

Beyond Crude Responses

Pursuit of clean cooking alternatives amid natural gas shortages in Pakistan

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Introduction

Natural gas has been the cooking fuel of choice for households in Pakistan's big and medium-sized cities since the 1960s onwards. That reliance has evolved mainly for three reasons. Natural gas has been an indigenous fuel for around 70 years. With major discoveries in Balochistan, particularly Sui, in the 1950s and in Sindh and KP in more recent decades, its abundance made it the go-to cooking fuel. The fact that it was indigenous and plentiful led to natural gas being much cheaper than imported fuels or electricity. Households were connected to this cooking fuel through extensive transmission and distribution infrastructure.

The demand: Pakistan's indigenous oil production has always been miniscule compared to demand. In the late 90s, when natural gas was still plentiful, and in subsequent years as well, governments found it convenient, both politically and economically, to switch energy needs of various sectors to gas. A policy shift in that decade touted fossil gas in the form of compressed natural gas (CNG) as a clean and cheap alternative for petrol vehicles. Thousands of CNG stations sprang up across the country.

Despite declining natural gas resources, the government maintained considerable difference between the price of petrol and CNG to promote the CNG industry. Attracted by the price gap, owners converted their diesel-run big private vehicles to CNG in large numbers. So rapid was the growth that by 2010 Pakistan became the country with the largest number of CNG vehicles.¹

Diversion of natural gas to the CNG sector represented a tremendous drain on available supply. In hindsight, the decision played a significant part in expediting depletion of the available reserves.

Around the same time, Pakistan had also expanded natural gas use for electricity generation and production of fertilizer, among others. By that time, household demand was already rising amid population growth and various sectors started experiencing shortages.

The deficiency: With these competing claims stretching the supply thin, households soon faced more shortage of cooking gas. Over the last decade, all sectors reliant on natural gas, including households, have regularly faced serious and growing shortages in the winters.

The proven national gas reserves are falling by nearly 10% a year now.² Over the last decade, serious shortages have been the norm during winters. Gas scarcity in Pakistan during the 2022-23 winter was the greatest for any year so far. The shortage lasted through the 2023 spring and beyond. Even at the peak of summer, when this research was being finalised, households in most cities across Pakistan faced at least 10 hours of daily gas shortages—around three hours during the day and another seven hours, usually from 11pm to 6am, at night. Summers had previously been free of gas shortages in years past since no gas was required for heating purposes. This was a clear sign of the natural gas supply struggling to meet even the mere cooking demand of Pakistani households.

The response: Such shortage of the principal cooking fuel had to be dealt with somehow. Initial public and private responses were no more than band-aid. The public sector gas suppliers resorted to scheduled and unannounced load shedding, euphemism for shutting down supply to various localities, even whole cities, when demand was greater than the natural gas infrastructure

¹ Pakistan largest CNG user, June 2, 2011, Dawn.

could supply. A measure aimed at curbing demand has been the intermittent imposition of ban on new gas connections. Such bans have often lasted a year or longer.

In a bid to enhance supply for domestic and other consumers, Pakistan started importing liquified natural gas (LNG) via long-term import contracts and would also purchase from the shorter-term international spot market when it could afford the price during heightened winter demand.

When LNG prices shot up globally following Russia's invasion of Ukraine in 2022—prices hit a record \$69.9 per million British thermal units (mmBtu) for Asia deliveries in August that year—Pakistan largely stayed away from the international LNG spot market to save its meagre foreign currency reserves. The country made no purchase from the spot LNG market for at least a year from June 2022 onwards.³

Ironically, the CNG sector, which was supposed to help Pakistan slash its oil import bill, has for many years now become the recipient of imported LNG to meet vehicles' demand.

As for the consumers, those with means simply switched to alternatives most similar to natural gas in utility and convenience. This was usually LPG, which came in cylinders and could be attached to the existing gas stoves, room and water heaters.

Low-income households also sought alternative fuels. Their choices were generally dictated by affordability, not by how clean or efficient a fuel was. Since all fuels were considerably more expensive than natural gas, these households restricted the use of alternatives to the most pressing needs, essentially only cooking during load shedding. The ongoing cost of living crisis in Pakistan has further undermined the low-income population's ability to afford alternative fuels. A recent study by The Knowledge Forum noted the severe impact of winter gas shortages on the health, education, savings and general wellbeing of low-income families.⁴

The natural gas shortage is particularly hurting low-income families and is likely to worsen amid historic high inflation and diminishing foreign exchange hampering Pakistan's ability to afford energy imports to bridge the shortfall. In short, Pakistan urgently needs to find alternatives to bridge the crippling gas shortage.

Being among the worst victims of extreme weather events unleashed by climate change, in which fossil fuel emissions play the central role, it stands to reason why Pakistan should aspire for renewables and minimise fossil fuel emissions.

Furthermore, Pakistan's international obligations, including the recent climate-related pledges, compel it to shun fossil fuels for renewables. In that respect, the pursuit of clean/renewable alternatives would not only present solutions to the debilitating natural gas crisis but also offer additional incentives in view of the national climate commitments.

In exploring clean alternatives to fossil gas for low-income domestic consumers, the present research keeps in focus the diverse housing landscape across various parts of Pakistan as well as the degree of focus on ensuring accessible clean cooking fuels as opposed to the use of renewable sources for electricity generation. It also considers the rhetoric and concrete progress

³ Pakistan gets international spot market offers for LNG after year-long gap, Arab News, July 14, 2023, <https://www.arabnews.pk/node/2337856/pakistan>

⁴ Gas-ping for survival: Impact of winter gas shortages on low-income households, The Knowledge Forum, June 2023.

in the public and private sector promoting a switch to renewables/ cleaner alternatives to natural gas. With a solution-oriented approach, the focus consistently remains on identifying gaps and suggesting practical measures to address them.

