Resolving environmental conflicts in Pakistan's energy policy

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"Civilization is in no immediate danger of running out of energy or even just out of oil. But we are running out of the capacity of the environment to absorb energy's impacts without risk of intolerable disruption."

John Holdren, 2003.[1]

Introduction: a global perspective on energy and industrial infrastructure

Pakistan's development predicament is emblematic of many countries that are undergoing rapid growth in energy demand from demographic pressures as well as more intense industrialization. While such growth can certainly be a sign of progress and potentially a means of poverty alleviation, it can also lead to errant euphoria and rash decision-making by policy-makers. At such times of ambition and anxiety, environmental concerns are regrettably relegated to "low politics," and dismissed with pleasantries as short-term gains are calculated on the basis of prestige projects such as large dams and sky-scrapers.

Bursts of infrastructure development require enormous amounts of energy and without careful planning such efforts can leave countries resource-depleted without much economic gain. The fate of capitals such as Abidjan or Buenos Aires that might boast superb buildings and roads but distressed economies must be considered by the infrastructure enthusiasts. Similarly enormous energy capacity projects such as the Caborra Bassa dam in Mozambique reflect how infrastructure without proper environmental planning and a resolution of indigenous conflicts can decay and deteriorate and become more of a liability than an asset.[2]

Even in China, which is often considered the hallmark of rapid industrial development in Asia, the connection between environmental harm and long-term economic decline is now being considered by the government. On April 16, 2006, President Hu Jintao made an alarming admission that China is perhaps growing too fast at the expense of its environment. The statement was made during a meeting with former Taiwanese opposition leader Lien Chan, as they discussed prospects for peace in the region.

While many Pakistani policy-makers often talk about emulating mainland China's development path, perhaps there are many lessons that they might instead learn from

Taiwan in terms of a relatively green growth. A composite environmental performance index developed by Yale University's Center for Environmental Law and Policy ranked Taiwan two scores ahead of the United States in its environmental performance. China scored 70 ranks below Taiwan. Pakistan, India and Bangladesh were all in the lowest quartile, largely due to poor air quality indicators that are linked to their energy policies. Sri Lanka and Nepal faired slightly better on account of better environmental health indicators but still far below environmentally progressive countries such as Malaysia and Costa Rica, which were in the top quartile.[3]

Taiwan has managed to accomplish growth despite a very large defense budget — the usual excuse for slow development by countries like Pakistan. While the country's economic and environmental performance might have been even better without its massive arms purchases, at least the island state has managed to follow a positive development trajectory. Studies by the Chinese government have shown that asymmetry of development and environmental decline are causing economic losses. One such study cited by the New China News Agency says the country's Western provinces will suffer an annual loss of 15 billion euros, or 13 percent of the region's GDP, because of environmental damages. President Hu Jintao's statement reflects a realization of these economic consequences.[4]

Keeping in views such global comparative perspectives, it is pivotally important that Pakistan's energy policy develop its resources with utmost care for ecological indicators. This essay attempts to highlight some of the current

An ecological critique of Pakistan's energy policy

The most fundamental concern with Pakistan's current energy policy trajectory stems from how success is being defined by the government. There is a perception that somehow reaching our energy extraction potential is necessarily a positive indicator of development.

Such definitional mistakes have led to major environmental policy concerns in yesteryears. For example, during the early decades of the twentieth century the Bureau of Reclamation in the United States had defined "conservation" of resources as harnessing every kilowatt of energy that flowed through a river. There was a perception that not harnessing such energy and letting the water flow to the ocean was "wastage." The bureau has since then realized that conservation is not synonymous with extraction but rather efficient usage of resources with minimal impact on the systems that sustain those resources in the first place.[5]

Here are some specific metrics that appear to be misleading energy policy-makers in Pakistan, based on a recent presentation by the country's senior energy advisor to the Prime Minister:[6]

Per capita consumption is low: Use of unrefined macro-indicator planning is pervasive in Pakistan and the country continues to consider consumption as a direct indicator of

success. While there may be some correlation between higher consumption and industrial success, using this as a metric creates perverse incentives for excessive energy usage that might even be wasted. Therefore in benchmarking performance against regional economic competitors the use of "per capita consumption" is highly misleading. Indeed, if per capita consumption is low that could also be considered a measure of success in terms of efficiency of processes. For example Morocco has a lower per capita energy consumption of 372 kilograms of oil equivalent per person per year (kgoe) than Pakistan's metric of 471(kgoe).[7] However, Morocco has a better performance than Pakistan on the human development index as well as in terms of industrialization indicators. Instead of using consumption as a metric of success, development indicators in terms of industrial output per units of investment should be used as metrics of success to prevent errant policies that artificially increase consumption.

