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India's Energy and Fiscal Transition

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ABSTRACT

This paper looks at India's expected energy transition towards a low-carbon future, and studies how government revenues from fossil fuels will be affected over the next two decades. It takes the International Energy Association (IEA 2021) scenarios for India and studies how both tax revenues and non-tax revenues for national (Central) and sub-national (State) governments would be affected. The study finds that under fairly standard assumptions on growth, prices and taxes, there would be continued growth in revenues from fossil fuels until 2040. However, revenues would fall significantly as a share of the gross domestic product (GDP) and overall government budget, and this would impose challenges for both the Central and State governments in India. Moreover, since the Central government is the greatest beneficiary of fossil fuels, it would face the brunt of the pressure. The paper also briefly discusses the possible impact of net zero and carbon taxes were India to take that route, as well as how subsidies are expected to impact and be impacted by such considerations.

Keywords: Energy transition, India, Tax revenues, Carbon tax

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INTRODUCTION

Over the next few decades, like most other countries, India will go through a significant energy transition, with a steady reduction in the share of fossil fuels in its energy portfolio.² Fossil fuels account for a significant share of Indian government revenues, and therefore, this energy transition is expected to impact government revenues and necessitate a simultaneous fiscal transition. This paper identifies the sources of Government revenue from fossil fuels, their quantum and how the energy and fiscal transitions will occur together.

Historically, India has not been among the major consumers of fossil fuels, and this is largely due to its low per-capita income. The transition (from a low per-capita income country) is obviously an important consideration for its economic policy, and will require sustained and high economic growth. India's economic growth has been powered by imports of fossil fuels to a significant extent. At the same time, among major economies, India's growth in renewable energy capacity has been among the highest in recent years (Table 1). India is also an outlier in terms of energy generation and per capita CO₂ emission (see Appendix: Figure A1) wherein the latter is lower than its population or economy would warrant by global standards.

Currently, the Indian government, both the Centre and the States, imposes a multitude of taxes, cesses, duties, etc. on all fossil fuels. Non-tax revenues are not insignificant, and include royalties from domestic mining operations, as well as dividends from public sector fossil-fuel companies. These non-tax and tax revenues are substantial and have been growing steadily over time. This growth, as later sections will show, has been due to an increase in both the quantum of fossil fuel-based energy, and the extent of ad valorem taxes imposed on it.

A significant portion of global literature categorizes the continued high government revenues from fossil fuels as “carbon entanglement.” The argument is that economies with a high level of entanglement have lower motivation to increase the pace of change towards a low-carbon future. (See, for instance, Lazarus and Asselt, 2018, and Piggot *et al.* 2020). That literature, however, does not address another major force operating on India—its **import dependence** on fossil fuels which adversely affects its energy security and trade balance.

As of 2018, India imported four-fifths of its petroleum needs. India's domestic production of crude and natural gas has steadily been declining since 2011-12. It imported over 62 million tonnes (MT) of petroleum products and 23 MT of liquefied petroleum gas (LPG) in 2019-20, ranking among the top importers globally (see MoSPI, 2021). Though India is the world's second largest producer of coal, and produces about four-fifths of its needs, Indian coal imports have also been steadily rising. They soared from 10 MT in 2007-08 to 45 MT in 2011-12, to about 150 MT in 2018-19 (Oskarsson *et al.*, 2021). India's import bill in 2019-20 for coal alone was Rs 90,000 crore (Rs 900 billion), for liquefied natural gas or LNG, Rs 65,000 crore (Rs 650 billion) and for finished petroleum products, Rs 181,000 crore (Rs 1.81 trillion).³

² However, given that it is a rapidly growing economy, with an expectation of continuing and even accelerated long term economic growth, it will also be among the fastest growing consumers of energy.

³ Which broadly translates to USD 12 billion, 8.7 billion and 24.1 billion for coal, LNG and petroleum respectively. See https://www.business-standard.com/article/economy-policy/india-saved-over-rs-30-000-cr-despite-rising-petro-product-imports-in-fy21-121042201160_1.html



TABLE 1 Growth of Consumption of Fossil Fuels and Other Energy Sources in India (Petajoules)

Year	Coal	Lignite	Crude Oil	Natural Gas	Electricity #	Total
1	2	3	4	5	6	7
2010-11	8,972	428	8,248	2,471	2,500	22,620
2011-12	9,664	476	8,547	2,483	2,827	23,996
2012-13	10,794	527	9,178	2,210	2,967	25,676
2013-14	11,186	499	9,316	2,017	3,147	26,166
2014-15	12,439	534	9,347	1,976	3,415	27,710
2015-16	12,660	480	9,750	2,021	3,604	28,517
2016-17	12,667	491	10,273	2,145	3,820	29,397
2017-18	13,594	527	10,549	2,279	4,044	30,993
2018-19	14,651	521	10,769	2,342	4,356	32,639
2019-20 (P*)	14,262	481	10,651	2,471	4,649	32,514
% Share in total consumption for 2019-20	43.9	1.5	32.8	7.6	14.3	100
CAGR 2010-11 to 2019-20 (%)	5.28	1.28	2.88	-0.003	7.14	4.11

Note: Electricity# - Only includes nuclear, hydro and renewable sources of energy, to avoid double counting; P* - Provisional

Source: Energy Statistics India 2021, MoSPI, Government of India

During the launch of the In-depth Review of India’s Energy Policies report from the International Energy Agency (IEA), Shri Dharmendra Pradhan, Minister of Petroleum and Natural Gas & Steel pointed out energy security as one of the main pillars of India’s energy vision. It is anchored by energy access, energy efficiency, energy sustainability and energy security, with energy justice at its core. While low-cost energy is the end objective that can enable sustained income growth, reduction of import dependence can no doubt be achieved through greater reliance on renewable energy (RE). And indeed, the country is moving steadily towards greater reliance on wind, solar and biomass-based energy, as well as greater use of electricity and hydrogen. The concern, however, is that current plans may not go far enough, and that India needs to be more aggressive in its transition towards a RE-powered economy. While some may call for tighter net-zero type of commitments (currently India is committed to 2070), others such as the IEA have recently come up with different conceivable scenarios for India and what these would mean in terms of its energy portfolio in 2030 and 2040.

Whatever path India takes would also impact the ability of both the Central and State governments to manage the transition. A critical aspect of this transition is going to be how it addresses fiscal challenges and ensures a smooth fiscal transition. This paper focuses on precisely that aspect—the challenge of fiscal transition that will accompany India’s energy transition.



The rest of this paper proceeds as follows. Section 2 reviews the literature and looks at the various attempts at estimating dependence on fossil fuels and at the gaps therein, especially in the Indian context. Section 3 looks at the elaborate nature and complexity of taxes on fossil fuels, how that translates into significant revenues and, finally, the transition of government revenues under different energy transition scenarios and assumptions. We find that under fairly plausible conditions, there will be a significant impact on both Central and State government revenues. Section 4 concludes with a discussion on the ramifications of the results.

REVIEW OF LITERATURE

Globally, a clean energy transition is an important aspect of a sustainable development strategy (World Economic Forum, 2019). Almost every country has its own transition plans and goals. One of the most fundamental inputs to these plans is the way it changes the government budget. Currently both energy exporting and importing economies are heavily dependent on tax and non-tax revenue originating from fossil fuels. The exporting countries source it by favorable price-setting, and importing countries do the same by taxing the production and consumption of coal, oil, natural gas, etc. The Paris Agreement on climate change sets a goal of keeping global warming “well below 2°C,” while striving to limit it to 1.5°C. The world, therefore, needs to switch from fossil fuels to clean energy, and achieve deep emission reductions in all sectors of the economy (IPCC, 2018).

The clean energy transition is being accelerated as the costs of clean-energy technologies plummet, and many countries seek to boost domestic energy production from locally-available RE, and also reduce imports. There are, of course, other benefits including reduced pollution and new employment avenues. If countries are, indeed, able to reduce their dependence on fossil fuels and rapidly reduce their usage, the role of fossil fuels as a tax base will shrink accordingly. For many countries—especially large producers and consumers, whose revenues from fossil fuels account for a large share of government revenues—this could be a cause of concern (see for instance OECD, 2019; ITF a, 2019; Manley *et al.*, 2016; and Bradley *et al.*, 2018).

Thematically, this paper analyzes the Indian government’s reliance on revenues (both tax and non-tax) from fossil fuels, and how these play out with the energy transition goals in *ceteris paribus* conditions. It analyzes government revenues from all three major fossil fuels—coal, petroleum and natural gas. Since India is both a producer and a consumer of these fuels, it looks at the fiscals from both production and consumption, including those for imported fuels. Other studies have no doubt looked at some aspects of India’s energy transition. Selected studies are reviewed below.

One class of studies focuses on petroleum, but not on coal. These studies can further be divided into two categories: studies of oil producing countries, and of oil consuming countries. Studies focusing on producing countries estimate expected revenues from petroleum products (e.g., Stephens, 2019); while those focusing on consuming countries are related to estimation of the petroleum-demand function, and the projection of associated tax revenues (e.g., Berwick and Malchose 2012; Sunley *et al.* 2002). However, two sets of authors—Agarwal (2012) and Parikh *et al.* (2007)—have focused on the projection of future demand and not on



the potential impact on revenues. They have estimated petroleum-demand functions for India using time-series data for the period 1980-1981 and 2000-01.

Mukherjee (2020) has attempted to estimate both the demand function and tax revenue functions for India; however, his study does not include coal. Mukherjee found a non-linear relationship between consumption of fuels and tax revenues over time: revenues increased disproportionately with regard to increase in consumption. As is well known, tax rates on fossil fuels in India have been going up steadily over the last few years, and therefore, the non-linearity is obvious. With a growing debate on instituting carbon taxes (Jenkins, 2019; Metcalf, 2021) this trend may yet continue.