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Background

The present research study is part of a series of studies undertaken by the TKF that looked at the low-income households' access to cooking fuel in urban Pakistan, prospects for progress towards clean / renewable energy solutions and how inclusive such a transition to clean fuels would be for financially stressed populations.

Recent research in this series⁵ examined the impact of winter gas shortages on low-income urban households. It included a survey in nine cities across Pakistan with families earning less than Rs 70,000 (\$200) a month. Some of the key findings of that survey that were relevant to the present study included:

- The monthly natural gas bill and alternative cooking fuels often consumed around a quarter of a low-income household during winter gas shortages.
- The gas shortages in winter alone had a deep impact on the education, health and the overall financial wellbeing of low-income households. Shortages that had started to persist throughout the year were certain to magnify that impact.
- Piped natural gas supplied to households by state entities (SNGPL and SSGC) offered substantially subsidized tariffs for consumers with minimal use.
- Once outside the piped natural gas delivered to their households, access to cooking fuels was a matter of affordability for the consumers, with no subsidy, protection or safety net available for those with limited means.
- The additional burden of cost of alternative cooking fuels had eaten into whatever little saving poor and low-income families managed throughout the year. This had severely compromised the capacity of these households to cover vital expenses, including emergencies.
- The gas shortages made natural forests close to cities vulnerable to firewood extraction, impacting the natural fauna and flora in these regions.
- The victims of energy poverty did not prefer or demand clean or renewable cooking fuels; they opted for the least expensive of the alternative fuels irrespective of the impact on the environment or the family's own health.

With the omnipresent natural gas shortage hampering cooking for urban households and costly imports not offering a sustainable solution, maintaining status quo simply is not an option.

Ways and means

We live in an age where technological advancements mean that the available range of clean alternatives is limited only by imagination. Renewable generation and storage have not only become cheaper but is also more efficient than ever today.

Some of the best known and widely used renewable energy sources include solar, onshore and offshore wind and hydroelectric. Countries in South Asia already rely on these sources to varying degrees. Biogas is another fuel used to some extent in these countries, mainly for cooking and heating homes. It is an environmentally-friendly, renewable energy source produced by the breakdown of organic matter such as food scraps and animal waste. Biomass—including wood, agriculture residue and organic matter, such as manure—release considerably less carbon dioxide than fossil fuels.

Green hydrogen may be a clean energy source if electrolysis—the process of using electricity to split water into hydrogen and oxygen—is powered using renewable sources. Although wood would at best be considered renewable if the plants are being replaced. Geothermal and tidal power have also gained prominence as renewable sources. Some of the more exotic renewable energy sources include algal biofuels, body heat, jellyfish, piezoelectricity and sludge generated by municipalities worldwide.

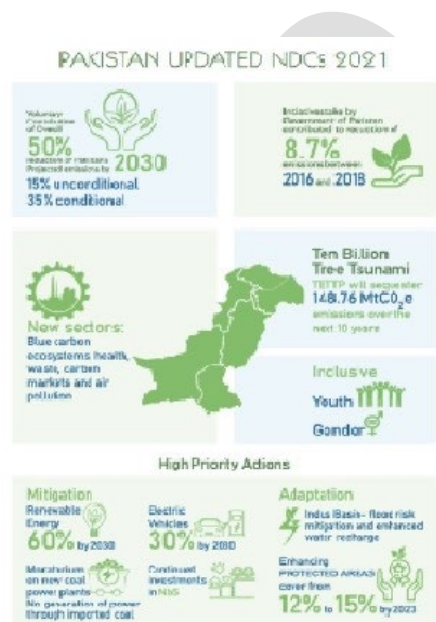
Pakistan: Energy mix, climate change & transition ambitions

Pakistan is part of a region that is enormously vulnerable to the adverse impact of climate change. The country itself is among the top five most affected nations by climate change.⁶

Obligations: Against this backdrop, Pakistan’s own commitments to shun fossil fuels gain added significance.

The country’s updated Nationally Determined Contributions (NDCs) in October 2021 set a cumulative conditional target of an overall 50% reduction of its projected emissions between 2015 and 2030, with a 15% reduction using the country’s own resources, and an additional 35% subject to international financial support.⁷

Switching to renewable energy is the main component of Pakistan’s strategy to reach the target. By 2030, it aims to switch to 60% renewable energy and 30% electric vehicles as well as ban coal imports.



Infographic courtesy: Ministry of Climate Change

At least 10 recommendations at Pakistan’s most recent Universal Periodic Review (UPR) at the United Nations Human Rights Council called upon Pakistan to address environmental and

⁶ Pakistan 5th most vulnerable country to climate change, reveals Germanwatch report, April 11, 2022, <https://www.energyupdate.com.pk/2022/04/11/pakistan-5th-most-vulnerable-country-to-climate-change-reveals-germanwatch-report/>; Pakistan 5th most vulnerable country to climate change, reveals Germanwatch report, December 4, 2019, <https://www.dawn.com/news/1520402>

⁷ Pakistan: Updated Nationally Determined Contributions 2021, <https://unfccc.int/sites/default/files/NDC/2022-06/Pakistan%20Updated%20NDC%202021.pdf>

climate change challenges. These included two recommendations⁸ specifically urging adoption of renewable energy. Pakistan supported every single one of 10 recommendations.⁹

Under Sustainable Development Goal 7 (SDG 7), Pakistan has to ensure access to affordable, reliable, sustainable, and modern energy for all by 2030. One of the three primary targets under this goal is about ensuring clean cooking fuels.

