Cheap Oil, Climate Change Mitigation and India

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The oil crash of 2014 is expected to have a moderate impact on the global economy with oil importers seeing a boost in growth. The long-term impacts on climate change are difficult to predict but it is very likely that these might even be beneficial to the process of decarbonising the global energy economy. Most countries, including India, could use the opportunity to reduce fossil fuel subsidies and invest in renewable energy instead.

The year 2014 was a landmark year in the realm of energy and climate change: the price of a barrel of oil crashed over the second half of the year from about $110 to about $55, it was the warmest year since records began in 1880 (NCDC-NOAA 2014), China, in a joint announcement with the United States (US), indicated an intent to achieve an emissions peak around 2030 (The White House 2014), and China's coal consumption declined for the first time since 2000 (Greenpeace 2015). It was also, very likely, the first year that renewable sources became the biggest source of electricity in Germany by providing 25.8% of generation (Agarwal 2015). Do these suggest that the world is finally beginning to take the climate change challenge seriously? How does the oil crash change this outlook?

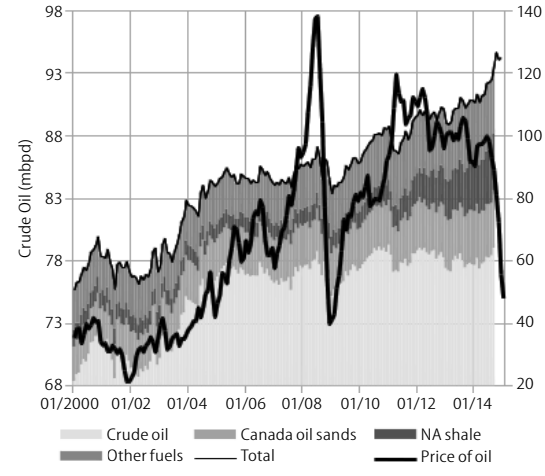
In this article, our objectives are twofold. We analyse the causes of the 2014 oil crash and its short-term impact on the global economy. And we will complement this by considering the role that the oil crash might play in the long-term transition of the energy system that will be required to limit climate change. Finally, we discuss the outlook for India.

Causes of the Oil Crash

Oil is the most valuable commodity traded internationally. Currently, about 94 million barrels per day (mbpd) are produced amounting to 31.4% of global primary energy consumption (IEA 2014a). It is the most important energy source used in transportation. To understand the causes behind the current shock we have to revisit the recent history of this commodity. Oil prices started off at about $30 a barrel at the turn of the century and rose to about $140 a barrel in July 2008 before the world was hit by the financial crisis-induced recession of 2007–09. The period 2002–07 saw high growth rates in almost all parts of the world, especially the US, China and India. The supply of oil was unable to keep up with global demand and the price of oil quadrupled (Figure 1). One reason for this was that the low oil prices in the 1990s forced the oil producers to cut back on capital investment in new and existing fields, and prevented the development of unconventional oil resources. The price of oil crashed in the second half of 2008 as recession drastically reduced demand to about 1–1.5 mbpd below potential supply. Despite a severe recession in the developed world, oil prices bounced back to a band between $90 and $120 between 2011 and mid-2014, driven primarily by increased demand in China, India, west Asia and a large number of developing countries.

Technological innovation has made it possible to drill for oil in deep water reserves under the seabed, and also extract oil from unconventional sources like the Canadian oil sands and North American oil shale. Oil sands are deposits of tar, bitumen, sand and clay. These are heated by steam injection to liquefy the bitumen before pumping it out. Oil bearing shale formations consist of

Figure 1: Production and Price Trends



Note the rapid increase in oil from North American shale since 2010. The oil crash of 2014 is accompanied by a sudden uptick in oil production in 2014.

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hydrocarbon rich sedimentary rock with poor permeability. Horizontal wells are drilled into these formations; water, chemical additives and sand are injected under high pressure to fracture the rocks (called hydraulic fracturing or fracking) in order to increase the permeability and extract the oil or gas. These wells have a low production rate and well output from peak production rate decline fast: about 30%–40% per annum.

