Chapter 2
Domestic Constraints to India's Energy Security

Lydia Powell

India's energy security 'problem' has traditionally been framed as one of absolute scarcity. The gap between the large and growing need for energy on the one hand and dwindling domestic energy resources on the other is often used to illustrate ever increasing scarcity. This narrative of scarcity assigns blame for India's energy insecurity primarily on nature. The basic premise of this narrative is that geology and geography that denied India key energy resources such as oil and gas make India energy insecure. Many of India's energy policy documents reflect this line of thought. The Integrated Energy Policy report observes that 'India's reserves of oil, gas and uranium are meagre' and that 'even though coal resources are relatively abundant it is regionally concentrated, it is of low calorific value and high ash content and the amount of coal that could be extracted with available technology is limited' (Planning Commission 2006). It further adds that 'even though hydro power potential is significant, it is small compared to India's energy needs and that its contribution to India's basket is likely to remain small' (ibid.). The section on energy in India's 12th five year plan (2012–2017) begins with the statement that 'India is the fourth largest consumer of energy after the USA, China and Russia but it is not well endowed with abundant energy resources' (Planning Commission 2012).

These statements are not factually incorrect but the implied message that poor resource endowment is among the most important reasons for India's energy insecurity is less accurate today than it may have been three decades ago. More importantly, the framing of India's energy insecurity as a problem of absolute scarcity and measuring it solely in terms of its share of imported energy has not facilitated progress. India is as insecure as it was five decades ago even if measured narrowly in terms of share of imported energy in India's energy basket. In fact India's vulnerability to even small shifts in the global energy market, especially in terms of the price of globally traded energy sources has increased. In this light, this paper will argue that India's dominant discourse on 'energy insecurity' framed by the narrow context of

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India's natural energy resource endowments and addressed through grand external strategies that primarily seek to make up for poor domestic resource endowment through acquisition of resources around the world are inadequate to meet the goals of energy security. It will argue that mundane domestic constraints in the production and supply of coal, oil and gas in the recent past have undermined India's energy security far more than any inadequacy in resource endowment.

2.1 Brief Energy Profile

India matches China in population size but its energy consumption is only about a fourth of that of China and it is likely to be just about half that of China even by 2035 (International Energy Agency 2013). Given the relatively low base, growth in energy demand in India in the next two decades is likely to be faster than the growth in energy demand in China, the world's largest energy consumer (ibid.).

Like China, India's energy profile is dominated by coal and this trend is likely to continue for the next two decades (Fig. 2.1). Coal accounted for about 50 % of commercial energy generation in 2001 and its share is likely to increase to 57 % by 2022 (Planning Commission 2012). The share of oil in commercial energy is expected to decline from 37.5 % in 2001 to 23.3 % in 2022 and the share of natural gas in commercial energy supply is expected to increase from 8.5 % in 2001 to 13 % by 2022 (ibid.).

Overall the share of fossil fuels in India's commercial energy supply is expected to fall marginally from 93 % in 2001 to 90 % in 2022 on account of an anticipated increase in nuclear power (ibid.). While renewable energy is expected to grow ten-fold in the next decade, its share in total commercial energy supply is expected to be less than 2 % and its share in total primary energy supply (commercial plus non-commercial energy supply) is expected to be less than 1 % (ibid.). India's imports consist mainly of oil but the import of coal and natural gas are growing rapidly (Fig. 2.2).

India's per person energy consumption of 614 kg oil equivalent (Kgoe) in 2011 is 109th among 137 countries listed in the World Bank's database (World Bank 2011).