Gerasimchuk *et al.* (2019) estimated the reliance of the BRICS countries on fossil fuel.⁴ In 2017, the combined revenues from fossil-fuel production and consumption, as a percentage of GDP, were the highest in Russia (8 percent), followed by India (3.7 percent), Brazil (2 percent), South Africa (1.9 percent) and China (1.2 percent). The reliance of these countries on both production and consumption taxes was found to be inordinately high and the paper called for diversification to reduce the reliance. The study, however, did not look at how these may change with energy transition.

Prayas (2021) analyzes the tax and non-tax revenue collected by the Central and State governments in India in 2018-19 and 2019-20. Unlike other studies, this one includes coal along with electricity, oil and natural gas and shows that the share of these sectors in total tax revenue of the Central and State governments combined, is just under 18 percent. While this study did include all major fossil fuels, it did not include the substantial dividends that the government obtains from its equity ownership of the fossil-fuel monopolies, nor did it include the corporate tax paid by public and private energy companies. Moreover, the study also did not look at how these might change over the next few decades.

To the knowledge of the authors, no study addresses the key issue being raised in this paper: “How the lower use of fossil fuels might impact government budgets, as India transitions to a low-carbon economy.” We include all key fossil fuels, coal, oil and natural gas as each is an important contributor to government revenues. Moreover, in India, public sector ownership of fossil-fuel companies also requires the inclusion of non-tax revenues (such as dividends and royalties), which are a significant component of government revenues.

The next section describes the data and the estimation process.

CHANGING SHARE OF FOSSIL FUELS IN GOVERNMENT BUDGETS

The first part of this section briefly describes India’s tax and non-tax sources of revenue from fossil fuels, for the Central and State governments. Next, it estimates the share of the fossil fuel sector in the total budget (centre and states combined). The last part of this section estimates how government revenues may be impacted as the share of fossil fuels, in overall revenues, falls over time.

⁴ The BRICS grouping comprises of Brazil, Russia, India, China, and South Africa.



Revenues from Fossil Fuels: A Complex Network

The Central and State governments in India have imposed a surfeit of taxes, cesses, levies and duties on various fossil fuels. These span the whole value chain from mining to consumption. A complex and well-spread set of such revenue sources have contributed to the high dependence of the Central and the State governments on these fuels. Moreover, each of the tax and non-tax sources are fairly significant in scope and scale. When taken together, therefore, as this section shows, there is a high degree of dependence on fossil fuels.

We first describe various taxes and other revenues from oil and natural gas companies. Coal is dealt with separately, as the taxes, cesses, etc. that apply to coal are very different from those that apply to oil and natural gas companies. Though India has implemented a Goods and Services Tax (GST) regime since 2017, this does not cover most petroleum products which continue to be under the older mechanism of Excise Duty (on production), Value Added Tax (VAT; imposed by State governments), and import duties. Some fossil fuels and their derivatives have been covered under GST, and a compensatory cess has also been imposed on coal.

Companies involved in fossil-fuel production and trade are also taxed corporation or profit tax. There are variations in types and rates of taxes across all major product categories and sub-categories. Table 2 summarizes the different components of tax and non-tax revenue included for each sector.

TABLE 2 Revenue Streams Included in the Estimation

Fossil Fuels	Tax Revenue	Non-Tax Revenue
Coal	GST and GST compensation cess, custom duty, corporate tax and other taxes	Royalty and dividend income contributed by public sector companies
Oil and Natural Gas	Cess, customs, excise duty, National Calamity Contingent duty, VAT, Corporate tax, GST on petroleum products under GST	Royalty and dividend income contributed by public sector companies

Note: The various taxes, duties, levies, cesses change from time to time. Tables A1 and A2 in the Appendix, provide the figures as of September 2020.

OIL AND NATURAL GAS The **Goods and Service Tax** regime was implemented in India in 2017. The GST is a form of VAT on consumption of goods and services, as well as on services at the national level. The objective is for it to replace all indirect taxes levied on goods and services by India’s Central and State governments. However, as of 2021, energy (electricity and petroleum products), fresh foods and alcohol products were among those kept out of its purview. Within petroleum, five commodities (crude oil, natural gas, petrol, diesel and aviation turbine fuel or ATF) remain excluded from GST’s ambit. However, there are some petroleum products that are included in the GST regime such as kerosene (18 percent), greases (18 percent), sulphur (18 percent), benzene (18 percent) and avgas (28 percent). Coal attracts a 5 percent tax under GST. Though the GST rates have remained the same since inception in 2017, GST collections have risen from 2017-18 and 2018-19, but fallen in the following two financial years, presumably due to the slowdown induced by the COVID-19 pandemic, as shown in Table 3.



TABLE 3 Contribution of Oil and Natural Gas to Government Revenues (Rs billion)

	2017-18	2018-19	2019-20	2020-21 (P)*
Integrated GST	92.1	164.8	131.0	115.9
Central GST	44.9	74.4	68.3	61.6
State GST/UT GST	49.7	79.6	73.5	61.2

Source: Petroleum Planning and Analysis Cell (PPAC).

Note: (P)* - Provisional. Integrated GST or IGST is a type of GST which is paid by the supplier in case of the interstate supply of goods and services to the Central government, which then shares these with the states. The GST is applied to any kind of supply or delivery of any kind of goods or services within a state, and has two components—Central GST or CGST which accrues to the Central government, and State GST or SGST which accrues to the State government.

A **cess** is a tax with specific purposes and is typically considered to be temporary in nature. It is different from other forms of taxes and is imposed as an additional tax, over and above the existing tax (a tax on tax). Currently, there are six different types of cesses being imposed in India, and two of these apply to the petroleum sector—a cess on crude petroleum, and a road cess. The cess on crude petroleum is imposed on domestic crude production (not imported crude), at the rate of 20 percent of the value; road cess is Rs 2.5 and Rs 4 per litre sold of petrol and diesel respectively.⁵ There has been some discussion on reducing the crude cess to 10 percent, and also to impose a COVID-19 cess, but both have not been imposed yet.

Given India’s federal structure, there are many constraints in imposing new taxes, and the Centre needs to share many of these with the State governments; the cess, however, is typically not.⁶ This gives the Central government some short-term flexibility in both instituting a cess and using its proceeds for a specific function.⁷ However, after the 14th Finance Commission, the share of the State governments in the tax revenue increased from 32 to 42 percent.

Taxes on imports or customs duty on oil and natural gas vary from product to product. The rates are decided separately for products covered under GST and those excluded from GST. Customs duties have two components, basic custom duty and additional custom duty. Thus, for non-GST petroleum products such as petrol, the basic custom duty is 2.5 percent of value, and an additional custom duty of Rs 18 per litre; for ATF, the basic custom duty is 5 percent and additional custom duty is 11 percent. For GST products like kerosene, it is 5 percent and 18 percent; for furnace oil, the combined duty is 29.8 percent.

⁵ The six cesses are: (i) Health and Education cess (4 percent on direct income tax) for basic free primary education and health needs of households below the poverty line; (ii) Road cess for maintenance of roads and infrastructure; (iii) Krishi Kalyan Cess (Agri Welfare Cess which is 0.5 percent on all taxable services) for support to farmers; (iv) Swachh Bharat Cess (0.5 percent of all taxable services) with the objective of delivering a clean India; (v) Ccess on domestically produced crude petroleum oil (20 percent of value); (vi) Infrastructure cess announced in 2016 is imposed on production of vehicles.

⁶ Article 270 of the Indian Constitution allows cess to be excluded from the pool of taxes that the Union government must share with the State governments.

⁷ Also this creates an incentive to levy cesses as that they are not shared with the states. Especially after the 14th Finance Commission increased the share of the states in overall tax revenues.

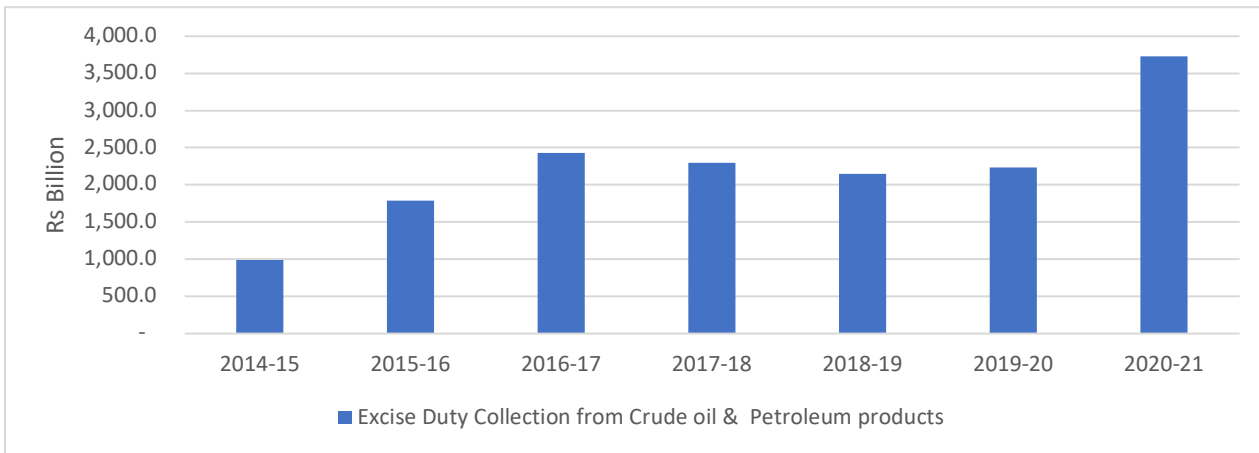


The combination of an ad valorem and specific or unit taxes has traditionally provided flexibility to better manage government revenues, while maneuvering through the crude price volatility. The contribution of custom duty increased continuously from Rs 41.25 billion in 2014-15 to Rs 229.27 billion in 2019-20, and possibly dipped significantly thereafter due to the COVID-19 slowdown. However, this is likely to be temporary and is expected to rapidly return to a high growth path.