In order to achieve the SDG 7 target, Pakistan needs to enhance electricity access, grid infrastructure expansion and promote off-grid solutions for remote communities. Increasing the share of renewable energy, which covers development and implementation of policies to incentivize renewable energy investment. Improving energy efficiency, strengthening policy and regulatory frameworks and mobilize financing to fund energy projects and infrastructure development are also indispensable for realizing SDG 7.

⁸ Recommendations 46.218 and 46.221

⁹ Addendum to Report the Working Group on Pakistan's Universal Periodic Review, A/HRC/53/13/Add.1, 6 June 2023, https://www.ohchr.org/sites/default/files/documents/hrbodies/hrcouncil/sessions-regular/session53/advance-versions/A_HRC_53_13_Add.1_AV_Pakistan_E.docx

Methodology

This study is based on desk research and interviews with key informants. Besides benefitting from KIIs with experts in Pakistan, the TKF also sought guidance from the country's neighbourhood on how countries with similar socio-economic factors have managed cooking fuels for low-income households. A recent survey, conducted for a related research study mentioned above, has also been utilised to draw upon relevant findings.

Even with potential solutions all around us, harnessing those would often depend on technology, affordability, or both, and at times geographic locations for specific sources, such as geothermal and tidal power. The decision to look more closely at the regional experience was dictated by a similarity of socio-economic environment, common dependance on costly fossil fuels imports, shared impact of the climate crisis, similar patterns of diverse housing density and urban-rural population ratio in Bangladesh and India.

For the perspective from India, the TKF is indebted to experts working on gas issues at the Environics Trust,¹⁰ which works with communities on issues around coal, bauxite and beach-sand mining etc., through participatory research, advocacy and court cases. The generosity of Kuntal Roy, a climate communications specialist, in sharing the Bangladeshi experience helped bring home the struggles in an energy-stressed region.

The work of Sustainable Development Policy Institute greatly helped boost TKF's grasp of the issue, particularly input by Dr Khalid Waleed, a PhD in Energy Economics.

The TKF gained from Institute for Development Studies and Practices not just thematic expertise but also its first-hand experience in establishing IDSP's University of Community Development as a self-sufficient composite renewable energy model.

Neighbourhood Watch

Transition to renewable fuels can be a complex topic to comprehend even in a single jurisdiction. Based on desk research and KIIs, below is a bird's eye view of the context, affordability and access to urban cooking fuels in Pakistan, Bangladesh and India. The view from Pakistan is by far the most detailed among the three countries, simply because of the study's prime focus on Pakistan. In compiling the following context about the three countries, much effort has been invested in guarding against generalisations.

Pakistan: energy mix and cooking fuels

Fossil fuels dominate Pakistan's energy mix. As per National Electric Power Regulatory Authority, out of Pakistan's total installed power generation, 63% of energy comes from fossil fuels. Policies like Alternative and Renewable Energy Policy 2019 envision renewable energy production, but that vision is yet to translate into reality.

As a clean / renewable energy source, hydropower has a prominent role in electricity generation in Pakistan. The installed hydro capacity is 10,251 MW, or around 25 percent of the total installed

¹⁰ <https://enveronicsindia.in/>

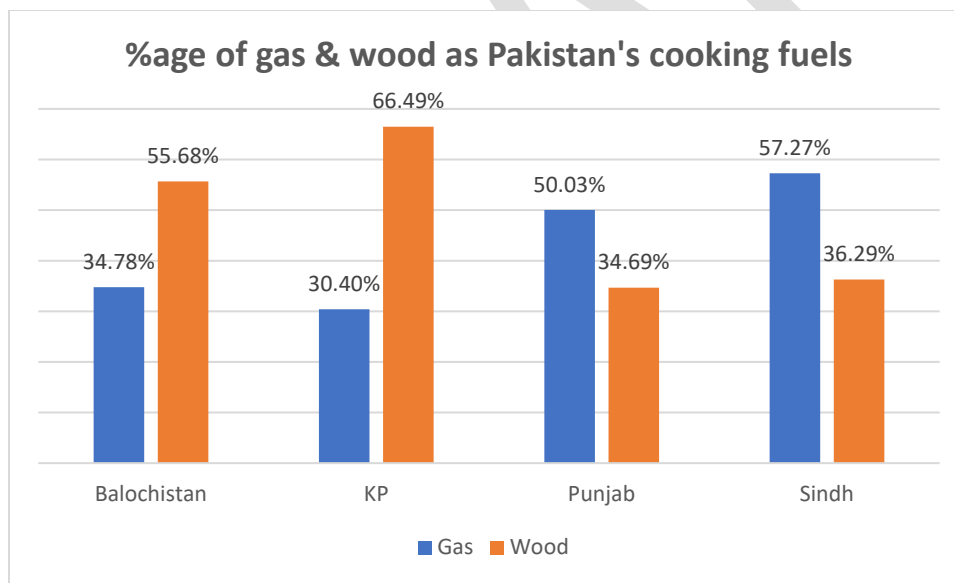
capacity. However, the country uses no more than 16 percent of its total hydropower potential.¹¹ The reasons for this untapped potential include the high investment cost for installation of hydropower plants, transmission network and resettlement of the affected population.