Efficiency defined in terms of units of energy per GDP: Aggregate economic metrics such as the gross domestic product (GDP) are useful to some degree in providing a very rough gauge of economic activity in a country. However, the use of such indicators for benchmarking energy policy can again lead to skewed outcomes. For example, the Pakistani government continues to define efficiency of energy in terms of energy input divided by GDP (also referred to as energy intensity), when most countries have moved to more refined measures that take into account the climate and sectoral mix of the country in question. For example, countries in extreme climates may have a much higher energy intensity due to energy consumption for heating or air conditioning. At the same time, some countries may have a much higher contribution of the service sector than of high-energy industry in promoting GDP which would lead to low energy intensity. The ultimate policy goal from an environmental perspective should be to achieve a mix of low energy-intensive economic growth sectors. A measurement of efficiency should be based on an evaluation of how much energy is being used to produce a given industrial output or useful end product (such as lumens of light for domestic usage) and how much is being lost or wasted.

Supply-side policies driven by GDP growth targets: The aforementioned metrics of energy ultimately lead to a set of policies that have tunnel vision towards economic growth without considering whether such growth is sustainable. To make matters worse, GDP growth targets are set and then existing energy usage ratios are used to calculate what amount of energy would be required to meet those growth targets. In one set of scenarios developed for the government, conservation was the last policy scenario considered in which a modest 9% reduction through reduced demand and 15% technical savings for power generation were assumed.[8] However, there is little attempt by policymakers to focus on how demand might be altered and made more efficient to meet the existing supply constraints. This supply-side approach stifles innovation towards environmental consciousness or energy conservation while leading to massive investments in new energy generation capacity at the expense of ecological factors.

Skewed cost-benefit analyses: Policymakers are often presented cost-benefit analysis in a stylized objective fashion when in fact the embedded assumption in such analyses can reveal enormous inconsistencies and a departure from ecological constraints. For

example, usage of high discount rates being used to calculate the benefits of environmentally beneficial projects such as solar and wind may render them uncompetitive in terms of cost even if they are likely to be more secure in the long-run.

Also, there are assumptions about energy imports being more expensive than domestic production because of existing regulatory constraints. However, if the cost of production, including environmental impact are calculated, imports will not necessarily be more expensive than domestic production. This is clearly the case with natural gas imports from Central Asia being more economical as well as having much less aggregate environmental impact in project development and air pollution concerns than local coal mines. While the security of energy supplies is a vital argument against imports, geopolitical circumstances are moving towards greater interdependence between countries on matters of energy as discussed later in this essay.

The peril of prestige in nuclear power

The cost-benefit analyses with regard to fuel cost for nuclear energy is particularly troubling. In most cases, the capital costs are the major component of such analysis whereas operating and maintenance costs and fuel costs are frequently underestimated. The price of uranium fuel can fluctuate dramatically as we can see from observing the past five years of the price of uranium oxide which was around $6 per pound in 2001 and has jumped to over $40 per pound in 2006.[9] Furthermore the cost of appropriate disposal of nuclear wastes is frequently neglected. While reprocessing is often presented as an alternative, in reality reprocessing does not reduce waste but can only reduce the amount of mined uranium. France, among the world's leading nuclear energy users, spends about $1 billion extra per year on reprocessed plutonium fuel compared to uranium fuel.[10] Even the relatively promising thorium reactors for which India has the second-largest ore reserves of monazite in the world, first require the thorium to be converted to fissionable uranium (233).

Plutonium fuel obtained by reprocessing (also called mixed-oxide fuel or MOX) is two to three times more costly than uranium fuel. Apart from the prestige of being a nuclear energy producer, increased investment in nuclear power makes little economic sense. By playing around with discount rates proponents of nuclear energy can sometimes come up with ostensibly cost-effective comparisons with other fuels but there is little doubt that the construction cost of a nuclear power plant is inordinately more than any other source. In a recent study by the Massachusetts Institute of Technology, the all-inclusive cost for a nuclear power plant operating over 40 years is 6.7 cents per kilowatt-hour, which is almost twice the cost for natural gas at current prices.[11]

And all these arguments bode negatively for nuclear even without considering its environmental and human health impact. Nuclear energy is also not very reliable at this stage since plant upgrades can take years to accomplish. For example, Pakistan's only nuclear generator, the Karachi Nuclear Power Plant (KANUPP) was shut down for refurbishment in December 2002 after exhausting its 30 year design life and is still undergoing upgrades before being ready to reach capacity again. The environmental

challenges of managing radioactive mining has become evident by the recent case of the village of Baghhalchur in rural Punjab, Pakistan. From 1978 to 2000 this region provided the Pakistani Atomic Energy Commission (PAEC) with yellow cake for the country's nuclear program. The half a million tribesmen in this region near Dera Ghazi Khan, many of whom are Baluchi, have leukemia rates that are six times the national average. Even former employees of the PAEC, such as Professor Khalid Rashid of Bahria University have publicly acknowledged that there are legitimate concerns of radioactive pollution that need to be investigated.[12] In a rare show of support for environmental enforcement the Pakistani supreme court agreed to hear the petitions of the residents of the area in March, 2006 and a decision is pending.