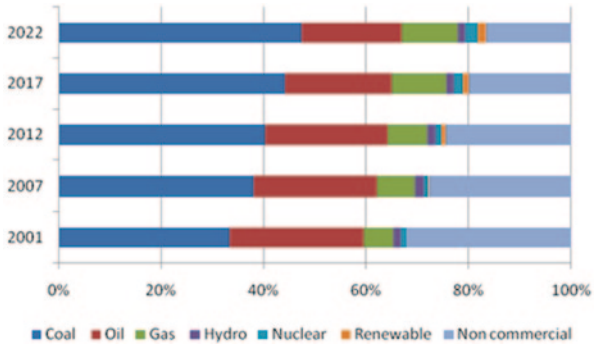

Fig. 2.1 Primary energy shares 2001–2022. (Planning Commission 2012)

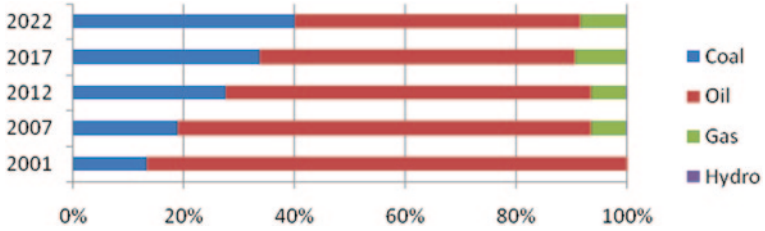

Fig. 2.2 Share of imports in India's commercial energy basket. (Planning Commission 2012)

Though 67% of rural households in India are officially connected to the electricity grid, average consumption of electricity is only 96 kilowatt hour (kWh) per person per year in a rural household (Planning Commission 2012). This is less than a tenth of the 1000 kWh per person per year said to be required for decent living standards (United Nations 2010). Two observations can be made at this point. India's energy profile at the national level is large enough to put it among the top five energy consumers, but its profile at the individual level is small enough to put it among the poorest few nations. This is an important distinction that influences policies on energy. The large share of people who do not have access to modern forms of energy such as electricity and liquid petroleum gas (LPG) make State led redistributive policies inevitable in the energy sector. But the large volume of India's energy needs make market led institutions a necessity especially in the light of the fact that most of it has to be procured from the global market. This puts the market in continuous conflict with the State. This conflict between the pursuit of equity by the State and efficiency by the market is not unique to India but the scale and intensity of the conflict in India sets it apart from similar conflicts around the world. Those that require State intervention in accessing energy resources and energy related services such as electricity and transportation outnumber those who can access these services through the market by a huge margin. This gives rise to two conflicting demands: one for the exit of the State by those who benefit from instruments of the market and the other for continued intervention by the State by those whose ability to procure services through the market are limited. Institutions of democracy have thus far resolved the issue in favour of the State but ironically this has only increased the pressure of the market.

2.2 Constraints in Primary Fuel Supply

2.2.1 Coal

Coal is the primary energy source as well as the primary fuel for power generation in India. Coal accounted for about 59% of installed capacity for power generation but it accounted for about 77% power actually generated in 2011–2012 (Fig. 2.3) (Central Electricity Authority 2013b). About 74% of coal produced in India is consumed by the power sector (Planning Commission 2011).

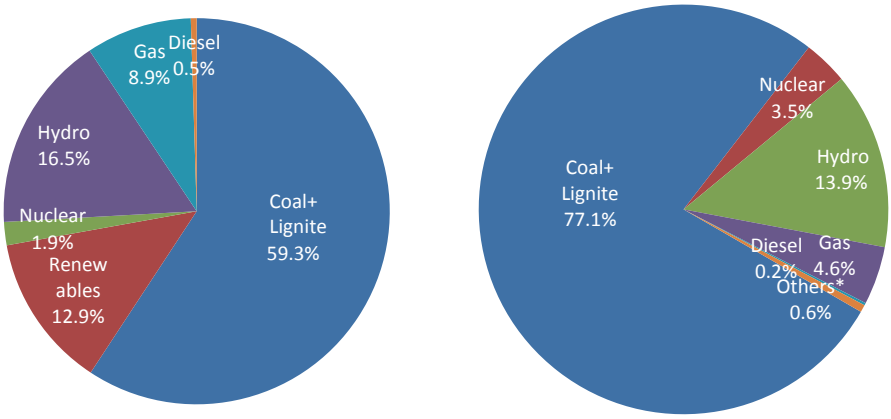

Fig. 2.3 Fuel-mix in power generation 2013–2014. All India installed capacity (245393.5 MW) 31.3.2014. Gross electricity generation (967.15 BU): 2013–2014. (Central Electricity Authority 2014)