Other unrealized potential lies in wind corridors and abundant sunlight in Pakistan. The wind corridors alone can generate up to 50,000 MW electricity. However, the contribution of wind in the total installed capacity is 4.8 percent (1,985 MW). Solar power constitutes around 1.4 percent (600 MW) of Pakistan’s total installed capacity.

According to official data, 37 percent households in Pakistan have access to clean fuel technology “including Gas, LPG/Cylinder and Electricity for cooking”. Urban areas have access to 73% of these so-called clean cooking fuels while rural areas share is 15 percent.¹²

Classification of fossil fuels as clean highlights that Pakistan’s journey to clean /renewable fuels is going to be a long and uphill one.

Natural gas and firewood jointly constitute 90% of Pakistan’s cooking fuel. According to the official count, 48% of the cooking fuel nationwide is natural gas and 41% is firewood.¹³



Source: Pakistan Social & Living Standard Measurement Survey 2019-20

Access to the gas transmission grid, and cost and ease of access of alternatives are usually the key determining factors in the choice of cooking fuel. Because of the size and nature of urban

¹¹ Pakistan Economic Survey 2021-22, p. 261, https://www.finance.gov.pk/survey/chapter_22/PES14-ENERGY.pdf

¹² Pakistan Social & Living Standard Measurement Survey 2019-20, Table 7.9: Distribution of Households by Fuel Used for Cooking, https://www.pbs.gov.pk/sites/default/files//pslm/publications/pslm_district_2019-20/PSLM_2019_20_District_Level.pdf

¹³ Pakistan Social & Living Standard Measurement Survey 2019-20.

housing construction, piped natural gas is the preferred cooking fuel for households with access to the transmission infrastructure. Cooking with firewood is more common in rural areas, where the ease of access to firewood and crop and animal residue, and open-air kitchens make them the preferred fuels due to their comparatively low cost.

In Sindh and Punjab, the two most populous provinces, 57% and 50% of the cooking needs, respectively, are met using natural gas. Firewood is the main fuel catering to most of the cooking needs in Balochistan (56%) and Khyber Pakhtunkhwa (66%).

Across rural Pakistan, natural gas constitutes 23% and wood 60% of the cooking fuel. In cities nationwide, 88% of the cooking fuel is gas and 10% wood. The highest reliance on natural gas for cooking for any one region in Pakistan is in urban Sindh (91%). On the other hand, the highest ratio for firewood use for cooking is most prevalent in rural Khyber Pakhtunkhwa (76%).¹⁴

Bangladesh

Indigenous natural gas is the cheapest energy source in Bangladesh. Over the last few years, there has been growing dependency on imported natural gas, as domestic production is dwindling.

Bangladesh is dependent on imported-natural gas/LNG and LPG and the import has been growing. In 2019-20, Bangladesh met 19% of its gas need with imported LNG. In 2020-21, that ratio rose to more than 25%.

Bangladesh uses the majority of its indigenous gas for electricity generation. Industries and fertilizer production also have access to gas on priority.

Households in big cities in Bangladesh have access to piped natural gas, although majority of the households in those big cities lack such access. The urban population without access to piped gas purchases LPG or liquid petroleum gas cylinder, which is more expensive than piped natural gas.

However, repeated tariff hikes have pushed the price of natural gas closer to LPG. The LPG industry is mostly driven by the private sector, which is one of the reasons why the price fluctuations for this cooking are very volatile.

Much like Pakistan, low-income urban populations in Bangladesh that does not have access to natural gas have no alternative but to go for LPG even though it is quite unaffordable for them. There are no other options for the urban population, unless consumers opt for electric stoves, which are expensive and consume electricity which itself is expensive.

According to the Bureau of Statistics, 28% of the population has clean cooking access. Like Pakistan, Bangladesh also considers gas a clean cooking solution.

As has been the case with Pakistan, Bangladesh finds itself saddled with payments to independent power producers for unused generation capacity. That unused capacity cannot be

¹⁴ Pakistan Social & Living Standard Measurement Survey 2019-20.

utilized, despite extensive energy shortages outside the main cities, because of deficiencies of the energy grid.

In terms of renewable energy generation, Bangladesh ranks very close to the bottom in South Asia, with 2.5% renewable energy generated from solar, hydro and wind.

A cultural thing

“Even if electricity from renewable sources becomes available as a clean cooking solution, which is not at all the case so far, the fact that people in our culture prefer to cook using the flame needs to be considered. Then there is the crucial matter of the cost of that electricity. Very few households have electric stoves, which are generally imported and quite expensive. The only relatively clean cooking solution in Bangladesh right now is natural gas, which of course is a fossil fuel. Rural areas do not even have that option since they lack access to piped natural gas. According to Bangladesh Bureau of Statistics, 92% of the rural households in 2022 were reliant on biofuels, including fuelwood and animal dung. In many places, rural populations do not even have good access to LPG cylinders. Access to LPG cylinders in rural areas has improved somewhat over the last five-year, but the rural per capita income is low compared to cities. An LPG cylinder costs more than \$10 in rural areas, and the rural population is not inclined to spend so much on cooking solutions.”

India: Little shortage, access capacity and grid problems

In India, two kinds of gases are used for cooking, one is the piped natural gas and the other liquified petroleum gas (LPG). The use of LPG cylinders grew from the early 1980s, coinciding with largescale shift away from firewood and kerosene as cooking fuels.

In piped natural gas, there is still a lot of government control, and price control mechanism are in place for some of the most crucial sectors, such as fertiliser, transport and household supply.