Excise duty is a tax imposed on the production of goods and includes their licensing and sale. It accrues to the Central government. All manufactured goods used to be charged an excise duty, but this was subsumed under GST for most products in 2017. Today, excise duty applies only on key petroleum products and liquor, but remains a significant revenue earner due to the rates and scales involved. Excise duty components include basic excise duty, a special additional excise duty, and an infrastructure cess. *The duties have steadily been rising: for instance, in 2014 they stood at Rs 3.56 and 9.48 per litre respectively for diesel and petrol; by 2021 these had increased to Rs 32.90 and 31.80 per litre for petrol and diesel, respectively.*

The contribution of excise duty increased by around 145 percent from 2014-15 and 2016-17, and by a further 53 percent from 2016-17 and 2020-21, as shown in Figure 1. To put it in perspective, provisional excise duty figures for key petroleum products stand upwards of Rs 3.7 trillion and about 1.9 percent of India’s nominal GDP for that year.⁸

FIGURE 1 Excise Duty Collection from Crude Oil & Petroleum Products



Note: 2020-21 figures are provisional.

Source: Petroleum Planning and Analysis Cell (PPAC), Ministry of Petroleum and Natural Gas, New Delhi. 1 Crore = 10 million.

The **Value Added Tax** replaced a complex set of sales taxes, and therefore, is a form of consumption tax imposed by State governments, and all revenues thus accrue to them. VAT was first introduced in 2005, but was fully implemented across India a decade later, by 2014.⁹ It varies widely across states. For instance, as of July 2021, the VAT on petrol was the highest in Madhya Pradesh (Rs 31.3 per litre), while it was about half of that in Andhra Pradesh (Rs 16.8

⁸ The sudden increase in the provisional figures for 2020-21, was due an increase in excise rates, presumably to cover other revenue shortfalls.

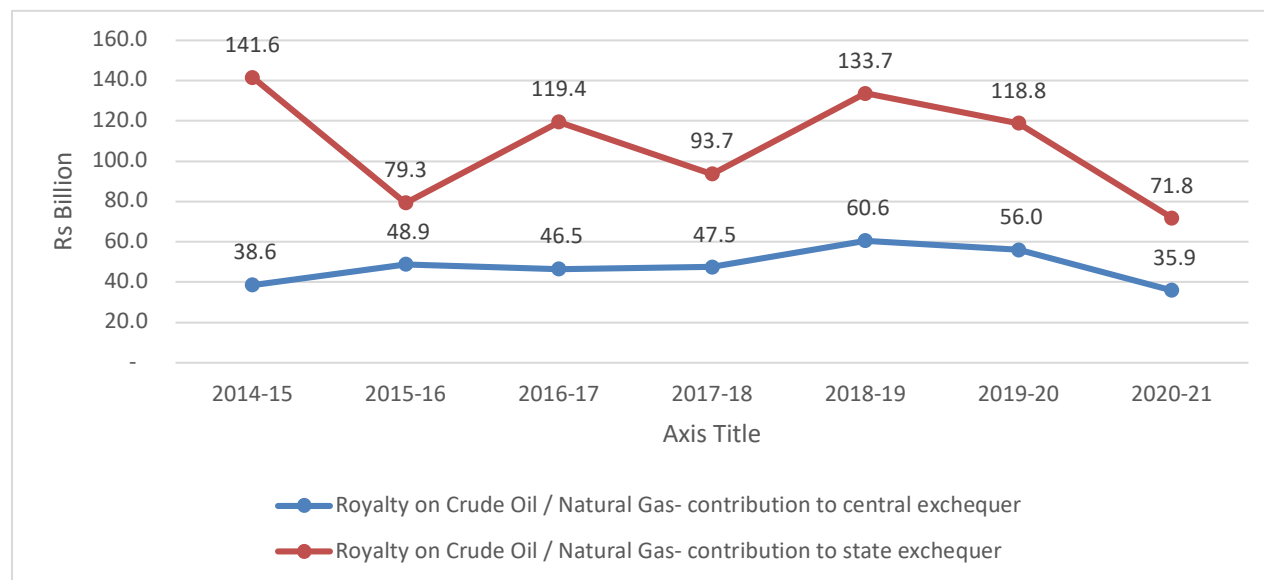
⁹ Barring the Union Territories (UTs) of Lakshadweep, and Andaman and Nicobar Islands.



per litre). Similarly, the VAT on diesel was highest in Arunachal Pradesh (Rs 23.5 per litre) and lowest in Andhra Pradesh (Rs 8.3 per litre). Its contribution has increased continuously over the years from 2014-15 to 2020-21, barring a slight fall in 2019-20. If petroleum products are included in GST's ambit (there is no consensus on that yet), VAT will be subsumed under it. Until then, VAT continues to be a significant source of revenue for State governments across India.

The **royalty** on crude oil is fixed as per the Oilfield (Regulation & Development) Act, 1948, which also provides that the royalty cannot exceed 20 percent of the well-head price. Royalties on output from offshore fields are payable to the Central government, whereas those from onshore areas are paid to the government of the State in which it is located. The royalty rate for offshore areas is currently 10 percent of the well-head value of crude oil and natural gas. For onshore areas, the rate of royalty is 12.5 percent in the case of crude oil, and 10 percent in case of natural gas. The contribution of royalty to both Central and State exchequers has fluctuated over the years.

FIGURE 2 Royalty on Crude Oil and Natural Gas



Source: PPAC, Ministry of Petroleum and Natural Gas, New Delhi.

Dividends are paid out by many companies in which Central and State governments hold a significant equity stake. These companies, or Public Sector Enterprises (PSEs), are involved in oil prospecting, extracting, processing and marketing. Though the government later divested some equity, a significant stake of petroleum companies continues to be held by it. Companies such as ONGC, Indian Oil, BPCL and GAIL are among India's largest companies and continue to be majority-owned by the Central government.

As per the guidelines on capital restructuring of Central PSEs (CPSEs), it was prescribed in 2016 that CPSEs would pay a minimum annual dividend of 30 percent of profit after tax, or 5 percent of the net worth, whichever was higher. In 2020, another advisory was issued stating that CPSEs should try to pay not just the minimum but higher than that, and also try to pay on a quarterly basis rather than annually. As per 2018-19, about 40 percent of the total dividend

received by the Central government from all CPSEs came from 13 oil and natural gas-based companies. Though some State governments also have stake in energy companies, that is a relatively small share of the total. (See Table A3 in the Appendix for a list of PSEs and their subsidiaries.)

The contribution of dividends differs greatly in terms of absolute numbers with regard to the Centre and the states. Contribution to the Central exchequer increased from Rs 91.97 billion in 2014-15 to Rs 103.93 billion (P) in 2020-21, with maximum contribution of Rs 175.01 billion being in the year 2016-17 (Table 4).

TABLE 4 Dividend Income from Petroleum Companies (Rs billion)

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21(P)
Central Govt.	91.97	102.17	175.01	145.75	155.25	122.70	103.93
State Govts.	.28	.95	1.83	2.62	1.95	2.15	3.79

Source: PPAC, Ministry of Petroleum and Natural Gas, New Delhi.

COAL AND LIGNITE The taxation structure followed for coal in India is complex. Taxes are levied on coal production by the Centre as well the States. There are almost sixteen different taxes combined at both levels (such as the National Mining Exploration Tax (NMET), excise duty, clean energy cess, royalty and direct mineral fund. See Appendix Table A9).¹⁰

Coal mining royalties are 14 percent of the basic price, paid to the concerned State governments and include royalties from all companies, public or private; those involved in mining for internal purposes (such as for iron smelting); or for sale to the power sector. In addition, the NMET of 2 percent of the royalty is charged for the funding exploration done by the State government. Additionally, a payment is made to the District Mineral Foundation (DMF), which is not more than a third of the royalty amount, and is to be decided by each concerned State government. The DMF funds are to be used for the welfare of the populations affected by mining.

Unlike for major petroleum products, coal does come under the ambit of GST with a rate of 5 percent that has remained the same since 2017. However, it also has a compensatory GST imposed on it. This is a clean energy cess, first introduced in 2010 as a form of carbon tax on the production and import of coal, lignite and peat. Initially, it was at a unit rate of Rs 50 per tonne of coal mined or imported, and in 2016, increased to Rs 400. In addition, other levies include Paryavaran and Vikas Upkar (Environment and Development Favour) levy of Rs 23 per tonne; a terminal tax of Rs 2 per tonne is paid by southern coal fields; while coal fields located in western India pay a forest tax of Rs 57 per tonne.

Coal India Limited or CIL is the largest of the coal and lignite companies, predominantly owned by the government. There are eight subsidiaries of Coal India Limited i.e., Bharat Coking Coal Limited (BCCL), Central Coalfields Limited (CCL), Eastern Coalfields Limited (ECL), Western Coalfields Limited (WCL), South Eastern Coalfields Limited (SECL), Northern Coalfields Limited (NCL), Mahanadi Coalfields Limited (MCL) and Central Mine Planning and Design Institute (CMPDI). The CMPDI is an engineering, design and exploration company set up for

¹⁰ Complete list is provided in the appendix



preparing perspective plans, rendering consultancy services, undertaking exploration and drilling work to establish coal reserves in the country, and collecting detailed data for preparation of projects for actual mining. The other seven subsidiaries of CIL are coal-producing companies. The CIL and its subsidiaries are incorporated under the Companies Act, 1956, and are wholly owned by the Central government. The coal mines in Assam and its neighboring areas are controlled directly by CIL under NCL, its subsidiary.