Coal reserves in India may not be as abundant as they were originally believed to be, but India is still among the top five countries in which most of the coal reserves are concentrated (International Energy Agency 2012). Estimates of coal reserves vary widely depending on the source and on how resources and reserves are defined.

As per estimates quoted in the 12th Plan document cumulative (including coal mined so far) reserves of coal in India are 119 billion tonnes (BT) which doubles to almost 290 BT if prospective reserves are added (Planning Commission 2012). However estimates by international agencies such as the one by the German Federal Institute for Geosciences and Natural Resources (BGR) used by the International Energy Agency (IEA) put reserves at a more conservative 60 BT (International Energy Agency 2013). Even if we go by more optimistic estimates of the Indian Government, we can see that reserves to production ratio for coal has fallen from over 200 years to about 100 years (Fig. 2.4) when reserves already produced are accounted for and remaining reserves are qualified on the basis of technical and eco-

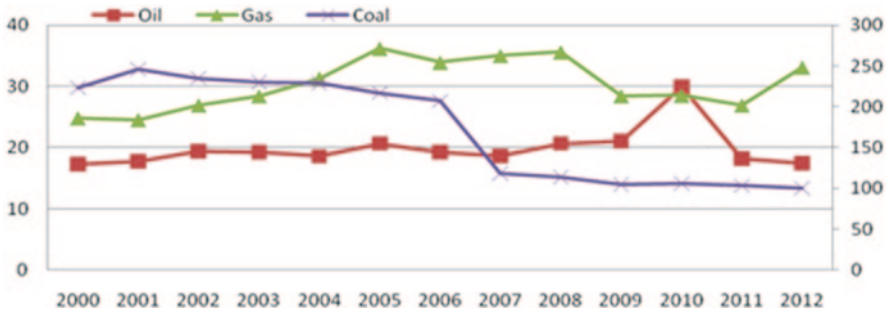

Fig. 2.4 India reserves to production ratio 2001–2022. (Right vertical axis for coal, left axis for oil and gas). (British Petroleum 2014b)

nomic recoverability under the United Nations Framework Classification (UNFC) of energy and mineral resources. By some estimates India's coal reserve estimates are less than 30 BT which gives a reserves-to-production ratio of 19 years (Chand and Batra 2011). This is alarmingly low compared to the 100 years that is quoted in the 12th Five Year Plan report. Where the truth lies as far as India's domestic coal reserve estimates are concerned appear to be less important in the short term when compared to constraints that hold up domestic production of coal as the following section will illustrate.

India is currently the world's third largest coal consumer and the world's second largest coal importer (International Energy Agency 2013) as well as the third largest coal producer in the world (Coal India Limited 2014). Coal India Limited (CIL) is the largest coal producing company in the world by volume of production (ibid.).

However in the last 10 years, coal production has not kept up with coal demand from the power sector on account of a wide range of domestic constraints that are unrelated to India's coal resource endowments. The result is perennial shortages of coal which manifests itself as electricity shortages. Electricity shortages and black-outs are the most visible illustration of India's energy insecurity today. The short-term solution to this energy insecurity problem has been to import coal. Perversely, import of any primary energy resource (including coal) which has been traditionally portrayed as the cause of India's energy insecurity has now become one of the key solutions to energy insecurity. Without coal imports, power generation would suffer leading to longer power outages thus making India less energy secure. This highlights two key points that the paper aims to make. First, there is a need to revisit the narrative that frames the share of imported energy as a source of energy insecurity. Second, importing energy is not necessarily the result of scarcity of domestic energy but rather the result of systematic problems in the domestic production of energy (Fig. 2.5).