In terms of the overall energy picture, India is largely dependent on coal and has considerable coal reserves. Coal still provides the maximum grid supply. In a new trend, in times of high energy demand, typically from September to November, the government diverts supply to gas power plants to enhance electricity generation if coal-based plants are unable to meet the energy requirements.

India does not yet have a shortage problem of cooking fuels, except relatively rare shortages in the interior parts. These are also usually because local LPG agencies wish to create shortages to extract more money from consumers. The government has responded by binding these companies to take money for LPG in advance, so people would not have to pay additional money.

India does not have much indigenous gas production, but reasonably good reserves are currently being explored, both onshore and offshore, to cut down the fuel import costs. More than half of India's gas requirements are met through imports. That is one reason for the emphasis on getting production systems up and running.

Big infrastructure projects are being planned on Andaman Islands, an area particularly sensitive in terms of impact on the ecology and indigenous population.

The cost of gas has escalated in recent years in India too. There are subsidies for people below the poverty line.

In mountainous regions, there is rather substantial use of wood and coal during winters. Wood is the most easily available fuel with the forest close by. Because of hydro power, electricity supply systems are well developed, unless they are disrupted by floods, as recently happened in Himachal Pradesh. Some of the hilly states are also tourist spots where LPG cylinders and coal are used in addition to electricity. Improved standard of living in tourist hubs means that consumers have more purchasing power to acquire alternative fuels.

Like Pakistan, the government in India offers subsidies for large solar-power parks, but not yet to incentivize installation of solar systems within the household. Similar to Pakistan, subsidies have been given for EV cars, which again cater to a particular class that can afford these things.

India plans to connect the whole country to a centralised grid, which would be supplemented by gas from already operational terminals, and around nine that are being constructed, across India's eastern and western coasts. It is building more than 33,000 kilometres of piped natural gas infrastructure for supply to households. This was supposed to link to the stalled Tajikistan-Afghanistan-Pakistan-India (TAPI) gas pipeline. The construction of the Indian leg of TAPI has been completed.

Out of about 33,000 kilometres of this pipeline, around 21,000 kilometers is operational. Around 10 companies are involved with the gas pipeline infrastructure.

In India, renewable systems are not directly connected to households. There are still grid problems and because of India's geographical landmass, the renewables reaching the last mile and grid system issues are big impediments. India has been able to increase its production capacity through renewable sources and yet the government is only thinking big solar parks and not looking at smaller grid systems. However, the problem of non-availability of renewable energy technology to the last mile remains.

Key reflections and the way forward

Pakistan, Bangladesh and India have all been regularly pummeled by extreme weather events amid a worsening climate crisis, for which fossil fuels are the main culprit. This attempt to look for clean solutions to common energy problems in Pakistan's surroundings found few clear solutions and more commonality in unrealized potential, in continuing infatuation with fossil fuels and rhetoric masquerading as policy stance and commitments to clean fuels. Concrete government plans to move away from fossil fuels and towards renewables are missing. The experts said that there was little action to cite how plans to turn entire cities green would be implemented.

The experts weighing in on the most suitable path to transition to renewables highlighted elementary challenges and gaps in implementing ambitious renewable energy policy targets in Pakistan.

All the key point highlighted by the experts are reproduced below. However, in line with this study's stated resolve to look for practical solutions, ideas that can help address the challenge are presented first, followed by issues that evoked regret and lament among the experts.

There was consensus on the criticality of issues with the last mile access for renewables. But the experts stressed that equally crucial was what the first mile would look like and what was the potential for reasonably scaling up solutions.

Dr Khalid drew attention to one of his research papers where he contrasted the energy ladder and energy stacking models. In the energy ladder models, as incomes rise, households switched to modern fuels, with electricity generated through renewables cited as the most modern fuel. In Pakistan, as household income have risen, consumers have not switched to higher efficiency or environment-friendly fuel due to lack of accessibility. Dr Khalid's thesis suggested a 6Es framework¹⁵ to look at what swayed consumers' fuel choices. He was of the opinion that policymakers focused on efficiency and environment among all the Es in formulating policy, whereas households selected their fuel based on the other four Es; if households believed a fuel was easily accessible, collectable, useable and was not expensive, they would overwhelmingly go for it, often without caring for efficiency and environmental impact.

¹⁵ Dr Khalid argues that in order to persuade a household to switch the fuel it uses, many of the following 6 Es would have to be ensured. These are: **E**ase of access, (examples are firewood, agriculture residue and dung in rural areas); **e**ase to collect (the degree of exertion that goes into collecting what is available), **e**ase of use (how soon and how easily can it be used at home, e.g., for LPG in rural settings, a cylinder, stove and indoor kitchen are needed), economy (in rural areas, traditional fuels are cheaper and modern ones expensive), **e**fficiency (all govt policy urges use of more efficient fuel (**e**nvironment friendly (electricity generated with renewable energy is an example, LPG is not as it is a fossil fuel, firewood is not, dung cakes cause respiratory illness and cause more emission)).

Dr Khalid argued that anyone wishing to promote clean, modern fuels at the household level could address this challenge by increasing the accessibility, usability and collectability of a fuel and make it less expensive. Based on the 6 Es model, once Pakistan's natural gas is depleted, the rural households would switch to firewood and animal or agriculture residue. Since the urban environs are not conducive for the use of such fuels, anyone not using expensive LPG would need to be provided electricity. With half the population living in the rural areas, it is crucial to ensure that people do not switch to firewood. It was suggested that one solution may be introduction of high-efficiency electric stoves, so that even if firewood was used it was used in highly efficient stoves. However, there was agreement that such stoves would not be cheap and would also need to be protected from rain in the rural open-air kitchens.