There are other companies that are either wholly owned by the Central government or in partnership with the concerned State government. Neyveli Lignite Corporation India Limited, for instance, is under the administrative control of the Central government's Department of Coal. It is engaged in exploitation and excavation of lignite, generation of thermal power and the sale of raw lignite. Singareni Collieries Company Limited (SCCL) is a joint undertaking of Government of Andhra Pradesh and the Government of India. The equity capital of SCCL is shared between the Government of Andhra Pradesh and the Central government in a ratio of roughly 51 to 49, respectively. Headquartered at Kothagudem in Andhra Pradesh, SCCL produces about 10 percent of the country's coal production. Of this, 76 percent is dispatched to the coal-based thermal power plants in Maharashtra, Andhra Pradesh and Karnataka. The remaining is supplied to cement companies and other industries.

TABLE 5 Payments to the Government from Coal India Limited (Rs billion)

Particulars	2020-21
Royalty	96.9
Additional Royalty under MMDR Act	
DMF	29.9
NMET	2.1
Goods and Service Tax:	
CGST	14.2
SGST	14.2
IGST	1.6
GST Compensation Cess	225.1
Cess on coal	20.5
State Sales Tax / VAT	0.1
Central Sales Tax	0.1
Others	15.4
Total	419.9

Source: Annual Report 2020-21, Coal India Limited.

Note: This table does not include the data from other public sector coal companies, however that data are available from individual company sources including websites.

Data on dividend receipts from coal companies is not included in Table 5, but they are substantial. For instance, in the period 2015 to 2020, CIL was the highest dividend payer to the government with a combined amount of Rs 425.92 billion; this amount was over and above



the corporate tax paid by CIL and its subsidiary companies.¹¹ This period, however, saw a fall in dividends (see Appendix, Table A10) due to declaration of lower dividends, and reduced shareholding. The shareholding fell from 79.6 percent in 2015-16 to 66.1 percent in 2020-21, and the total dividend fell from Rs 138 billion in 2015-16 to Rs 51 billion in 2020-21. The corporate tax for coal companies has also been substantive. In the six-year period, the total corporation or profit tax of the government from coal companies was Rs 484.06 billion, with the highest of Rs 98.05 billion in 2019-20.

Estimating the Share of Fossil Fuels in Government Revenues

We now calculate the total tax and non-tax revenue for coal, oil and natural gas from the revenue sources mentioned above. In the process, we also compile gross tax revenue, total tax revenue, total non-tax revenue and total revenue receipts for the Central and State governments (UTs as well) for the years 2018 to 19 and 2019 to 2020. Table A13 in the Appendix provides the detailed methodology used in the paper. The choice of year is strictly based on the availability of latest data. While data for earlier years is hard to come by (for coal for instance), data for 2020 to 2021 and current financial year (2021-22) are not available for some of the critical petroleum and coal products. Moreover, detailed data on coal is not available and therefore can only be estimated at a more aggregated level.

Tables A3 and A4, in the Appendix, detail revenue from various sources. Table 6 below summarises the role of oil and natural gas, and coal for revenue-generation in India. The revenue generated from oil and natural gas for both 2018-19 and 2019-20 is about six times higher than that from coal. Also, taxes, duties and cess contribute almost 90 percent of the total revenue both for coal, oil and natural gas. The same trend is true for Central and State governments. Table A7 in the Appendix provides details of different data sources used for calculating revenues from oil and natural gas and coal.

As Table 6 shows the bulk of the revenues, at both Central and State levels, emanates from taxes, though non-tax revenues are not insignificant either. We find that the bulk of the tax revenues are from the indirect taxes from petroleum products. Direct tax revenues for coal have also been falling over the last few years, along with dividends. Moreover, provisional data from 2021 suggests that indirect tax revenues from petroleum are likely to be significantly higher than those for the two years under consideration (2018-19 and 2019-20). In all likelihood, even if petroleum products are shifted to the GST regime (with a top rate of 28 percent), additional surcharges or cesses can be introduced to generate higher revenue from such fuels. Moreover, later we discuss the possible impact of imposing carbon taxes; and the impact would naturally depend upon the rate.

To better illustrate the impact of fossil-fuel revenues, consider the figures in Table 6. The table compares revenues from fossil fuels with GDP and also key areas of government budgetary expenditures. These estimates are for 2018-19 and 2019-20, the revenues are likely to be significantly higher in 2020-21 due to steep increases in indirect tax rates and higher petroleum prices.

Consider 2019-20, when the total revenues from fossil fuels (for Central and State governments) were Rs 648 thousand-crore or Rs 6.48 trillion. We compared this with India's GDP and

¹¹ Calculated from *Annual Reports*, Coal India Limited, 2020.

TABLE 6 Sources of Revenue from Fossil Fuel (Rs billion)

	2018-19			2019-20		
	Oil & Natural gas	Coal*	Total	Oil & Natural gas	Coal*	Total
Total Revenue	57.6	9.3	66.9	55.6	9.2	64.8
Taxes, Duties and Cess	52.7	7.0	59.7	51.4	7.0	58.4
Royalties, Dividends	4.9	2.3	7.2	4.2	2.2	6.4
State revenue	22.8	2.2	24.9	22.1	2.2	24.3
Taxes, Duties and Cess	21.4	0.4	21.8	20.9	0.5	21.4
Royalties, Dividends	1.4	1.7	3.1	1.2	1.7	2.9
Central revenue	34.8	7.2	42.0	33.5	7.0	40.5
Taxes, Duties and Cess	31.3	6.6	37.8	30.5	6.5	37.0
Royalties, Dividends	3.5	0.6	4.2	2.9	0.5	3.5

Source: Author calculations

Note: *Figures for coal are provisional. Also, dividends for coal companies (other than CIL), were not available and have not been included; these are likely to be a very small percentage of the total.

government budgets. Data on the GDP is available from the Central Statistical Organisation, and that for government budgets is available from various budgetary documents put out by the Ministry of Finance (MoF).¹² Figures in Table 7 show that 3.2 percent of the country's GDP for 2019-20, and almost 10 percent of the total Central and State government budgets, came from fossil-fuel revenues. As column 4 in Table 7 shows, revenues from fossil fuel are more than double that of India's entire defense expenditure, three times the health expenditure of the Central and State governments, and comparable to the entire public sector expenditure on education, sports, art and culture (labelled as "Govt. Education Expenditure" in column 1).

TABLE 7 Key Economic and Budgetary Figures of India 2019-20 (Rs billion)

	Central	State [^]	Total	Total as % of GDP
1	2	3	4	5
Tax Rev from Fossil Fuels	37.0	21.4	58.4	2.9
Non-Tax Rev from Fossil Fuels	3.5	2.9	6.4	0.3
Total Revenue from Fossil Fuels	40.5	24.3	64.8	3.2
<i>Compare with</i>				
Govt. Health Expenditure*	6.4	14.6	21.0	1.0
Govt. Education Expenditure*	9.5	56.8	66.3	3.3
Defence Expenditures	31.6	-	31.6	1.6
Total Govt. Budget Expenditures	269.9	400.6	670.5	33.0
India's GDP			2034.0	100.0

Source: "Budget at a Glance 2020-21" Government of India.

Note: *This includes transfers from the Central government, including Centrally Sponsored Schemes, Finance Commission Grants, and Other grants/loans. [^]These are for all states combined. Education includes sports and art and culture. Health includes public health.

¹² Available from Budget Documents

Tables A11 and A12 in the Appendix provide finer details on various elements of total fossil-fuel revenues as a share of GDP and government revenues. To summarise, revenues from fossil fuels are a significant component of India's economy, and may even become more important in the immediate term, before starting to fall as the energy transition gains momentum. The next section attempts to study that transition, using projections made by others.

ENERGY AND FISCAL TRANSITIONS

International Energy Association (IEA, 2021) projects energy usages under different scenarios, namely, Stated Policies Scenario (STEPS), India Vision Case (IVC), and Sustainable Development Scenario (SDS). STEPS provides an assessment of the direction in which India's energy system is heading, based on today's policy settings and constraints, and the assumption that COVID-19 will be under control by 2021. The IVC is based on a more complete realization of India's stated energy policy objectives. The IEA forecasts show limited differences between the two, both in the overall electricity use, as well as the break-up. This is natural, given that India is already committed to a significant part of its energy use coming from fossil fuels. The country has also built a significant coal-power infrastructure in recent years, and this will remain functional for a significant period of time.¹³ The SDS, however, is significantly different; it rests on some difficult assumptions on improving energy efficiency, taking on electric vehicles (EVs) and a rapid movement away from coal. The SDS explores how India could mobilise an additional surge in clean energy investment to produce an early peak and rapid subsequent decline in emissions, consistent with a longer-term drive to net zero, while accelerating progress towards a range of other sustainable development goals. The SDS appears to be an unlikely scenario, but is retained here in the interest of completeness.

TABLE 8 India Energy-Use Projections under Different Scenarios (Unit Mtoe)

Source	A: STEPS			B: SDS			C: IVC		
	2019	2030	2040	2019	2030	2040	2019	2030	2040
Coal	413	498	541	413	318	209	413	463	497
Oil	242	335	411	242	292	268	242	325	379
Natural Gas	55	113	173	55	124	181	55	129	215
Nuclear	10	28	58	10	28	64	10	28	58
Hydro	15	19	26	15	22	31	15	19	26
Bioenergy	182	188	204	182	120	169	182	116	158
Other RE	11	54	160	11	90	225	11	72	188
TOTAL	928	1,235	1,573	928	994	1,147	928	1,152	1,521

Source: IEA (2021)

Note: In million tonnes of oil equivalent (Mtoe)

¹³ See Oskarsson et al. (2021), for a discussion on India's new coal geography and how distinctly different it is from the old public-sector driven industry.