The high price of oil made these unconventional sources of oil economical, and North American shale and oil sands have added 4 mbpd to the global supply since 2010. The global economy, aided by the occasional supply disruptions from civil war afflicted Iraq and Libya or sanction-hit Iran, was able to absorb the increasing supply of oil. This state of affairs unravelled in mid-2014 when the incremental demand reduced with a slowdown in Europe, Japan and China. China's economy has been steadily slowing down as it handles a debt overhang (IMF 2015a) and transitions to a service sector led middle-income economy.[1] We will have more to say on China's transition in the coming sections. On the supply side, besides increasing production from American shale, Iraq and Libya were also able to deliver oil to market. This led to a sudden glut, and declining prices. In an important meeting in November 2014, the Organization of Petroleum Exporting Countries (OPEC) announced no cuts in production quotas, leading to a free fall in the price of oil. Estimates by the International Energy Agency (IEA) suggest that the demand – supply mismatch is about 1 mbpd (IEA 2014b). Both slow demand growth and a supply shock have resulted in the current state of affairs. A simple econometric model by the economist, James Hamilton, suggests that about half of the decline in price can be attributed to the demand slowdown (Hamilton 2015).

Supply-Side Responses

Oil supply and demand are both quite inelastic in the short run, one reason why a 1%–2% mismatch in demand and supply can lead to halving or doubling of prices. The 1970s oil crisis has ensured that oil has mostly been eliminated from all sectors of the economy besides transportation, where there is no good substitute to oil yet. And most oil producers cannot switch off oil production even if they are producing at a loss. OPEC is, in principle, a cartel which can set prices by controlling supply. In practice, this requires keeping discipline over a disparate group of 12 member-countries. In the past, it has often been left to Saudi Arabia to shoulder the burden of being the swing producer. Often, this has been at the cost of market share and foreign exchange earnings. Furthermore, as more and more production moved to the hands of non-OPEC countries, it hardly makes sense for such action without the cooperation of the other big players like Russia. Neither supply nor demand can respond fast enough to a change in the price of oil.

As mentioned earlier, a lot of the new oil in the market is from North American oil sands and shale. These unconventional resources are difficult to mine and require a high price of oil to break even. This is also true for a lot of deep water reserves. A significant fraction of the North American unconventional oil is unprofitable at prices below $60–$70 (Nysveen 2015). Wells in shale fields have very high decline rates and new wells are drilled every two–three years. Scaling back on drilling rigs to drill new wells is the easiest way of cutting down on investment. The US rig count is currently at a three-year low. Even if no new wells are drilled, the old ones in the fields will be operated for a couple of years before they run dry. It will take a year or so for the production to decline. In the long run, a price of $80–$90 is likely required to justify the capital expenditure in new shale, deep water and oil sands projects to sustain or increase oil production.

Most OPEC countries and Russia are highly dependent on oil revenues and need a fiscal break-even price in the $50–$200 range (IMF 2015b) to balance their budgets. For example, Saudi Arabia needs a $90–$100 price of oil to pay for its social spending. While the OPEC countries still make money they cannot sustain their budgets with these low oil prices for too long. Many observers believe that we are currently seeing a price war between OPEC (at least, Saudi Arabia) and the North American producers of unconventional oil. It is in OPEC's interest to drive these companies out of business in order to gain a better control over the oil supply chain and support a higher price of oil in the long run. Saudi Arabia has a lot of foreign exchange reserves to sustain this strategy but countries like Iran and Russia are likely to face a severe contraction. Given this uncertainty, it is difficult to say how much prices will recover in the next couple of years. This uncertainty does not even take into account the short-term economic and policy responses of the global economy, a topic which we cover in the next section.

Short-term Economic Outlook

The global economy mostly benefits from lower oil prices as there is a transfer of income from oil exporters to oil importers. If current prices continue, oil importing countries will save about $1 trillion per year. Oil has a large multiplier effect in the economy, importing countries will generally see lower inflation, lower costs of production and an increase in real income. The multiplier effect depends on the oil intensity of the country: higher the oil intensity, higher the impact. Before the crash, expenditure on oil was equivalent to approximately 7.5% gross domestic product (GDP) in India, 3.5%–4% in the US and China in 2014.[2] The International Monetary Fund (IMF) estimates that the global economy will get a boost of 0.4%–0.7% of GDP in 2015 from the drop in oil prices (Arezki and Blanchard 2014). The real impact of the oil crash depends on a lot of other factors that we investigate below.

Not all the benefits of the reduction in prices will be passed on to the consumer. A large number of countries are recovering from a high fiscal debt, and coping with increased social spending and stimulus spending during the recession. Many countries are using the oil crash as an opportunity to balance budgets, reduce deficits, eliminate energy subsidies and replace these with more targeted subsidies and cash transfers. Not surprisingly, these have also been recommended by

multilateral institutions like the IEA, the World Bank and the IMF. India, Indonesia, Iran, Egypt and other countries have used this opportunity to eliminate or reduce fuel subsidies and raise taxes (Nicola 2015). India scrapped the diesel subsidy last year. India's crude oil basket was about $53 a barrel on 5 February 2015, less than half the July 2014 figure. While the Government of India (GoI) will save about $60–$70 billion on its oil import bill, the price at the petrol pump has declined only 20%–25% as the excise duty has been raised multiple times.

