation in the transport and energy sector and proper execution of policies, are necessary preconditions to achieve the NDC targets.

Bibliography

- ADB. 2021. "Energy Transition Mechanism Explainer: How ETM Will Support Climate Action in Southeast Asia." *Asian Development Bank*. November 03.
<https://www.adb.org/news/features/energy-transition-mechanism-explainer-support-climate-action-southeast-asia>.
- Alvarez, Carlos Fernandez. 2021. "Key lessons for phasing out CO2-emitting coal plants from electricity sectors." *IEA*. October 19. <https://www.iea.org/commentaries/key-lessons-for-phasing-out-co2-emitting-coal-plants-from-electricity-sectors>.
- Amir, Amina. 2021. "Pakistan Auto Policy 2021-26: Sales tax slashed on local electric vehicles." *The News International*. December 23. Accessed January 03, 2022.
<https://www.thenews.com.pk/latest/919171-pakistan-auto-policy-2021-26-sales-tax-slashed-on-local-electric-vehicles>.
- APP. 2021. "World Bank sees Pakistan's debt-GDP ratio declining." *The Express Tribune*. November 05. <https://tribune.com.pk/story/2327959/world-bank-sees-pakistans-debt-gdp-ratio-declining>.
- Asian Development Bank, and the World Bank Group. 2021. *Climate Risk Country Profile: Pakistan*.
- Barnes, T. 2010. "Pakistan floods now worse than 2005 earthquake, say officials." *The Christian Science Monitor*. August 08. Accessed December 17, 2021.
<https://www.csmonitor.com/World/terrorism-security/2010/0808/Pakistan-floods-now-worse-than-2005-earthquake-say-officials>.
- Determination of the NEPRA in the Matter of IGCEP of NTDC*. 2021. Case No. LAT-01 (September 24).
- DW. 2016. "Pakistan ratifies Paris climate change agreement ." *DW*. November 11.
<https://www.dw.com/en/pakistan-ratifies-paris-climate-change-agreement/a-36355815>.
- Government of Pakistan. 2021. *Updated Nationally Determined Contributions*. Islamabad.
- International Energy Agency. 2021. *Global EV Outlook 2021*. IEA.
- Isaad, Hanea. 2021. "Pakistan and energy transition." *The News International*. December 20.
<https://www.thenews.com.pk/print/918146-pakistan-and-energy-transition>.
- Khan, Rina Saeed. 2017. "Pakistan passes climate change act, reviving hopes - and skepticism." *Rueters.com*. March 24. Accessed December 18, 2020.
<https://www.reuters.com/article/us-pakistan-climatechange-lawmaking-idUSKBN16V19N>.
- Library of Congress. 2020. "Germany: Law on Phasing-Out Coal-Powered Energy by 2038 Enters into Force." *Library of Congress*. August 31. <https://www.loc.gov/item/global-legal-monitor/2020-08-31/germany-law-on-phasing-out-coal-powered-energy-by-2038-enters-into-force/>.
- MoCC. n.d. *Ministry of Climate Change*. Accessed December 2021.
<http://www.mocc.gov.pk/Detail/MWYwYTEwMWYtNGQ0OC00ZWY4LWE1ZWUtMTNlZTRkYWE1OTlh>.
- NEPRA. n.d. *IPPS 2006 RE*.
<https://nepra.org.pk/licensing/Generation%20IPPs%20RE%202006.php>.

- Rao, Vakeel. 2021. "SEPA prepares climate change policy." *The Express Tribune*. 07 14.
<https://tribune.com.pk/story/2310462/sepa-prepares-climate-change-policy>.
- The Government of Pakistan. 2016. *Pakistan's Intended Nationally Determined Contribution*.
 November 06.
- The Paris Agreement. n.d. *United Nations Climate Change*. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- USAID & Energy Planning and Resource Center Planning Commission. 2020. "Options to Catalyze an Electric Vehicle Market in Pakistan." Policy Brief.
- What is the Kyoto Protocol? n.d. *United Nations Climate Change*.
https://unfccc.int/kyoto_protocol.

-
- i The Paris Agreement. n.d. United Nations Climate Change. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- ii NEPRA. 2021. "Determination of the NEPRA in the Matter of IGCEP of NTDC." September 24.
- iii Ibid.
- iv Alvarez, Carlos Fernandez. 2021. "Key lessons for phasing out CO2-emitting coal plants from electricity sectors." IEA. October 19. <https://www.iea.org/commentaries/key-lessons-for-phasing-out-co2-emitting-coal-plants-from-electricity-sectors>.
- v Isaad, Haneea. 2021. "Pakistan and energy transition." *The News International*. December 20.
<https://www.thenews.com.pk/print/918146-pakistan-and-energy-transition>.
- vi ADB. 2021. "Energy Transition Mechanism Explainer: How ETM Will Support Climate Action in Southeast Asia." Asian Development Bank. November 03. <https://www.adb.org/news/features/energy-transition-mechanism-explainer-support-climate-action-southeast-asia>.
- vii Isaad, Haneea. 2021. "Pakistan and energy transition." *The News International*. December 20.
<https://www.thenews.com.pk/print/918146-pakistan-and-energy-transition>.
- viii Library of Congress. 2020. "Germany: Law on Phasing-Out Coal-Powered Energy by 2038 Enters into Force." Library of Congress. August 31. <https://www.loc.gov/item/global-legal-monitor/2020-08-31/germany-law-on-phasing-out-coal-powered-energy-by-2038-enters-into-force/>.
- ix International Energy Agency. 2021. *Global EV Outlook 2021*. IEA.
<https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf>
- x Amir, Amina. 2021. "Pakistan Auto Policy 2021-26: Sales tax slashed on local electric vehicles." *The News International*. December 23. Accessed January 03, 2022. <https://www.thenews.com.pk/latest/919171-pakistan-auto-policy-2021-26-sales-tax-slashed-on-local-electric-vehicles>.
- xi International Energy Agency. 2021. *Global EV Outlook 2021*. IEA.
<https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf>
- xii APP. 2021. "World Bank sees Pakistan's debt-GDP ratio declining." *The Express Tribune*. November 05.
<https://tribune.com.pk/story/2327959/world-bank-sees-pakistans-debt-gdp-ratio-declining>.