The ostensible benefit of nuclear energy in terms of reduced greenhouse gas emissions is also misleading since the energy required to mine uranium and the maintenance of reactors shows that there is indeed a net contribution of greenhouse gases from nuclear energy as well.[13] While Pakistan and all other countries should keep the nuclear option open it must always be a last resort and probably requires several more decades of research on waste management solutions and cost efficiency before being viable at a large scale.

Humbling the hysteria over hydropower

The prestige factor with large-scale hydropower also appears to be resonating with the Pakistani government. While the advantages of dams such as Tarbela and Mangla at the time of construction are widely appreciated, the long-term viability of these projects remains questionable. In its case study on Tarbela dam, the World Commission on Dams generally concluded that the dam had made a positive contribution to the Pakistani economy, particularly the energy sector. However, what is less clear is whether the dam and other such large irreversible hydropower projects can sustain benefits over the long-run in comparison with alternative energy sources. The useful life of a dam such as Tarbela is about 100 years for which around 100,000 people were displaced, not to mention the inundation of 23,000 hectares of arable land. Even the increase in cultivable land requires further ecological study in cost-benefit analyses since in many cases mismanagement of the irrigation schemes led to salinity and water-logging and eventual loss of arable capacity in 22% of the Indus basin.[14] Evaporation losses can greatly diminish irrigation benefits as well, and the flood control advantage of dams must be balanced with the risk of dam failure in high risk zones.

In particular seismic hazards and the vulnerability of such sources in times of armed conflict and droughts also needs to be considered, specially following the Kashmir earthquake of October 2005. The vulnerability of dams to earthquakes remains considerably high throughout this region as exemplified by numerous studies of faults in the area.[15] A large dam failure can be utterly catastrophic as illustrated by China's experience with the collapse of the Banqiao reservoir dam in 1975 which killed over 175,000 people and displaced 11 million residents. Even though China is proceeding with the Three Gorges project on the Yangtze river, despite the refusal of the World Bank to

fund, the Chinese are having second thoughts about some of their other dam projects including a moratorium on 13 proposed dams on the Nu River.[16]

Indeed, even the positive impacts of reduced greenhouse gas emissions of large dams is being questioned since there is potential for methane generation from dam reservoirs. It is for this reason that dams above 10MW generating capacity were initially excluded from the list of eligible renewable energy sources presented by the European Union to the Intergovernmental Panel on Climate Change in 2000. While this list was subsequently not accepted by all countries, the World Bank has admitted that hydropower projects greater than 10MW have "declining commitments" from the international community.[17] It is thus alarming that the Pakistani government is now considering five new large hydropower projects. The Bhasha (Diamir) Dam whose construction has already been inaugurated by President Musharraf would be comparable in MW capacity to Tarbela at around 3500MW. Extensive community opposition is already palpable around this project, reminiscent to earlier concerns over the Kalabagh dam, and there are growing concerns that the conflicts at the micro-level as well as distributional concerns between provinces may further destabilize the country.[18]

As compared to large-scale hydropower, small-scale hydropower is a highly attractive renewable solution and must be encouraged across Pakistan. Such dams have the advantage of being more flexible to engineering redesign or removal if necessary as they age. There are indeed promising possibilities in this regard for smaller rivers across Pakistan such as the Kunhar, the Swat, and Chitral. While aggregate hydropower capacity from these rivers might not ostensibly match the potential from large projects, the overall efficiency in distribution systems can often make them more attractive.[19] There is much to be gained from pursuing a sensible policy on hydropower so long as we remember that "bigger" is not always "better."