Import of coal (thermal and coking coal) has steadily increased from 20.9 million tonnes (MT) in 2000–2001 to over 130 MT in 2012–2013 (Central Statistical Office 2013). In 2012–2013, thermal coal imports touched 97 MT including about

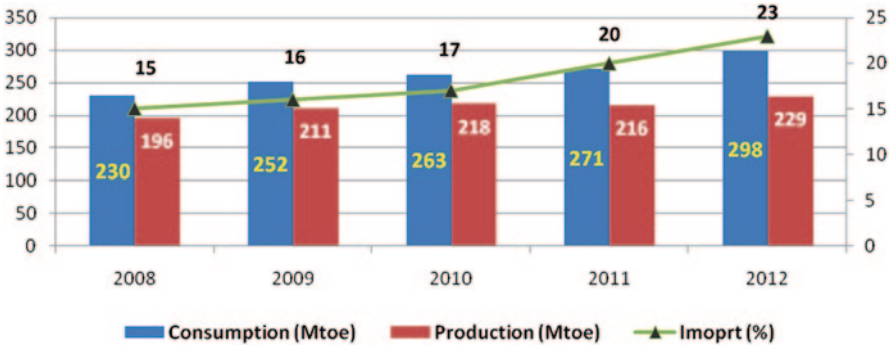

Fig. 2.5 India coal supply, demand and imports in Mtoe (including coking coal). (British Petroleum 2014b)

24 MT of coal imported for generating plants which were specifically designed for imported coal which is an increase of 40 % over the previous period (Central Electricity Authority 2013). Coal imports accounted for 3 % of total imports in terms of value in 2012-13 and this figure is expected to increase substantially in the future (Reserve Bank of India 2013).

Forecasts for coal imports in 2013–2014 anticipate a significant increase. Power producers are expected to import 82 MT of coal in 2013–2014 as per a statement by the Government (Press Trust of India 2013). By 2016–2017, the gap between supply and demand for thermal coal is projected to increase to 230 MT (Ministry of Coal 2011). Domestic constraints that keep India from reaching theoretical possibilities for coal production include but not limited to (1) monopoly status of Coal India Limited (CIL) and the presumed inefficiency in production (2) inadequacies in policies implemented to bring in the private sector (3) access to coal bearing areas on account of environmental and social constraints and corresponding regulatory hurdles (4) inadequacy of transport links that connect coal mines to coal demand centres (5) lack of reform in the distribution end of the power sector which limits ability to absorb changes in the price of primary fuels such as coal used for power generation (6) lack of transparency and independent regulation in the sector (Khanna 2013; Russell 2013).

Obviously the endowment of abundant coal resources within the country have not automatically led to security of coal supply as domestic governance of the sector that create institutions and processes to convert resources beneath the ground into fuel above the ground are both inadequate and inappropriate. If the key parameters of governing the coal sector do not change, import of coal will remain the 'solution' to India's energy security problem. In this context there is a need to seek answers to three questions. The first is about the physical availability of imported coal; the second is the logistical capacity to import coal and third is the country's ability to absorb this additional economic burden.

The physical availability and access to global coal resources is unlikely to become an energy security threat as some observers have predicted (Gupta et al. 2011). Coal is the most abundantly available fossil fuels worldwide accounting for 55 % of fossil fuels reserves (International Energy Agency 2013). Coal resources are more than 20 times larger than reserves and this makes up 90 % of global remaining fossil fuel resources (ibid.). Coal is far more accessible than oil and gas because coal resources are widely distributed around the world. Thirty-two countries have reserves of more than 1 BT and 26 countries have resources of over 10 BT (ibid.). In all major producing countries including India, proven reserves exceed projected cumulative production even by 2035 and in theory cumulative production in several of these countries can be met by drawing solely on the reserves of existing mines (ibid.).