Key solutions

- The question of micro and macro level infrastructure development would be central in contemplating transition from gas to a renewable cooking fuel in Pakistan. The existing gas distribution/transmission infrastructure is not conducive to transmitting renewable cooking fuel to households. Development of suitable infrastructure entails a cost, which has to be borne by the consumer, private businesses or public sector entities. A lot needs to happen first in terms of infrastructure before definite steps can be taken on the path to renewables.
- One solution may be creating community grid systems with distributed generation and a generation plant in close proximity to dwellings so transmission losses are minimal and electricity is generated and consumed through community grids. In Sindh, some villages linked with wind energy through community grid run on this model. Similarly, some micro hydels providing electricity to some communities through micro grids run on this model. If the rural population has to be persuaded to switch from firewood, then electricity would be the only reliable option. Developing a grid across great distance in remote areas and installing transmission lines and distribution systems may not seem feasible. Off-grid solutions or distributive generation may be viable.
- The energy-stressed households that struggle to afford the subsidized bill for their piped natural gas use cannot afford even the maintenance, let alone the upfront installation cost, of renewable infrastructure. They would not have access to renewables unless the government installs them. Any private businesses installing renewables would operate with an eye on profit. Pakistan does not have a tendency for cooperatives. Amid the scale of the need, pilots and projects like some wind or hydel power via mini-grid are hugely valuable as models, but the decision-makers have to explore where the one-time upfront cost for scaled up solutions would come from.

No roof of their own

"Focusing on energy for cooking needs is work that does not get the spotlight, even though it should. Much of the attention remains on availability of electricity. At the stage of planning, no one is focusing on alternative energy for cooking needs.

Citizens being able to bear the cost of installing renewable solutions is one challenge, but apartment dwellers living in high-rise or multi-storey buildings in densely populated cities do not even have their own roof. Micro grids are vital for renewables to work. Pakistan's renewable energy policy does look at electricity generation from clean sources. But imagination and focus have been missing in creating conditions conducive for switching to clean energy sources."

- The experts from Pakistan particularly lamented a lack of integrated energy planning in the country's power sector and faulted that for the residential sector cooking needs being entirely ignored. They said that once Pakistan's natural gas was depleted, LPG would become difficult to afford due to economic and environmental reasons. The entire burden would shift to the electricity grid in one form or another. Pakistan was not ready for that. Electricity was already very expensive. Ultimately, in search of cheaper cooking fuel, the consumers would either increase firewood use, which was already alarmingly high in Pakistan. If the current 40% of the total energy needs being met through firewood shifted to electricity, colossal quantities of imported fuel and coal would be required.
- The world carbon markets are getting developed and carbon credits can be one way to help Pakistan fund the switch to renewables. If the carbon market can be developed and project developers link that to clean cooking fuels that can yield an additional revenue source. Attracting that market here would on the one hand help meet the energy need and on the other hand an additional revenue source for financing that solution would also materialise. If carbon credits are linked with Pakistan's clean cooking choices and more commercial entities look to that, financing the upfront installation costs may be possible.

Misplaced priorities

- Across the three countries, entire power generation systems and urban cooking were overwhelmingly reliant on fossil fuels. The share of clean fuels in the energy mix ranged from almost non-existent to miniscule.
- The key informants found it worrying that while the International Energy Agency (IEA) has been saying that the next five years would see a decline in the use of oil and other fossil fuels, but that is not the case in South Asia where fossil fuel-based energy projects are expanding. That decline is not happening in South Asia. In trying to meet rising energy needs, decisionmakers regularly invest in new or existing fossil fuels projects, even generating electricity using indigenous coal and natural gas to save foreign exchange, as well as using imported oil, gas and at times even imported coal for the purpose.
- In all three countries, the emphasis on generating electricity seemed to occupy almost the entire energy horizon, to the extent that the focus on developing renewable was synonymous with developing alternative sources of electricity generation. Despite shortages, the need for largescale clean alternatives had failed to draw and retain policymakers' attention.
- Increasing electricity generation capacity on the back of fossil fuels and infrastructure deficiencies hampering energy transmission increase financial burden on the country led to accumulated capacity payments to independent producers. The energy consumer bore this cost indirectly as well as in very direct ways.
- South Asian governments had made vociferous and loud commitments to fight climate change and emission-causing fossil fuels. Lack of action on those commitments exposed a wide do-say gap that these governments and leaders were not sufficiently challenged on.
- In trying to meet rising energy needs, decisionmakers regularly invested in new or existing fossil fuels projects, particularly generating electricity using indigenous reserves of coal

etc., or natural gas to save foreign exchange, as well as using imported gas and at times even imported coal.

- At a time when fossil fuels are costing consumers in Pakistan historic highs, and when renewables are cheaper than ever, failure to single-mindedly pursue clean fuels is a no brainer.

'No one saying no to fossil fuels'

“The civil society movements resisting fossil fuels have consistently opposed scaling up of new fossil fuels projects, not setting up new infrastructure on gas and cutting back on coal use. That money should instead be allocated to renewable technology. I don't see whether that is going to be implemented, because all our countries, particularly in South Asia, are looking at exhausting in a big way whatever fossil fuel is available in our countries. The campaigns are trying to grapple with how to stop this fossil fuel use. Civil society need to be vigilant about what the government is doing, and keep a watchful eye on what needs to be done. They need to think of solutions to issues that involve so much complexity, including politics and geopolitics.”