A lot of countries might also see lower inflation rates, perhaps reduced by the amount of savings passed through to the consumer. The US and India are expected to get a boost to their GDP though China, the EU and Japan will continue with their slowdown, despite the low oil prices, as the positive impact of cheaper oil will be negated by deeper structural issues.

As discussed in the previous section, almost all oil exporters will face fiscal deficits. Some countries like Saudi Arabia have reserves that might help cushion them from cuts in spending but others like Russia might enter into a severe recession. For example, the IMF projects a contraction of 3% for Russia. Other countries in west Asia that have meagre savings but substantial government spending might be forced to cut their social budgets. A lot of countries like Iran have already been eliminating energy subsidies, and are likely to accelerate these if low prices continue. Finally, continuing low prices may lead to cancellation of projects in oil and gas that require high investment of capital.

It is ironical that the oil crash might lead to policies and economic decisions that will, very likely, lower the future demand for oil.

Long-term Trends and Climate Change

The last decade and half of high oil prices, technological innovation and behavioural changes are having a significant impact on the global energy system. We would like to understand the role of oil, and the oil price crash, in this context.

Oil provides the fuel of choice for transportation. It is interesting to note that the OECD (Organisation for Economic Co-operation and Development) oil consumption has declined by about 10% despite the 30% increase in GDP over the past one and a half decades (Table 1). Per capita oil consumption in a large number of developed countries has peaked. Perhaps, the most interesting observation is that per capita driving and traffic have peaked or levelled off in many developed countries, and have actually declined in cities. This phenomenon is often referred to as "peak travel" or "peak car" (Millard-Ball and Schipper 2011). In many countries, this preceded the rise in oil prices in the 2000s.

Table 1: OECD and Non-OECD Oil Consumption

(in million barrels per day)

Region	2000	2005	2010	2014
OECD	48.55	50.52	46.94	45.6
Non-OECD	28.42	34.17	40.92	46.8
Total	76.97	84.69	87.86	92.4

Source: IEA.

Many explanations have been offered for this observation: high cost of car ownership, traffic congestion and gridlock in cities, ageing populations, better public transport, changes in preference towards car ownership, etc. In these

countries, the youth are more urban, have better access to public transport and perhaps prefer to spend their time and income on smartphones, cycling, online shopping and entertainment instead of acquiring cars (Goodwin 2012). Many of these observations, especially high density urbanisation in cities, traffic congestion and other patterns of spending already hold true for the rapidly urbanising developing countries like India and China. Public transportation-oriented urban planning can reduce congestion, car ownership and carbon emissions from driving. Even if car ownership rates are increasing rapidly from a low base, they might saturate at lower levels in the current developing world. We must note that these concerns about travel saturation are independent of the fuel used in the car.

The growth of biofuels and electric vehicles challenge oil's role as the only energy source in the transportation sector. Public transportation solutions like buses, bus rapid transit (BRT), metros, light rail and trams considerably reduce the demand for personal transportation solutions like cars and scooters. There has been significant investment worldwide in metros and BRT systems. Cities in the developed countries, have made a concerted effort to pedestrianise their urban cores, and have added bike lanes and congestion taxes to discourage cars. Large number of cities have also successfully rolled out bike-share programmes. Increased worldwide investment in high speed rail (HSR) is in direct competition with short-haul air travel and long-distance driving. Besides reducing fossil fuel consumption, these efforts can be justified from the point of view of reduced congestion, improving the quality of life, health benefits like reduced pollution. These measures have all contributed to peak car. Long-distance air travel, which is growing rapidly, is perhaps the only transport segment where oil has no substitute in the foreseeable future.

While there has been significant technological progress in electric cars and hybrids worldwide, these are still too expensive for the mass market. The prohibitive cost of the battery is the limiting factor. The electric car market worldwide is being supported by a segment of enthusiastic early adopters, aided partly by government tax subsidies. Globally, about 3,00,000 electric vehicles (not counting two-wheelers) were sold in 2014 (Liebreich 2015). The decline in oil prices is unlikely to affect this market in the short run. Rapidly falling costs of electric cars, rising incomes in developing countries, and, perhaps, the right policy support could accelerate their penetration in these markets. These would very soon be essential given the pollution levels in cities in the developing world, particularly India. In the meantime, electric two-wheelers and rickshaws (e-rickshaws) are making a difference in many parts of the developing world (OECD/ITF 2015). Biofuels, on the other hand, are likely to be affected by the oil crash if they are not supported by quotas or purchase obligations.