However the import of coal could be constrained, once again, on account of domestic infrastructural and technological inadequacies. The import of 40 MT of coal would require 28 railway rakes per day which is a 17 % increase in demand over current levels (Jacob and Singh 2014). This is in addition to 160 rakes per day that would be required to transport increase in domestic coal production (ibid.). As

of 2013 (March) an average of 228 rakes were loaded from CIL mines per day (PIB 2013b). If railway rakes to carry domestic coal from mines or ports to consuming centres do not double in the next decade it could pose a challenge to electricity generation. In addition, the supply of fuel for power generation will suffer if railway corridors that transport coal do not increase proportionally. The contracts for the eastern arm of the dedicated freight corridor which was expected to absorb bulk of the domestic coal traffic from coalfields in Chhattisgarh, Jharkhand and Orissa was awarded only in 2013 after years of delay on account of regulatory issues concerning acquisition of land, environmental clearance etc (Inamdar 2013). Then there is the question of port capacity. Though there is optimism that port capacity to handle import of coal would increase in proportion to increase in demand, many expect the 'last-mile' transport of imported coal from the port to the hinterland to remain a constraint (Drewry Maritime Associates 2011).

Even if all logistical constraints that inhibit import of coal are removed, technological specifications could limit the role of imported coal. The replacement of domestic coal with imported coal is not straightforward as one would assume. Blending of imported coal with domestic coal changes the aggregate quality of coal to be fired which requires technical changes to be made in boilers used by power generators. Typical boilers procured from Bharat Heavy Electricals Limited (BHEL) are designed for Indian quality coal (Central Electricity Authority 2012). While it is possible to use a blend of domestic and imported coal in existing boilers the volume of imported coal in the blend has so far been limited to 15–20 % (ibid.). This sets a limit on the extent to which imported coal can make up for shortfalls in domestic coal availability in the short term. Last and possibly the most important issue is India's economic ability to absorb additional pressure on its fragile external account which is addressed in the section on oil.

Most of the domestic challenges highlighted above are not unique to the energy industry. India faces similar challenges in other sectors as it matures into a full-fledged industrial economy. However the questions that must be raised at this point are (1) is the continued emphasis on India's poor energy resource endowment status as the single most important reason for India's energy insecurity justified and (2) has this emphasis facilitated India's move towards greater energy security?

2.2.2 Oil

As for oil which remains at the centre of India's energy security discourse, India's resource endowments are definitely poor. India's oil reserves estimated at 5.8 billion barrels (billion bbls) in 2012 is less than 0.3 % of global reserves (British Petroleum 2014b). Oil production is more or less stagnant and India is expected to meet over 78 % of demand for crude oil through imports by 2017 (Planning Commission 2012).

In the longer term, domestic oil production is expected to decline at a rate of 1.7 % from 900,000 barrels per day (bpd) in 2012 to 600,000 bpd by 2035 (International Energy Agency 2013). On the other hand, demand for oil is expected to

grow at the rate of about 3.6% a year representing the largest absolute increase after China (ibid.). India's domestic oil reserves would last for less than 20 years (Fig. 2.3) at a production rate of roughly 763,000 barrels per day (bpd) (Planning Commission 2012). This would mean that the share of imported crude will increase to 90% by 2035 (International Energy Agency 2013). Initiatives to increase domestic production have failed to have an impact (Fig. 2.6). In the 11th plan period (2007–2011), India had set itself a target of 800,000 bpd but only 711,000 bpd was produced, a slip of 14% (Planning Commission 2012). India's oil imports are expected to increase from 2.5 million barrels per day (mbpd) to over 6.9 mbpd by 2035 (International Energy Agency 2012).