No quick fix

- It became clear at the outset that one cannot look at the Pakistani gas grid and consider switching to renewable cooking fuels via the existing pipeline infrastructure to transmit clean cooking fuels to households across the length and breadth of the country. Before renewable energy is connected to households via a grid, much rethink and various investments are involved, some by individual consumers, some by private businesses, and others by government organisations in setting up policies and implementing them.
- In neither of the countries have renewable energy possibilities progressed to the point where clean fuels can be readily adapted, or quickly replace piped natural gas as a cooking fuel. Making clean cooking fuels scalable and affordable is a separate challenge, which is not in the spotlight in any of the three countries,
- In Pakistan and Bangladesh, the governments acknowledges that they now have more electricity generation capacity than they need, and certainly more than existing infrastructures are capable of transmitting. Despite that, investments continue to be made in fossil fuel-based generation projects, instead of clean energy or upgrade of the main grid and creation of micro grids that facilitate delivery of clean fuels to consumers.
- Generating energy through renewable may be the easy part. The actual transmission of renewable energy to the consumer is where all three countries encounter infrastructure limitations, which have impeded transitioning to renewable cooking solutions. This has largely been due to persistence with a single-grid model and a failure to investing in infrastructure, including mini grids that ensure last-mile access.
- Biogas systems have been experimented with on small scale. The ability to scale up would prove how useful it is. Unless there is a chance that they can meet the needs of a sizable section of the population, there would be little acceptability of and investment in such initiatives

Out of options

“Electricity is cheaper in Bangladesh because natural gas helps the country produce cheap electricity. However, electricity bills have risen considerably since Covid-19, with at least eight tariff hikes. Soon electricity, natural gas and LPG would cost almost the same. All of these energy sources would be costly for the low-income households in both urban and rural areas. Moving to electric stoves might be cheaper compared to LPG, but not compared to the piped domestic natural gas for households. Using electricity also includes buying expensive electric stoves; they consume a lot of electricity which will definitely inflate the power bills. The only option may be to move to efficient electric stoves, with electricity generated somehow through cheap renewable energy sources. Otherwise, there would be no affordable cooking solutions left for the low-income urban population, which cannot even use biofuels for cooking in the urban settings.”

Ignored vulnerabilities

- Poverty is rampant in all South Asian countries and low-income households need support to access conventional or renewable energy, particularly for cooking. Not sufficient thinking is happening around these issues.
- LPG cylinders are the go-to alternative to during piped natural gas supply disruptions in Pakistan, India and Bangladesh. Consumers in urban settings cannot use wood because of the size and architecture of urban dwelling. Whether they can afford them or not, low-income urban consumers have little choice except LPG cylinders, because of lack of affordable alternative.
- Civil society has paid little attention to cooking fuel scarcity and affordability issues. Much of the civil society focus has been on the use of fossil fuels in power generation.

Civil society campaigns and communities

“Campaigns for clean fuels can learn from some of the Philippines and Indonesian struggles that have gotten communities organised in a big way, mainly around power plant-related projects. Power plant-related projects are somehow a little easier to get people organised around because of the complexity of issues. It is as important to see the different kinds of projects and understand the impacts on communities.

In India, gas reserves are being explored between coal beds through the process of fracking. Local communities have complained about the lack of usable water and how the rivers are getting polluted. Some affected communities want to file cases against the companies involved to get compensation. Such situations need tackling in a manner responsive to the local communities’ sentiments. These issues should also be addressed on a project-to-project basis, since an onshore exploration would be different from a pipeline and an offshore exploration different from gas exploration around coal beds; gas leakages present a whole different spectrum of issues. Every infrastructure needs to be dealt with in line with the issues it throws up for the local communities. Courts also need to be pushed to look at some of these issues, because it is no one-off thing. With all these exploration and pipeline projects going on in difficult terrain, it is important to look at what happens when that infrastructure fails.”

- Piped natural gas appeals to consumers because it is still cheaper than other cooking fuels, is convenient and needs little maintenance cost compared to LPG cylinders.

However, with consistent rise in LPG cost, the energy accessibility crisis has now become an affordability crisis for low-income households.

- Even if, and it still is a big if, an efficient way is found to transmit electricity generated through renewables to the last mile as a cooking fuel, smart thinking would be needed to make not only the fuel affordable for low-income households but also the electric stoves and associated paraphernalia.
- With dwindling piped natural gas access, pressure on wood and other biofuels bodes ill for natural forests and the health and well-being of consumers using such fuels.
- Across the three countries, entire power generation systems and urban cooking are both overwhelmingly reliant on fossil fuels. The share of clean fuels in the energy mix ranges between almost non-existent to miniscule. Clean alternatives are not being actively pursued nor is the required infrastructure present for those
- Making sure that subsidies ensured access to cooking fuels for such households despite their low purchasing power, and not creating inefficiencies in the system at the same time, was a challenge. But equity, equality and socio-economic justice demanded provision of such protection to those in need. Subsidies should be targeted and based on empirical studies to determine the households that are in need. Charging high earning and poor households the same steep price for LPG needs to be resolved through targeted subsidies and innovative price mechanism.
- If much of a household's income is spent on energy, with little left for education, health and quality of life, there would be serious long-term impact. Such things needed to be looked at during the energy planning stage and demanded forecasting. The current planning ignored the impact of depletion of a major fuel and what impact it would have on electricity demand.
- In 2007, civil society protests in Pakistan during when energy shortfall compelled the govt to address the electricity crisis by expanding capacity. Where the civil society, government and planners slipped up was that the solution presented to overcome that crisis was not a long-term one. They failed to register that the accessibility crisis could transform into an affordability crisis within 10 years, with independent power producers (IPPs) entitled to capacity charge, for electricity that was not even produced. The civil society should be more watchful during the journey towards renewables, to ensure that the transition is inclusive and equitable.