A decade and a half of high oil prices, and long-term policy support and investment in urban planning and public transportation, have ensured that many substitutes to fossil fuel dependent transportation have already been successful. Most of these achievements are not going away in the light of low oil prices.

Oil has a smaller role to play in electricity generation worldwide, less than 5% of the world's electricity is fuelled by oil. Oil is used for electricity generation, primarily, in small and impoverished countries, island nations and the oil producers in west Asia. The latter burn almost 2 mbpd of oil to generate electricity.

The last decade has seen a dramatic decline in the cost of wind turbines and solar photovoltaic (PV) modules. Onshore wind is currently at 6–10 cents/kwh (Rs 3.6–6.0) on a levelised cost of electricity (LCOE) basis in most parts of the world (all cost data are from the report, IRENA 2015). This makes it the most cost-competitive source of electricity worldwide. It is as cheap as new coal powered electricity at the utility level in India, for example. Solar PV modules have fallen in cost by about 80% in the 2009–14 period and solar power is at 10–30 cents/kwh (Rs 6–18) in various parts of the world. This puts it at grid parity — the cost of retail electricity — in more than half the world. Note that these numbers are the true, unsubsidised costs. Solar PV costs are expected to fall a further 30%–40% by 2017–18.

Oil plays a minor role in the electricity generation of large renewable markets like India, China, the US and Germany, and it will be less economical than solar PV or wind even at $50 a barrel. The world invested $310 million on renewable sources of electricity in 2014, a number that is set to increase significantly in the coming years (BNEF 2015). The crash in oil price will have a negligible impact on this investment. In fact, many countries in west Asia have started major investments in solar power in order to reduce costs, and to save their precious oil for future exports. Recently, a Saudi Arabian power firm bid for a 200 MW solar PV plant in Dubai for under 6 cents/kwh (Rs 3.6). In Germany, the *Energiewende* (energy transition) is on target and it demonstrated in 2014 that electric grids can be run with a high renewables penetration of more than 25%.

Another major, though unrelated, development in global fossil fuel use is the decline in coal-based electricity generation in China in 2014 (EIU 2015). The economic slowdown in China, saturation and decline of heavy industries, pollution control measures, rapid increase in renewable sources of electricity and good rains in 2014 were responsible for this decline. China had committed to capping coal use by 2020, and it might achieve that goal even earlier. China is the biggest importer of coal in the world, and the market for internationally traded coal is likely to remain depressed for years if Chinese demand sags. The globally traded cost of coal (currently, at about $60 a tonne) is already down 50% since 2010 (Corones 2015). India is the only major economy that is likely to significantly increase its coal consumption in the near future, and could take advantage of the depressed prices.

Outlook for India

The oil crash has been good for India, and a windfall for the GOI. Petrol and diesel prices are 20%–25% lower than last year and the current inflation rate, about 5%, is the lowest in years. The current account deficit and the fiscal deficit have improved significantly. The GOI has been

able to withdraw the diesel subsidy, streamline the LPG subsidy, raise about Rs 20,000 crore in 2014–15 through additional excise duty on petrol and diesel (*Livemint* 2015), and is likely to keep the fiscal deficit at 4% in 2014–15. The elimination of the petrol and diesel subsidies, and the additional excise duties will fetch the GoI an estimated Rs 1,40,000 crore in 2015–16 compared to a couple of years ago. The country will also save about $60–$70 billion in foreign exchange. Finally, the LPG and kerosene subsidy is likely to be significantly smaller as the prices of all petroleum products have reduced.[3] This gives the GoI a lot of leeway to spend on infrastructure, targeted social programmes, and the energy and transportation sector.

While the short-term prospects are undeniably good, it is in the long-term outlook that the nation and the central government can do a lot to achieve low carbon economic growth. A number of good policies have already been implemented. These need to be strengthened, and others need to be enacted and implemented for India to best exploit the current state of affairs, and to attain a leadership role in climate change mitigation. We consider some of these below.