The import of crude oil is seen to be associated with two key external risks for India's energy security. The first is the volume risk which originates from the fact that most of the global conventional oil reserves and most of India's oil imports are concentrated in the Persian Gulf. The political and social volatility in the Persian Gulf region gives rise to the possibility of deliberate oil supply disruptions by state or non-state actors. The second is the price risk which is the probability of a dramatic increase in the price of oil in the international market on account of, among other things (a) instability in oil producing regions (b) reduction of supply on account of policies adopted in producing countries (c) international sanctions against oil procurement from specific countries.

With regard to the first (volume risk), the prospect of the United States withdrawing from the position of net security provider in the Persian Gulf and its security consequences in the region has gained importance in national security platforms. The argument is that the United States is unlikely to remain a guarantor of security on account of falling volumes of oil imports from the Persian Gulf region in the next two decades. Domestic production of oil in the United States is increasing while demand is stagnant (International Energy Agency 2013). As new discoveries in the North American continent come on-stream, the United States is likely to source most of its imported oil closer to home. Overall United States' oil import is expected to fall from 9.5 mbpd in 2011 to about 4.5 mbpd by 2035 (International Energy Agency 2012). If the United States implements policies for increasing fuel efficiency and emission reduction, the extent of imports is likely to fall to 3.4 mbpd

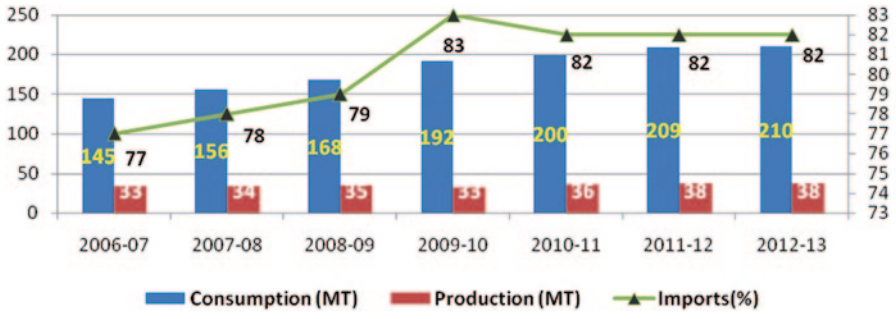

Fig. 2.6 India oil supply, demand and imports in MT. (British Petroleum 2014b)

by 2035 by some estimates (ibid.). Other sources project that total oil imports of the United States is likely to fall to just 1 mbpd by 2035 (British Petroleum 2014a). In the next 10 years, oil imports of the United States from the Persian Gulf are expected to fall to just 0.3 mbpd or less (International Energy Agency 2012).

Currently the overwhelming power of American maritime forces not only underwrite the stability of oil production in the Persian Gulf but also ensure the security of oil supply lanes in the region. The provision of security and stability in oil producing regions subsidises the global oil market as it reduces overall cost of oil production and supply. It also allows all other nations including affluent oil importing nations in Europe to 'free-ride' on the global public good of security that the United States provides. The fear among Indian observers is that continued reliance on oil imports from the increasingly insecure Persian Gulf region would worsen 'energy security' especially if the United States reduces its engagement with the region. This concern is not new. India's maritime security document (Ministry of Defence 2004) called for strengthening of maritime defence capabilities to protect crude supply lines in an effort to replicate or counter China strengthening its maritime capabilities. The integrated energy policy called for diversifying oil supply sources to include greater number of 'secure sources' to provide additional insurance against future supply disruptions in the Persian Gulf region. It is very unlikely that either of these response strategies will increase security of oil supplies (Planning Commission 2006).