Conclusion

Nothing about the growing challenge of cooking fuel scarcity in Pakistan is straight forward. Dealing with this at a time of severe financial crunch when humanity is as close to Armageddon as it has ever been makes this a near-perfect storm. This should have been enough for urgent redressal measures. Unfortunately, that has not been the case.

In hindsight, Pakistan was already in urgent need of alternatives to its main cooking fuel all those years ago. This was before the climate crisis brought attention to the need for cleaner, renewable fuels. Understanding how the natural gas shortage has snowballed into the present crisis is also to grasp why finding solutions has been so tough for the authorities, the consumers and the civil society.

Lack of capacity and resources for all three stakeholders and scant interest by successive governments is certainly a factor. The growing demand, not least due to unchecked population growth, and failure to take proactive steps despite alerts for over a decade has got us in the hole we find ourselves in today.

Armed only with hope and at times good intentions was never going to be a solution. That is plain for all to see today. Pakistan is not the only regional country facing such challenges. But it is by far the least prepared and able to effectively respond because of its financial circumstances and slumber in effective policy formulation and timely implementation.

The only silver lining is that status quo is no longer an option. The dramatic escalation in the natural gas shortage in Pakistan in the 2023 alone demonstrates why neither the authorities nor any of the other stakeholders can afford to be fence-sitters any more. Consequently, if tackled sagaciously, the crippling gas and general energy challenge could present a valuable opportunity for Pakistan to wean itself away from fossil fuels.

This is not and should not be Pakistan's fight alone. The energy grids everywhere are dependent on imported fossil fuels, constant tariff and dirty fuels imperil the low-income groups directly and indirectly affect all humanity through harming the climate. Failure to transition urgently would condemn humanity to a devastating and irreversible combination of energy poverty and what the UN secretary general has called the era of global boiling.¹⁶

Since Pakistan is situated in a vulnerable geographical location, where the intensity and frequency of extreme weather events remain high, appropriate measures to protect the most vulnerable population should always have been a priority. However, Pakistan would certainly require international assistance and cooperation to succeed in its efforts.¹⁷

The stakeholders would only have themselves to blame if in the 2023-2024 winter and any winter thereafter they are not closer to realistic, sustainable and clean solutions to the gas crisis than they were at the same time the previous year.

¹⁶ Hottest July ever signals 'era of global boiling has arrived' says UN chief, UN News, 27 July 2023, <https://news.un.org/en/story/2023/07/1139162>

¹⁷ <https://www.energyupdate.com.pk/2022/04/11/pakistan-5th-most-vulnerable-country-to-climate-change-reveals-germanwatch-report/>

Recommendations

For the government

- Urgently seek international cooperation and assistance to deal with scarcity of cooking fuels and indeed all energy sources.
- Learn lessons from the experience of countries who have progressed away from fossil fuels and transitioned towards renewable energy sources, particularly cooking fuels.
- Engage in integrated energy planning could not be stressed enough. Moving towards affordability of clean energy sources is a long-term solution, where the production process would need to be indigenous and communities empowered and imparted awareness for community-based solutions, including installation of disaggregated solar units to meet the cooking needs. Community grids can be developed but that would be a long journey. Effective awareness raising would be needed and financial institutions would have to step forward.
- Focus on both generation and transmission of renewables, including infrastructure expansion that ensures last mile access, where necessary through establishing mini grids. Going forward, the masses should be kept informed not just about general ambitions but specific timeframe and practical steps for ensuring last mile access for diverse renewable energy sources that are mindful of the country's diverse housing landscape.
- Benefit from carbon markets that incentivize climate action by enabling parties to trade carbon credits generated by the reduction or removal of greenhouse gases from the atmosphere, such as by switching from fossil fuels to renewable energy or enhancing or conserving carbon stocks in ecosystems such as a forest.

For CSOs

- Keep the spotlight on the unmet cooking needs of low-income households, within the larger endeavour to push for clean and affordable energy access of vulnerable sections.
- Demand that instead of expansion in fossil fuel projects, that investment should be made in renewables.
- Vigilantly guard against short-term solutions becoming long-term problems, an example being the capacity payments to independent power producers (IPPs) causing a severe electricity affordability crisis.
- Draw attention to the kind of policy measures that abate dependence on fossil fuels as well as the practical steps that are necessary for transitioning to clean cooking fuels and equitable / affordable access to poor households.
- Highlight through research and pilots the potential for a diverse range of clean cooking solutions that are capable of being scaled up.
- Engage the communities affected by energy poverty amid the combined crisis of cost of living and climate change, ensuring that civil society solutions are mindful of and guided by the communities' demands, needs, and financial and other circumstances.
- Provide voice to communities demands and demand the authorities and planners consistently include their perspective in all stages of energy management and

transition, including generation, transmission, last-mile access, tariffs and environmental aspects that affect their lives.

- Enhance, through collaborations in Pakistan and beyond, the requisite knowhow among own ranks for effective advocacy for transitioning to viable clean energy solutions.
- Benefit from the Universal Periodic Review process of the HRC and other international forums to draw attention to the issue with a view to facilitate effective solutions.
- Reach out to and encourage companies and individuals to benefit from Pakistan's contributions in carbon markets to compensate for their greenhouse gas emissions by purchasing carbon credits from entities that remove or reduce greenhouse gas emissions.

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