An agenda for change

Despite the aforementioned grim critique there are some relatively quick policy interventions and compliance measures which can be undertaken to improve Pakistan's energy prospects. The country has adequate human and natural resources to meet these demands for the foreseeable future. As relations improve with its neighbors and regional security the long-term outlook can indeed be very positive as the following measures are considered domestically:

Auditing energy consumption

The first step to solving any technical problem to is to have a better estimate of the status quo. At present there is hardly any data available on the energy performance of Pakistan's industry. Therefore a detailed audit of industries and households in urban and rural areas is needed. A modest study of energy conservation potential including audits was performed by the government in the late eighties which included industrial units, residential and commercial buildings and appliances, turbines and tractors in agriculture and passenger and freight vehicles. Apparently there is renewed interest from the Asian

Development Bank and the German development agency (GTZ) to revise this study which should subsequently be an important tool for energy policy-makers in Pakistan.[20]

Individual studies of energy consumption, particularly in rural areas of Pakistan have revealed some counterintuitive insights which the government might also consider. For example, one doctoral study of rural energy consumption in Punjab found that electricity is only used for lighting which is a negligible proportion of the total household energy consumption, and the researcher concluded that ""a route of supply side energy policy that only encourages increasing the supply of energy resources, most often based on inaccuracies extrapolations of past growth or historic elasticity of energy supply.[21] Food preparation, water heating and animal-warming are main demand areas in rural areas and traditional fuels continue to be preferentially used even when grid power is made available. Some of these fuels may indeed be very problematic when used in crude form, such as dung, but quite workable with small technological innovations that filter out pollutants such as inexpensive "clean" stoves that have been used in Mexico and China.[22] A comprehensive energy audit would reveal the details necessary to implement such technological efforts and provide more effective and targeted solutions.

Conservation pricing and enforcement

Creating proper economic incentives to ensure conservation behavior on the part of consumers is an essential ingredient to effective energy policy. First there needs to be effective enforcement of energy usage to prevent theft and "free riding" of the system. The government has begun to enforce laws against such thefts but considerably more compliance assurance is needed through police action and prosecution where necessary.

Furthermore, recent analyses conducted at the Lahore University of Management Sciences has revealed that there is allocative inefficiency in Pakistan's manufacturing sector characterized by "the absence of equality between marginal rates of substitution and factor price rations."[23] In other words the pricing of energy in Pakistan's manufacturing sector is leading firms to use resources inefficiently. Ensuring that such pricing concerns are addressed will reduce the load on the system considerably and be a win-win solution for industry as well that will have more dependable supply.

Using technology to overcome losses in the system

By one estimate of Pakistan's private energy systems, thermal efficiency in energy generation system tends to be around 32-35% when the global average is around 54%.[24] We could thus have a 60% improvement in energy generation by simply switching to newer production technologies. Distribution losses in these systems tend to be around 23%, whereas the technical losses should be no more than 3%. By this estimate Pakistan could increase its energy availability by a staggering 80% simply through more efficient distribution systems that could be updated at a fraction of the cost of mega-energy generation projects being proposed.

Furthermore, these numbers do not even account for energy conservation measures in buildings and factories that would result from proper energy audits across sectors mentioned earlier. There are some glimmers of improvement in the improvement of energy efficiency through more effective harnessing of biofuels as revealed by one comparative study of the region which compared Pakistan, India, Bangladesh and Thailand.[25] Indeed there are many lessons on efficient technological applications, specially at the rural scale which can be gleaned from such comparisons.

Giving precedence to renewable sources

Apart from natural gas, there is tremendous potential for wind and solar energy across South Asia that has hardly been explored. With funding from the Asian Development bank, Pakistan's government has set a target of generating 10 percent of its electricity needs using renewable energy resources (approximately 2,700 MW) by 2015. The government has established an Alternative Energy Development Board (AEDB) and will launch a Renewable Energy Project that will invest in developing electricity sources for rural areas. However, this target is woefully inadequate based on.

Based on comparative data from India, Pakistan as the potential for solar and wind energy that far exceeds this goal. There is tremendous potential for wind and solar energy across South Asia that has hardly been explored. According to Winrock International, less than 10 percent of India's estimated wind energy generation potential of 45,000 MW has been harnessed so far. Solar energy potential — an estimated 300 days per year of full solar exposure in many areas of the country — is enormous as well.[26] While the Pakistani government has started to develop some wind and solar projects in Sindh and Baluchistan as highlighted by Chapter X (Pandey) in this volume, these projects continue to be relegated to the periphery rather than being given precedence over the larger infrastructure projects.

Mining with maturity

There has also been a renewed interest in mining coal in Pakistan. While coal is abundant in Baluchistan and parts of Sindh, the quality of the deposits is a matter of great concern. The contribution of coal to Pakistan's electricity generation has declined from 60% in 1947 to 8% currently but this should not be a cause for lament by the government. Some high quality coal deposits when harnessed with appropriate technologies are indeed viable. However, there must first be appropriate regulatory safeguards for safety and health in mining the coal as well as protection for sensitive ecological areas such as Kirthar National Park.[27] At present Pakistan has not been part of numerous industry-wide efforts to improve the performance of the mining sector such as those launched by the World Business Council on Sustainable Development. Any new mining projects must adhere to such standards before being rushed through for approval.