First, the United States is unlikely to disengage from the region even if it imports no oil from the region as the 'marginal' barrel of oil is likely to be produced in the Persian Gulf irrespective of an increase in North American oil production. The marginal barrel decides the price of oil in the global market and the price of oil is unlikely to fall off the list of American priorities. Second, in the event of a major global military conflict, it will be almost impossible for India to unilaterally ensure the safety of its oil shipments. Third, when there is a threat of disruption or instability in the Persian Gulf, the price of oil would rise sharply well before the crisis actually unfolds and the globally integrated oil market would make no distinction between oil from the Persian Gulf and oil from relatively secure places such as Norway. A disruption somewhere is a disruption everywhere as far as the oil market is concerned and this will be reflected in the global price of oil. This means that diversification of India's crude supply basket with safe sources is unlikely to deliver energy security (Fig. 2.7). In other words, strategies that are designed to hedge against the efficient and well functioning oil market are likely to fail.

Overemphasis of these high-risk, high-cost and low-impact external strategies for securing oil imports conceals more immediate domestic threats to India's energy security arising from the volume and price of India's oil imports. India is among the few large oil importing countries that also have a large trade deficit. The trade deficit effectively puts a ceiling on how much oil India can import and at what price. If oil prices continue to increase in the medium term, the pressure on India's current account deficit could potentially deteriorate rapidly to the extent that it reaches the limit. This is a high-probability, high-impact event for which India is not fully prepared.

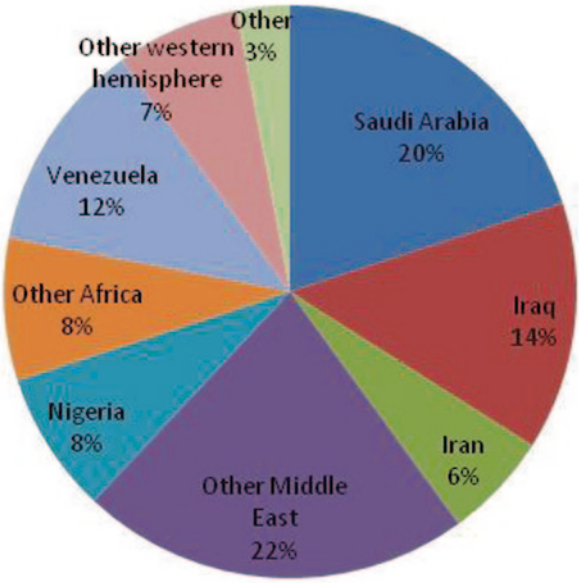

Fig. 2.7 Source of India's crude imports 2013. (Energy Information & Administration 2014)

The share of crude in India's total imports (in terms of value) has fluctuated in the last four decades reflecting changes in the global and local economy (Reserve Bank of India 2013). In 1970, it was less than 10% but increased to more than 40% during the oil crises of the late 1970s (Reserve Bank of India 2013). It has remained above 25% over the last 10 years. India's current account deficit touched a high of 4.2% of GDP in 2011–2012 and is expected to remain above 3.6% of GDP, which exceeds what has traditionally been seen as sustainable during the 12th plan period (2012–2017) (Planning Commission 2012).

An increase in India's oil import bill puts a downward pressure on the rupee. The depreciation of the Indian rupee further adds to the burden of oil imports as it increases the price of oil. In June 2013, the price of crude oil was equivalent to $ 150/barrel for India (also for Brazil, South Africa and Turkey) on account of the rapid depreciation of the rupee. Effectively, India's oil import bill increases by roughly INR 100 billion for every rupee depreciation against the US dollar. This means that an INR 10 depreciation of the rupee against the dollar will translate into an increase of INR 1 trillion in India's oil import bill if the depreciation of the currency is sustained and all other factors remain constant.

In the absence of abundant domestic resource endowments, having the economic resources to access global markets is an equally potent instrument for securing energy. In this context, India is one of the most vulnerable countries among all large oil importing countries/regions. Though India imported less than 28% of its energy needs its import bill was roughly 7% of GDP (at market exchange rates) in 2012 which is very high compared to that of Japan whose energy import bill accounted for only 4.7% of its GDP (market exchange rates) even though it imported almost

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