TABLE 9 India Energy-Use Projections under Different Scenarios (As percentage of total)

Source	A: STEPS			B: SDS			C: IVC		
	2019	2030	2040	2019	2030	2040	2019	2030	2040
Coal	44.5	40.3	34.4	44.5	32.0	18.2	44.5	40.2	32.7
Oil	26.1	27.1	26.1	26.1	29.4	23.4	26.1	28.2	24.9
Natural Gas	5.9	9.1	11.0	5.9	12.5	15.8	5.9	11.2	14.1
Nuclear	1.1	2.3	3.7	1.1	2.8	5.6	1.1	2.4	3.8
Hydro	1.6	1.5	1.7	1.6	2.2	2.7	1.6	1.6	1.7
Bioenergy	19.6	15.2	13.0	19.6	12.1	14.7	19.6	10.1	10.4
Other Renewables	1.2	4.4	10.2	1.2	9.1	19.6	1.2	6.3	12.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The Base Case: Stated Policies Scenario (STEPS)

Using these IEA (2021) projections, we can estimate the energy from each source including RE, coal, oil and natural gas for the years 2030 and 2040. All the projections of India's energy use until 2030 and 2040 are made under the assumptions of 5.4 percent annual economic growth.¹⁴ Others have also attempted to estimate India's future energy use based on growth assumptions. TERI-SHELL (2021) studied India's energy transition for the period 2020 to 2050 on the assumption of 4.8 percent real GDP growth,¹⁵ and targeted net zero by 2050.¹⁶ In the same study, solar and wind are projected to produce 88 percent of the total electricity by 2050.

The *BP Energy Outlook* for 2020 studies the period 2018 to 2050. It assumes GDP growth of 6 percent per annum and projects the energy sector will achieve net zero by 2070.¹⁷ In the same report, conditions for 2050 are predicated upon three assumptions—the rapid transition scenario, where carbon emission from energy use falls around 70 percent by 2050; the net-zero scenario, under which carbon emissions from energy use falls by 95 percent; and business as usual, where carbon emission from energy use falls by 10 percent only. The base for comparison for all three scenarios is the level of emissions in 2018.

It is difficult to ascertain which of these projections are more realistic, given the fluid conditions, rapidly changing technologies and possible commitments by the Central and State

¹⁴ This translates to a 10 percent nominal growth rate, which is a standard assumption we retain. Also see <https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html> and <https://www.bloomberg.com/graphics/2020-global-economic-forecast-2050/>

¹⁵ There are few medium-term GDP projections in the RANGE OF 6%+ range as well. The average growth rate for 2000-2020 stands at 5.8% and 2010-2020 stands at 5.3%.

¹⁶ "India: Transforming to a Net Zero Energy System" Downloaded on September 27, 2021. <https://www.shell.in/energy-and-innovation/new-sketch-india-transforming-to-a-net-zero-emissions-energy-system.html#vanity-aHR0cHM6Ly93d3cuc2h1bGwuaW4vSW5kaWFza2V0Y2guaHRtb>

¹⁷ <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2020.pdf>



governments in India. Therefore, in the interest of comparability, we use the IEA real growth estimates for India as a benchmark for studying how the fiscal might be affected under prevalent energy transition scenarios.

We take as a given that the prices of all fossil fuels and exchange rates are as those ruling currently. We also assume that tax and non-tax revenues change proportionately with use of fossil fuels. (Of course, if high levels of carbon taxes are instituted, revenue shares from fossil fuels can be expected to shoot up initially before starting to fall, we, however, do not investigate that scenario). The forecasted menu of energy sources is converted to fuel quantities using a conversion factor of energy use to calculate the quantity of different fuel. These are provided by the Ministry of Statistics and Programme Implementation (MoSPI) and are shown in Table A14 in the Appendix. This enables us to calculate the quantity of coal, oil and natural gas required in 2019, 2030 and 2040, from the IEA (2021) estimates. The revenue received from each of these sources under various tax categories is then estimated for 2019-20. Using this we obtain a value of 'revenue per unit' for coal, oil and natural gas for each revenue category for 2019-20. Assuming that the tax rates and prices of these commodities remain the same, we use this revenue per unit to project revenues for 2030 and 2040.

We do not include GST paid on inputs, input services and capital goods (input tax credits foregone) by businesses dealing in production and distribution of petroleum products, which are outside the GST net. These taxes are a small and insignificant percentage of the total revenues from fossil fuel, and therefore, this absence would not significantly introduce a downward bias. Moreover, some data are available for the financial year (April to March) and some on a calendar year basis, which we treat as the same.

Further, we calculate the total Central and State government revenues as a share of GDP in 2019-20. Assuming the revenue to GDP ratio remains constant,¹⁸ and using the projected GDP for India in 2030 and 2040, we estimate total government revenue for these years separately for Central, State, and Union Territory (UT) governments. The GDP and overall government revenues for 2030 and 2040 are then used as a denominator to study how fossil-fuel revenues will change over time, relative to overall government revenues.

Table 10 below displays the projections under the STEPS. While expected revenues from fossil fuels are expected to rise (see column 1), we expect this rise to be lower than economic growth. Therefore, as a share of GDP, revenues are expected to fall. More importantly, as a share of government expenditure as well, these are expected to fall significantly. This is among the key challenges that Central, State and UT governments in India face; namely, finding alternative revenue sources to cover the loss of fossil-based revenues.

As presented in Table 10, fossil-fuel revenues as a share of government revenue (column 5), are of a very high magnitude at both Central and State levels. For the Central government, 20.8 percent of total revenue came from fossil fuels in 2019. Given *ceteris paribus* assumptions, this is projected to fall to 10.7 percent in 2030 and to 6.3 percent in 2040. The share is not insignificant even in 2040. Of the total revenue earned by State governments in 2019, 8.3 percent came from fossil fuels. This is projected to fall to 5.1 percent in 2030 and to 2.6 percent

¹⁸ The Tax-GDP ratio has remained relatively constant over the last decade. However, in general, the ratio should rise with per capita income.

TABLE 10 Government Revenues from Fossil Fuels (Base Case)

	In Rs Billion	As Share of GDP	As Share of Government Expenditure	As Share of Government Revenue
(1)	(2)	(3)	(4)	(5)
Central Government Fossil-Fuel Revenue				
2019	4,047.5	2.0	15.0	20.8
2030	7,030.3	1.1	10.8	10.7
2040	9,953.7	0.6	4.5	6.3
State Government Fossil-Fuel Revenue				
2019	2,427.1	1.2	6.2	8.3
2030	4,347.5	0.7	5.4	5.1
2040	6,253.8	0.4	2.0	2.6
Total Central and State Government Fossil-Fuel Revenue				
2019	6,474.6	3.2	9.8	13.3
2030	11,377.8	1.8	7.8	7.6
2040	16,207.5	1.0	3.0	4.1

Source: Authors' calculations.

Note: Central government revenues are presented as a share of total Central government revenues in column 5 (or expenditures in column 4). State revenues are presented as a share of total State government revenues, in column 5 (or expenditures in column 4). The total is an aggregate of the two. Overall government budget figures have been projected at a GDP real growth rate of 4.5 percent and 10 percent, which is in sync with expected nominal growth. Future budgetary expenditures and revenues are projected at 10 percent nominal growth rate.

in 2040. The Centre is more dependent on revenue from fossil fuel, than are the States. The Centre's share is likely to remain high in the future as well.¹⁹

Consider Table 10 (column 4), for the Central government's combined tax and non-tax revenues from fossil fuels. These account for 15 percent of the total budgetary expenditure in 2019 and are projected to reduce to 10.8 percent and 4.5 percent in 2030 and 2040, respectively. State government revenue from fossil fuels, as a share of total expenditure, was 6.2 percent in 2019, which is projected to fall to 5.4 percent in 2030 and 2 percent in 2040.

We find that under the base case, and with fairly standard assumptions on process and growth, revenues from fossil fuel will increase over the next two decades, even if tax rates and fuel prices do not increase. However, both as a share of GDP, and with regard to its share in Central and State government budgets, the share of revenue from fossil fuels is likely to fall significantly. This is because the expected growth in fossil-fuels based energy use is significantly lower than the expected GDP growth (assumed to be 10 percent nominal and 5.4 percent real annual growth rate). Also note that compared to current levels, the fall in revenue share

¹⁹ Our study is not directly comparable to that by Prayas (2021) for 2019-20, as our estimates include dividend income, and also do not consider RE and other electricity. Prayas (2021) has estimated the share of coal, petroleum, gas and electricity revenues in total revenue receipts for the Centre at 18.8 percent, and the States at 9.8 percent

from fossil fuels will be far greater for the Central government than for State governments. Therefore, the impact of the fiscal transition will be far greater on India's Central government than on the State governments. However, if carbon taxes are imposed, it would be a different story altogether and this is discussed later.

Next consider Table 11, where we compare the base case with other cases. We find that both STEPS and IVC yield similar results with minor differences, when compared as a share of total government revenues. The SDS for 2030 yields very similar scenarios too. This is because, by 2030, it is expected that in both scenarios (STEPS and IVC) the consumption of coal will fall significantly, but not that of oil and natural gas. As mentioned earlier, coal accounts for lower revenues than oil and natural gas products per unit of energy. Thus, the base case (STEPS) and sustainable development case (SDS) have almost similar projections for 2030.