India's economic growth will lead to significant emissions from the growing transportation sector. Indian cities already suffer from extremely high levels of pollution and congestion. Unfortunately, India's urbanisation suffers from the lack of a public transportation-oriented urban planning policy. Often urban planning and transportation are handled by entirely different bodies. Democratisation of urban bodies, and vesting them with financial, planning and decision-making roles should be a priority. According to some studies, with the right policy framework, India's urban transportation emissions in 2050 could be 40% below baseline (OECD/ITF 2015). A majority of trips in urban India are served by walking and cycling. Transportation policy and urban planning should be designed to retain and encourage these options as a choice in the future (Ghate and Sundar 2013).

Average fuel consumption standards for passenger cars and vans were introduced in 2014. These mandate a corporate average emissions of 130g/km in 2016–17 and 113g/km in 2020–21, compared with a figure of 137g/km in 2013–14 (ICCT 2014). India's success with the introduction of natural gas-powered buses, taxis and autorickshaws could be extended to cover all public transport in cities. India should also introduce standards for low sulphur fuels to control particulate emissions. A national regulatory body for fuel quality, emissions standards and regulation should be constituted. The National Electric Mobility Mission Plan 2020 was launched in January 2013 with the target of achieving sales of 6–7 million electric vehicles (EV) in 2020. About Rs 15,000 crore have been earmarked to be invested in subsidies, infrastructure, etc. Electric scooters and e-rickshaws have already found a market in India, and targeted support could increase their sales significantly. Policies to promote electric buses and e-rickshaws for public transport could make a substantial difference to urban pollution. The GoI could increase the funds earmarked for EVs and fuel efficiency by charging a tax on sports utility vehicles, and petrol and diesel.

India's electricity generation doubled in the last 10 years, and it is likely to grow faster in the next 10. New coal-powered generators were bidding at Rs 4.0–7.0 per kwh LCOE in 2012–13. Renewable power, especially wind, biomass and small hydro are already competitive with coal (Table 2).

Table 2: Comparisons of Coal and Renewable Technologies — Levelised Cost of Electrictity

(Rs/kWh)

Technology	Benchmark LCOE Costs Range
Coal	4.41–7.11
Wind	3.95–6.34
Small hydro	3.80–5.25
Biomass	5.27–7.97
Solar PV	7.72
Solar thermal	11.88

The renewables figures do not include additional reductions from accelerated depreciation.
Source: Parekh and Bhattacharya (2013) and CEA (2014).

Substantial cost reductions are likely in renewables, especially wind and

solar. Solar PV could see costs drop by another 30%–40% by 2017–18. A significant fraction of new power demand can be met by renewables, especially when factoring in the expected cost reductions. The GOI's goal of 100 GW of solar in 2022, while ambitious, is achievable. India's solar policy is geared towards utility scale solar, but a sensible rooftop and distributed solar policy is required for this goal to be met. A rationalisation of cross subsidies, investment in smart metering and the grid, and investment in storage plants like pumped hydro will be required to handle a high penetration of intermittent renewable power. Most importantly, further reforms and incentives are required to help the distribution companies transform to energy service providers.

Electricity generation from coal is stagnating or declining worldwide, and global coal prices have halved in the last four years. Imported coal-powered coastal electricity generation will likely become more competitive. This option should be considered with caution, the implications on energy security and India's position on climate change should be considered first. On the other hand, nuclear power based on imported French or American reactors is likely to be too expensive (Ramana and Raju 2013) in comparison with renewables and coal.

Conclusions

The 2014 oil crash, the result of a massive increase in North American oil production and a general slowdown in the global economy, is likely to lead to a couple of years of depressed prices. It should have a positive impact on the global economy and could lead to a 0.4%–0.7% boost to the world's GDP. The crash in oil prices is unlikely to derail action on climate change mitigation. Technological innovations in the last decade have ensured that renewables are competitive with equivalent fossil fuel-based technologies. Many countries will use this opportunity to reduce or eliminate fossil fuel subsidies and move some of their spending towards renewables. The gradual transition towards decarbonising the global energy system will continue.

NOTES

1 We use the IMF Economic Outlook reports as our source of economic forecasts. We are primarily interested in a consistent methodology applied to all regions of the world, not necessarily in their correctness (which has often been questioned).

2 Estimated using 2014 pre-crash prices and data from IMF and IEA.

3 The diesel subsidy was about 63,000 crore in 2013–14. The additional excise duty on petrol and diesel are Rs 7.75 and Rs 7.50, respectively, as of 16 January 2015. Assuming a consumption of 69 million MT of diesel and 20 million MT of petrol in 2015–16, the excise hike fetches about Rs 76,000 crore (all figures from the Petroleum Planning and Analysis Cell, http://ppac.org.in/).

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