Human security versus securing energy resources

Since much of Pakistan's minerals are in the sparsely populated province of Baluchistan or in the highly heterogeneous province of Sindh, there are also serious concerns about asymmetric development and benefit trajectories for the country. While it may be considered environmentally fortuitous that the mineral reserves of the country are in a region of lower population density to mitigate aggregate risk, the negative differential distribution of benefits to Baluchis from the minerals has led to serious grievances.[28] Instead of making the minerals appear as a distributive conflict, the government should use the revenues being generated as a means of addressing the economic dispariaties that exist in the province. Such disparities cannot be alleviated simply by large infrastructure but rather through educational capacity-building for the Baluch to ensure employment security in the long-term. Otherwise, there is a danger of capital flight and a continuation of asymmetric development.

Contrary to common perception, mining companies are often willing to operate in politically insecure locations so long as the government is supportive of their economic interests. Unlike other industrial sectors the location of a mine is determined by geology far more than by individual choice. Resource companies are more afraid of nationalization and uncompetitive government behavior than they are of ethnic tensions. When queried at a recent shareholder meeting about the $100 million investment that Barrick Gold has made in the Reko Diq copper-gold mine in Baluchistan in spite of ethnic tensions, the CEO Peter Munk responded: "If I had my choice between dealing with (Venezuelan President Hugo) Chavez, or (Bolivian president Evo) Morales, or Aziz (the Pakistani prime minister), I know where I would put my money."[29]

However, it is important that the government not misuse this complacence to ethnic strife on the part of mineral investors, since at the end of the day they will still have to spend enormous amounts of money for security which could be avoided by constructive engagement with the community. Furthermore, the demands of the indigenous Baluchis must not be conflated with the insurrection of tribal elite such as Nawab Bugti's family.

The energy factor should also be used as a means of fostering cooperation not only between provinces but also regionally between South and Central Asia. The proposal for various gas pipelines have the potential to not only provide relatively clean and environmentally manageable energy to the region, but also to foster cooperation.[30] Interdependence is an attractive incentive for cooperation. Nevertheless, in this case, political stability is far more consequential for success than with individual mines. The potential for sabotage along pipelines can paralyze projects and constructive engagement with all players is essential to the success of these projects. There are lessons which Pakistan can learn from recent projects such as the Baku-Tblisi-Ceyhan pipeline from Azerbaijan to Turkey via Georgia about how to manage such matters. In that case there were environmental challenges that led to conflicts while the political negotiations brought the countries closer.[31] A willingness to engage with communities and stakeholders, even if this may delay the project, as well as political compromise between

countries must occur simultaneously for such projects to succeed. However, if appropriately managed they can indeed lead to greater cooperation and stability.

Conclusion

Pakistan has tremendous potential for having a sustainable energy policy, if appropriate planning measures are put in place. However, the current development trajectory that the government is pursuing raises serious ecological concerns which inevitably translate into impaired development in the long-term. The first step towards an environmentally conscious energy policy would be to have a nation-wide audit of current inefficiencies in the generation and distribution system for power. This must be followed by appropriate pricing and compliance enforcement to prevent losses and perverse incentives for wastage of energy. Once these conservation matters have been addressed, the remaining shortfalls should first be met with plans for expansion of renewable sources, mainly, wind, solar, biomass and small-scale hydroelectric. Large hydroelectric generation projects should only be considered after the guidelines enunciated by the World Commission on Dams have been followed, rather than hastily pushing forward such projects under the banner of national pride or patriotism. Research on environmentally safe ways of harnessing nuclear energy and disposing of radioactive wastes should continue. However, at present, expansion of nuclear energy installation capacity should be a last resort. This argument is premised not only on ecological concerns but also on economic factors. Transboundary gas pipeline projects have the potential for augmenting Pakistan's energy prospects while also fostering regional cooperation. Following lessons of similar projects elsewhere with which the World Banks has considerable experience, Pakistan can gain cost-effective sources of natural gas. However, these efforts must be undertaken with special reference to prioritizing benefits for Sindh and Baluchistan's indigenous population. Short-term planning on energy policy will lead to rash decisions that might lead to a decline in economic growth as well as environmental indicators in Pakistan. Conversely, human security and environmental risk management, coupled with a long-term approach to energy planning can sustain the enviable economic growth rates that we are witnessing today.

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