By 2040, however, the differences in outcomes become somewhat better defined as SDS sees a more significant fall in the consumption of oil, natural gas and coal, than does the base case. The total Central and State government revenues from fossil fuels, as a share of total government revenues, is 4.1 percent in the base case, but 3.7 percent in the SDS case. In the IVC—although coal and oil use are significantly lower—the use of natural gas is significantly higher than in the base case. The simulation shows a higher fossil-fuel revenue share due to the high rates of taxation on natural gas.

TABLE 11 Government Revenues from Fossil Fuels as a Share of Government Revenues

	STEPS	SDS	IVC
Total Central and State Government Fossil Revenue			
2019	13.3	13.3	13.3
2030	7.6	7.6	8.2
2040	4.1	3.8	4.7
State Government Fossil Revenue			
2019	8.3	8.3	8.3
2030	5.1	5.2	5.6
2040	2.6	2.5	3.1
Central Government Fossil Revenue			
2019	20.8	20.8	20.8
2030	10.7	10.7	11.6
2040	6.3	5.7	7.3

Source: Authors' calculations.

Note: Central government revenues are presented as a share of total Central government revenues and those for the States are presented as a share of total state government revenues. The total is an aggregate of the two.



EMERGING ISSUES IN FOSSIL FUEL TAXATION

India has taken several measures—both on the regulatory and the fiscal side—that are expected to enable an efficient energy transition. For example, the installed capacity of RE is being increased by more than five times (2015 to 2022). Other announced policies—including those on urban development (Smart Cities), cleaning of rivers (Namami Gange) and sanitation (Swachh Bharat Mission)—are also in sync with efforts to address potential climate-change developments. Programmes on cleaning up manufacturing emissions, such as the Perform, Achieve and Trade (PAT) scheme that aims to decrease energy consumption in industry and thereby reduce emissions are also underway. India’s National Energy Policy (NEP) reiterates the importance of de-carbonization through the twin interventions of RE and energy efficiency. All these efforts are in line with the SDS vision and will play out in different ways.

India is also using fiscal tools to reduce emissions. Previous sections have already discussed the high taxation on fossil fuels. At the same time, issues such as net zero, carbon taxation and reducing subsidies on fossil fuels are increasingly coming into the public domain. Let us consider net zero first. As discussed in previous sections, under various assumptions related to actions on sustainability, India’s energy portfolio will arguably not vary significantly in 2030 and 2040. This is because whether India chooses a net zero of 2060, 2070 or later, the additional burden of the energy and fiscal transitions will be felt later and not significantly in 2030 and 2040.

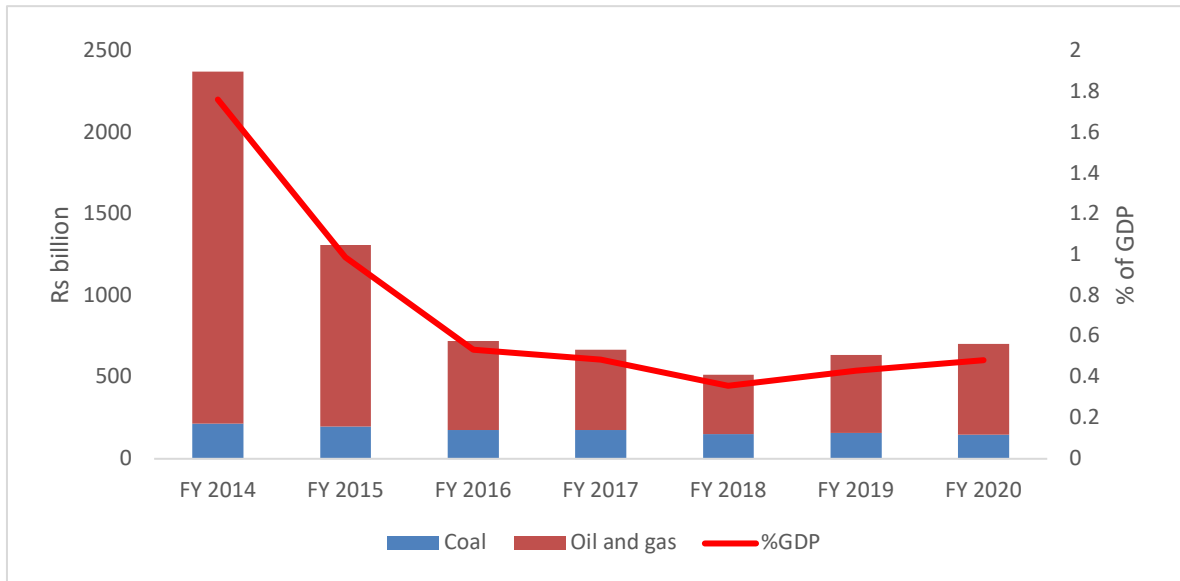
As for energy subsidies, the Indian government has been subsidising many sources of energy—mostly for reasons of welfare and equity as well as supporting public sector commercial entities and industry. Until 2017, concessional excise and customs (import) duties applied to coal. Since then, coal has been brought under the ambit of a very low rate of GST (5 percent) plus a compensation cess of Rs 400. Reduction and easing of compliance requirements of norms is another component of a tacit subsidy regime that applies to coal.²⁰ Overall coal subsidies were estimated at slightly less than Rs 150 billion in 2020, having steadily fallen from Rs 215.2 billion in 2014. Subsidies on petroleum and natural gas fell steadily till 2017, but have risen steadily since. From 2017 onwards, the bulk of the subsidies are associated with LPG or cooking gas, with greater coverage of LPG as a cooking medium through the Central government’s Ujjwala programme²¹.

The subsidies themselves are the result of a low GST (revenues forgone on account of lower rates on LPG), coupled with income support through direct benefit transfers to the users. The subsidies have been estimated at Rs 556.70 billion in 2020 (down from 2,161.4 billion in 2014). The key finding is that fossil-fuel subsidies have been falling steadily in the last decade, apart from those associated with LPG for cooking. Figure 3 shows that the amount of subsidy declined from 2014 to 2017, but has increased somewhat since.

²⁰ There is another pseudo tax that is applied on coal transport by the Indian Railways, which overcharges freight to subsidise passenger transport. IISD (2021) estimated coal transport to have been 45 percent higher than the cost-recovery base rate.

²¹ In FY 2020 subsidies related to LPG and Kerosene amounted to Rs. 214.5 billion.

FIGURE 3 Subsidy for Coal, Oil and Gas



Source: Calculated by the authors, using data from IISD (2021).

While government revenues from coal, oil and natural gas were 3.2 percent of GDP in the financial year FY2020, the subsidy for the same was 0.5 percent of GDP. One of the key issues here has to do with the objective of supplying subsidised cooking gas to the underprivileged, and these subsidies are unlikely to fall. Unless a significant shift occurs toward electricity-based cooking, reduction in such subsidies appears unlikely. In other words, these subsidies are independent of the high levels of taxation on fossil fuels, and are unlikely to change significantly due to welfare considerations, irrespective of the other actions on the sustainability front.

Finally, consider carbon taxes. To our knowledge, there are no universally acknowledged “correct” rates for carbon taxes. Although petroleum products are taxed heavily in India, to date India does not have any tax that directly focuses on carbon emissions, and which is levied on fuels based on their greenhouse gas (GHG) emissions.

TABLE 12 Revenue from Carbon Tax

	2019	2030	2040
Revenue from Existing Tax Sources	3.2	1.8	1.0
Coal	0.5	0.2	0.1
Oil and Natural Gas	2.7	1.6	0.9
Revenue from Carbon Tax	1.4	2.3	1.2
Coal	0.6	0.8	0.4
Oil and Natural Gas	0.7	1.5	0.8

Source: Authors' calculations.

Assumptions: In 2019, carbon tax of USD 10/tonne CO₂; in 2030 and 2040 of USD 35/tonne CO₂ and exchange rate Rs 65/USD



To assess the impact of carbon tax, we use the framework provided in Parry *et al.* (2017). Accordingly, a rate of USD 10 per tonne of CO₂ was imposed for 2020, gradually increased to USD 35 for 2030 and is expected to remain at the same level afterwards. Also, we use the emission factor of each fuel provided in the *Economic Survey of India 2015-16* to calculate the quantity of CO₂ emissions from coal, oil and natural gas for different years. If we impose carbon tax on the same lines, the revenue generated would be 1.4 percent of GDP in 2019, changing to 2.3 and 1.2 percent in 2030 and 2040 respectively (Table 13). The revenue from carbon tax is less than the revenue generated from the existing taxes for 2019, but is expected to be higher going forward to 2030 and 2040. There are two reasons for this. First, the carbon tax rate in 2019 was lower than what it will be in 2030 and 2040. Second, the usage of coal, oil and natural gas falls gradually in 2030 and 2040. The drop in usage is expected to be greater for coal, than for oil and natural gas. Hence, the difference in revenues (under the existing system, and with imposition of carbon tax) is caused primarily by a drop from coal-based revenue.

High carbon taxes, however, have many dimensions—including effectiveness as well as impact on growth and equity. For instance, if LPG is taxed more, we would expect LPG subsidies to also rise commensurately. Moreover, for a country where the bulk of energy production occurs in or through the public sector, a shift towards RE need not require price signals with associated economic and equity costs. In other words, given that the bulk of the energy sector is under the public domain, price signals will have limited power to encourage a faster shift away from coal.

The way energy and revenue transition will work out for different Indian states is another important issue. In this paper, we do not analyse individual states. On the basis of latest available revenue estimates, however, it is clear that the impact across states will not be uniform. Table A14 in the Appendix provides aggregate petroleum-based revenue for all states and UTs in the last three years. It shows that Maharashtra, Uttar Pradesh and Tamil Nadu are the top three with regard to receiving revenues from petroleum-based products. Revenues received by Andhra Pradesh, Telangana, Karnataka and Gujarat are also quite high. More than 50 percent of India's total petroleum-based revenue in 2018-19, 2019-20 and 2020-21 was collected by these seven states. Any decline in consumption of petroleum products will affect the exchequer of these seven states more than that of other states.

Similarly, going forward based on energy transition goals, as the usage of coal declines, its impact across states will also be uneven. India has the fifth-largest coal reserves and is the second largest producer of coal in the world. Almost 70 percent of the total coal produced in India comes from just five states—Jharkhand, Chattisgarh, Odisha, West Bengal and Madhya Pradesh. Naturally, any decision to move away from coal is going to affect these states more than it will the others.

As we have quantified earlier, the dependence of Central, State and UT governments for revenues from coal, oil and natural gas is very high. Going forward, as the use of fossil fuel is expected to reduce, it is crucial to explore other sources of revenue. The following sub-sectors of the energy sector could arguably be taxed: electricity used in EVs, sale of hydrogen and bio fuels, batteries, renewable electricity and beyond. There are also issues related to both the environment and adequacy, which need to be researched and discussed in greater detail. Other avenues include improving tax buoyancy by increasing the tax net, reforming the direct tax code, and most importantly reducing informality—all of these will increase tax buoyancy manifold.



CONCLUSION

India's energy sector is in the early stages of transition from fossil fuel to RE sources. The final outcome of this process will be decided by many factors, including the GDP growth rate, price of RE-related technology, investment in new energy infrastructure and more. One key aspect of this transition is the government's dependence on fossil fuels for revenues. On the average, petroleum taxes contributed over 2 percent towards the GDP in the last decade (Mukherjee, 2020). Excise duty from petroleum products alone now contributes 85 to 90 percent of all excise collected by the Central government, accounting for roughly 24 percent of indirect tax revenue in 2018-19 by the government's own estimates.²²

The reliance of the Central, State and UT governments on fossil-fuel based taxes, has increased considerably over the last few years. Based on the methodology explained earlier, we calculated the revenue that Central, State and UT governments in India received from coal, oil and natural gas for 2019 and found it to be a significant share of total revenues, and higher than estimated by others.

We further projected the same for 2030 and 2040, and found that, under different scenarios, there is likely to be an increase in quantum of fossil-fuel revenues in absolute sense, but as share of total revenue and expenditure there will be a significant fall. In other words, Central, State and UT governments will be forced to depend less on fossil fuels relative to the size of their budgets.

Finally, this study sheds some light on both the change in the quantum and share of revenues, as India transitions to a low-carbon economy. Other studies need to be conducted on the impact of this transition on India's foreign exchange outflows, infrastructure and investment requirements, and also on the changing nature of India's largely public-sector driven energy industry to one where the private sector and public-private partnerships play a growing role. We have also not looked at how the transition will impact revenues at the individual state/UT-level, which will vary depending upon each state/UT's resource base (presence of fossil-fuel mining), economic structure (demand for energy) and income levels. We believe these are important issues that future research needs to consider.

²² Parliamentary response to unstarred question in the Lok Sabha, and SBI (2020). See <http://164.100.24.220/lok-sabhaquestions/annex/173/AU181.pdf> and https://images.assettype.com/tv5kannada/2021-09/33458244-9a46-445c-a5c0-505349745733/190320_Ecowrap_20200319.pdf

APPENDIX

TABLE A1

S. No.	Commodity	Basic Excise Duty	Special Additional Excise Duty	Road & Infrastructure Cess	Total Central Excise Duty
1	Crude Petroleum Oil	Rs 1 per tonne excise duty + Cess @20% + Rs 50/ MT as NCCD	—	—	Rs 1 per tonne excise duty + Cess @20% + Rs 50/ MT as NCCD
2	Natural Gas [other than CNG]	Nil	—	—	Nil
3	CNG	14%	—	—	14%
4	Petrol (Unbranded)	Rs 2.98/ltr	Rs 12.00/litre	Rs 18.00/litre	Rs 32.98/litre
5	High Speed Diesel (Unbranded)	Rs 4.83/litre	Rs 9.00/litre	Rs 18.00/litre	Rs 31.83/litre
6	ATF	11% [2% for RCS flights]	—	—	11% [2% for RCS flights]

Source: Ministry of Petroleum & Natural Gas, Posted on September 19, 2020 3:54 p.m. by PIB Delhi, <https://pib.gov.in/PressReleasePage.aspx?PRID=1656647>

Note: ATF - Aviation Turbine Fuel; CNG - compressed natural gas; NCCD - National Calamity Contingent Duty; RCS - Regional Connectivity Scheme.

TABLE A2

Commodity	GST
LPG	Domestic 5.00%
	Non - Domestic 18.00%
Kerosene	PDS 5.00%
	Non PDS 18.00%
Naphtha	Fertiliser 18.00%
	Non- Fertiliser 18.00%
Bitumen & Asphalt, furnace oil, Lube, Pet coke etc	18.00%

Source: Ministry of Petroleum & Natural Gas, Posted on September 19, 2020 3:54 p.m. by PIB Delhi, <https://pib.gov.in/PressReleasePage.aspx?PRID=1656647>

TABLE A3 Public Sector Enterprises Generating Revenues for Government from Petroleum

Names
PSEs
Balmer Lawrie & Co. Limited
Bharat Petroleum Corporation Limited
Biecco Lawrie Co. Limited
Chennai Petroleum Corporation Limited
Engineers India Limited
Gas Authority of India Limited
Hindustan Petroleum Corporation Limited
Indian Oil Corporation Limited
Numaligarh Refinery Limited
Oil India Limited
Oil & Natural Gas Corporation Limited
PSE Subsidiaries
ONGC Videsh Limited
Mangalore Refinery and Petrochemicals Limited
Non-PSEs Earning Revenues from Petroleum
Centre For High Technology
Directorate General of Hydrocarbons
Oil Industry Development Board
Oil Industry Safety Directorate
ONGC Videsh Limited
Petroleum Conservation Research Association.
Petroleum Planning And Analysis Cell
Petroleum Federation of India (PetroFed)
Petroleum and Natural Gas Regulatory Board

Source: Ministry of Petroleum and Natural Gas. Downloaded from <https://mopng.gov.in/en/about-us/psu-subsidiaries-and-others>

TABLE A4A Sources of Revenue from Oil and Natural Gas

Contribution of Petroleum Sector to Exchequer (Rs billion)		
	2018-19	2019-20
1. Contribution to Central Exchequer	3,480.41	3,343.15
Tax/ Duties on Crude oil & Petroleum products	2,798.47	2,875.40
<i>of which</i>		
Cess on Crude Oil	177.41	147.89
Royalty on Crude Oil / Natural Gas	60.62	56.02
Customs Duty	160.35	229.27
Excise Duty	2,143.69	2,230.57
IGST and CGST	239.16	199.30
Dividend to Government/ Income tax etc.	681.94	467.75
<i>of which</i>		
Corporate/ Income Tax	385.61	231.34
Dividend income to Central Govt.	155.25	122.70
2. Contribution to State Exchequer	2,275.91	2,210.56
Tax/ Duties on Crude & Petroleum products	2,273.96	2,208.41
<i>of which</i>		
Royalty on Crude Oil / Natural Gas	133.71	118.82
Sales Tax/ VAT on POL* Products	2,012.65	2,004.93
SGST/UTGST	79.61	73.45
Dividend to Government/ Direct tax etc.	1.95	2.15
Total Contribution of Petroleum Sector to Exchequer	5,756.32	5,553.70

Note: POL*- Petroleum

Source: PPAC

TABLE A4B Sources of Revenue from Coal (Rs billion)

Revenue Components	2018-19	2019-20
Royalty	112.77	106.82
DMF	28.80	31.23
NMET	2.28	2.14
CGST	14.25	13.65
SGST	14.12	13.64
IGST	8.99	1.68
GST compensation cess	240.45	231.66
Cess on coal	16.75	18.59
State Sale Tax/VAT	.07	.12
Central Sale Tax	.07	.20
Central Excise Duty	.07	.21
Entry Tax	.04	0
other	9.60	10.64
Total	448.26	430.59

Source: Annual reports, Coal India

Note: Data for Coal India Limited and its subsidiaries

TABLE A5 Average Tax-GDP ratio with 10% nominal GDP growth (2030)

	Average tax/non-tax to GDP ratio					
	% of GDP			% of Gross Revenue		
	Total	Coal	Oil & Natural gas	Total	Coal	Oil & Natural gas
Total Revenue share						
2019	3.2	0.5	2.7	13.25	1.88	11.37
Taxes, Duties and Cess	2.9	0.3	2.5	17.16	2.05	15.11
Royalties, Dividends	0.3	0.1	0.2	4.29	1.49	2.79
2030	1.8	0.2	1.6	7.57	0.74	6.83
Taxes, Duties and Cess	1.6	0.1	1.5	9.60	0.78	8.82
Royalties, Dividends	0.2	0.0	0.1	2.42	0.63	1.80
State revenue share						
2019	1.2	0.1	1.1	8.26	0.74	7.52
Taxes, Duties and Cess	1.0	0.0	1.0	10.45	0.23	10.23
Royalties, Dividends	0.1	0.1	0.1	3.24	1.89	1.35
2030	0.7	0.04	0.6	5.12	0.31	4.82
Taxes, Duties and Cess	0.6	0.01	0.6	6.32	0.09	6.23
Royalties, Dividends	0.1	0.03	0.0	1.88	0.90	0.98

	Average tax/non-tax to GDP ratio					
	% of GDP			% of Gross Revenue		
Central revenue						
2019	2.0	0.3	1.6	20.8	3.6	17.2
Taxes, Duties and Cess	1.8	0.3	1.5	27.2	4.8	22.4
Royalties, Dividends	0.2	0.0	0.1	5.9	0.9	5.0
2030	1.1	0.1	1.0	10.7	1.3	9.4
Taxes, Duties and Cess	1.0	0.1	0.9	14.1	1.7	12.4
Royalties, Dividends	0.1	0.0	0.1	3.1	0.3	2.7

Source: Authors' calculation

TABLE A6 Average Tax-GDP ratio with 10% nominal GDP growth (2040)

	% of GDP			% of Gross Revenue		
	Total	Coal	Oil & Natural gas	Total	Coal	Oil & Natural gas
Total Revenue Share						
2019	3.2	0.5	2.7	13.25	1.88	11.37
Taxes, Duties and Cess	2.9	0.3	2.5	17.16	2.05	15.11
Royalties, Dividends	0.3	0.1	0.2	4.29	1.49	2.79
2040	1.0	0.1	0.9	4.07	0.30	3.77
Taxes, Duties and Cess	0.9	0.1	0.8	5.34	0.33	5.01
Royalties, Dividends	0.1	0.0	0.1	1.17	0.24	0.93
State revenue share						
2019	1.2	0.1	1.1	8.26	0.74	7.52
Taxes, Duties and Cess	1.0	0.0	1.0	10.45	0.23	10.23
Royalties, Dividends	0.1	0.1	0.1	3.24	1.89	1.35
2040	0.4	0.02	0.4	2.61	0.12	2.49
Taxes, Duties and Cess	0.3	0.00	0.3	3.43	0.04	3.39
Royalties, Dividends	0.0	0.01	0.0	0.75	0.30	0.45
Central revenue						
2019	2.0	0.3	1.6	20.8	3.6	17.2
Taxes, Duties and Cess	1.8	0.3	1.5	27.2	4.8	22.4
Royalties, Dividends	0.2	0.0	0.1	5.9	0.9	5.0
2040	0.6	0.1	0.5	6.3	0.6	5.7
Taxes, Duties and Cess	0.5	0.1	0.5	8.2	0.8	7.4
Royalties, Dividends	0.1	0.0	0.0	1.8	0.1	1.7

Source: Authors' calculation

TABLE A7 Sources of Data

Fossil	Data Sources
Oil & Natural Gas	All aggregate and disaggregated data for both central and state government can be obtained from Petroleum Planning and Analysis Cell (PPAC).
Coal & Lignite	1. Annual Reports Coal India Limited 2. Annual reports of SCCL. 3. Major Statistics (Export/Import) from Ministry of Coal

TABLE A8 Conversion Factors

Energy Sources	Conversion
One million tonnes of Coal	15.70 petajoules of energy
One million tonnes of oil equivalent (MTOE)	41.87 petajoules of energy
One billion cubic metre of natural gas	38.52 petajoules of energy
One million cubic metre of natural gas	38.52 terajoules of energy

TABLE A9 Tax related to Coal

Central Government	State Government
NMET	Royalty
Stowing Excise Duty	Direct Mineral Fund
Clean Energy Cess	Value Added Tax
Basic Custom Duty	Entry Tax
Countervailing Duty	State Cess on Coal
Excise Duty	
Central Sales Tax	
GST Compensation Cess	
Mixed	
Non CIL Coal	
Corporate Tax	

TABLE A10 Dividend and Corporate Tax for Coal (Rs Billion)

Year	Dividend to the Government#	Corporate tax of All Coal Companies *
2015-16	137.76	86.52
2016-17	96.72	84.71
2017-18	80.40	63.03
2018-19	58.60	76.92
2019-20	52.43	98.05
2020-21	50.91	74.81
Total	425.92	484.06

Source: Dividends to the government are available from CIL's Annual reports. Corporation or Profit Tax is available from the CMIE PROWESS database of all Coal companies.

TABLE A11 Revenues from Fossil Fuel as a Percentage of Total Government Expenditures

	2018-19			2019-20		
	Oil & Natural gas	Coal	Total	Oil & Natural gas	Coal	Total
Total Revenue	10.2	1.7	11.8	8.4	1.4	9.8
Taxes, Duties and Cess	9.3	1.2	10.6	7.8	1.1	8.9
Royalties, Dividends	0.9	0.4	1.3	0.6	0.3	1.0
State revenue	6.8	0.6	7.5	5.7	0.6	6.2
Taxes, Duties and Cess	6.4	0.1	6.5	5.4	0.1	5.5
Royalties, Dividends	0.4	0.5	0.9	0.3	0.4	0.7
Central revenue	15.0	3.1	18.1	12.4	2.6	15.0
Taxes, Duties and Cess	13.5	2.8	16.3	11.3	2.4	13.7
Royalties, Dividends	1.5	0.3	1.8	1.1	0.2	1.3

Source: PPAC and Authors' calculations from different sources.

Note: The figures under Central government are as a share of Central government expenditure for those years; for State governments, the figures are the combined expenditure of the State and UT governments for those years; and the total is an aggregate of the two.

TABLE A12 Revenues from Fossil Fuels as a Percentage of India's GDP

	2018-19			2019-20		
	Oil & Natural gas	Coal	Total	Oil & Natural gas	Coal	Total
Total Central and State Revenue	3.03	0.49	3.53	2.73	0.45	3.18
Taxes, Duties and Cess	2.78	0.37	3.15	2.53	0.34	2.87
Royalties, Dividends	0.26	0.12	0.38	0.20	0.11	0.31
State Government revenue	1.20	0.11	1.31	1.09	0.11	1.19
Taxes, Duties and Cess	1.13	0.02	1.15	1.03	0.02	1.05
Royalties, Dividends	0.07	0.09	0.16	0.06	0.08	0.14
Central Government revenue	2.78	0.37	3.15	2.53	0.34	2.87
Taxes, Duties and Cess	1.65	0.35	1.99	1.50	0.32	1.82
Royalties, Dividends	0.19	0.03	0.22	0.14	0.03	0.17


Source: PPAC and Authors' calculation

TABLE A13 Methodology

We use the energy requirement forecast from IEA for 2030 and 2040 under three different scenarios.
Converted the energy required into quantity required using conversion parameters from MoSPI.
Using the revenue received on (both tax and non-tax) by both centre and state government in 2019-20, we calculate the revenue received per unit of usage. All the calculation was done separately for 'coal' and 'oil & natural gas'
Using the projected quantity usage and revenue per unit in 2019-20, we project the tax revenue (Tax, duties and cesses) and non-tax revenue (Royalty and dividends) for centre and state government in 2030 and 2040.
We assume 2 scenarios of GDP growth- one as 7% and other as 10%. Keeping the ratio of tax revenue to GDP constant, we calculate the project tax to GDP ratio for 2030 and 2040. We have presented the 10% growth result in the paper.
Further, we also assume that the revenue from these as a share of total government revenue remains same over the years. Using the average share of revenue from coal, oil and natural gas for last 10 years separately for tax revenue and non-tax revenue (for centre and states), we project the ratios for 2030 and 2040 as well.

TABLE A14 Petroleum based revenue for different States and UTs

S.No.	State/UT	Revenue in Rs. million		
		2018-19	2019-20	2020-21
1	Andaman & Nicobar Islands	926.4	942	738.7
2	Andhra Pradesh	110,413.3	103,235.4	111,253.2
3	Arunachal Pradesh	551	265.5	1045.2
4	Assam	44,379.7	41,162.6	40,789.4
5	Bihar	67,431.3	63,826.8	59,758.5
6	Chandigarh	630.2	610.9	610.6
7	Chhattisgarh	40,043.7	38,862.9	41,214
8	Dadra & Nagar Haveli, and Daman & Diu	137.2	218.3	217.2
9	Delhi	44,302.4	38,837.9	26,893.1
10	Goa	6,973	7,627.2	6,920.9
11	Gujarat	182,881.8	17,1379	167,069.3
12	Haryana	89,445.6	83,329.1	84,519
13	Himachal Pradesh	3,673	4,446.5	8,882.4
14	Jammu & Kashmir	14,698.5	14,756.2	14,830
15	Jharkhand	28,084.1	33,122.3	36,312.9
16	Karnataka	147,729.7	156,493.6	157,364.3
17	Kerala	81,407.3	82,450.6	70,602.4
18	Ladakh	0	149.5	501



S.No.	State/UT	Revenue in Rs. million		
		2018-19	2019-20	2020-21
19	Lakshadweep	0	1.6	0
20	Madhya Pradesh	95,717.1	108,179	119,753.7
21	Maharashtra	284,625.4	279,173.8	263,625.7
22	Manipur	1,820.4	1,938.2	2661.7
23	Meghalaya	07	03.5	010
24	Mizoram	886	921.3	848.8
25	Nagaland	976	1,162	1,488.1
26	Odisha	57,523.5	56,874.4	64,191.1
27	Puducherry	91.9	58.6	108.4
28	Punjab	66,915.3	56,759.7	63,346.1
29	Rajasthan	129,190	134,946.7	152,631
30	Sikkim	1,360.2	1,295.2	1,108.1
31	Tamil Nadu	187,846.8	187,367.9	175,024.3
32	Telangana	100,556.2	100,660.5	8,7132
33	Tripura	2,968.8	4,015	4,829.2
34	Uttar Pradesh	197,838	207,309.1	225,587.2
35	Uttarakhand	16,014.8	15,014.2	15,320
36	West Bengal	84,109.1	80,876.1	83,333
	TOTAL	2,092,262	2,078,380	2,090,580

Source: PPAC

Note: These revenues are sum of sale tax and SGST/UTGST.

FIGURE A1 Energy Generation and CO₂ Emission



FIGURE A2 India's Total Coal Imports



Source: <https://coal.gov.in/major-statistics/import-and-export>



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