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Environmental Responsibility: An Emerging Paradigm of Indian Public Sector -A Case Study

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Abstract
Corporate Environmental Responsibilityis relatively a new concept which includes different ideas, actions, strategies and ideologies. The concept clearly identifies and explains the role played by the corporations in the current environmental crisis. "Its basic premise is that a corporation engages in environmentally beneficial actions to reduce society's burden on our ecosystem and promote environmental sustainability. Corporate Environmental Responsibility is about managing the use of natural resources in the most effective and efficient manner in order to reduce environmental impacts and financial costs. This study is pertaining to the corporate Environmental responsibilities as a part of corporate social responsibilities of Indian Oil Corporations. It discusses on the amount of direct and indirect energy consumption and CO2 emission created and its responsibilities towards the society are analyzed.The study found that, total Environmental Expenditure is increasing: for Corporate Social Responsibility Expenditure was Rupees 460.37 crore in that Rs.252.48 was spent for Covid 19 (2% of average Net Profit as per Section 135(5)), health and sanitation was Rupees 29.54 crores and for Swatch Bharat was Rs.16.38 crores, It is a welcoming feature and environmental concern of Indian Oil Corporation, otherwise Corporate Social Responsibility.

Keywords: Corporate Environmental Responsibilities, Energy Consumption, CO2 Emission, Indian Oil Corporation

Introduction

Corporate Environmental Responsibility is a concept clearly identifies and explains the role played by the corporations in the current environmental crisis. Corporate Environmental Responsibility (CER) as defined by Jamison et al. (2005) takes into account environmental commitment, whereby the company fully embraces sustainability and has a net positive impact on environment and society.

The sustainable development goals mandated by the UN tries to take into account the 3Ps – Profit, Planet and People, all together in a balanced manner. Governments through their policies, regulators through monitoring, corporations through innovation, and customers through modified lifestyles have been endeavoring to meet these goals and work for a better future (Hart S, 1997)

As to whether or not companies need to be sustainable in the first place, that does tie in to the nebulous, philosophical question of corporate responsibility. From a purely scientific standpoint, companies have to start being sustainable. Most pollution is directly tied to corporate enterprise.

If global warming progress is to be made, government regulation will have to restrict pollution, companies will have to take initiative in reducing pollution, or green-tech ventures will have to find universal energy solutions. The first two options are more likely in the short run, so companies will either face regulation or successfully deter regulation.

Literature Review

There are two theories such as Natural Resource BasedView theory (NRBV) and Neo-Institutional theory are adopted to investigate the contexts in which an organization is encouraged to undertake environmental actions and evaluate environmental strategies associated with them. The NRBV is a theory of how an individual firm might gain a competitive advantage bygoing green (Hart, S,L 1995). Institutional theory emphasizes the role of social and cultural pressures imposed on organizations that influence organizational practices and structures (Scott, 1995). Hoffman (2001) argues that while organizations do not simply react to the pressures dictated by the organizational field, they also do not act completely autonomously without the influence of external bounds. Institutional and organizational dynamics are tightly linked.

Lyon and Maxwell (2008) define CER as "environmentally friendly actions not required by law, also referred to as going beyond compliance, the private provision of public goods, or voluntarily internalizing externalities." According to accepted economic theory, regulation should hurt firms, because it increases costs and constrains the choices available to managers (Berchicci and King, 2007). On the other hand, regulations can be effective in inducing beneficial effects. Porter and Van der Linde (1995) proposed that "by stimulating innovation, strict environmental regulations can actually enhance competitiveness" and therefore "partially or more than fully offset the costs" of compliance (Porter and Van der Linde, 1995). Regulatory mechanism with its pros and cons remains the most effective driver for environmental compliance,but going beyond compliance requires other non-regulatory factors. Market pressures to enhance cost competitiveness have additionally stimulated the adoption of EMS such as ISO 14001 because they contribute to identifying and implementing efficiency improvements (Delmas, 2002). Anton et al. (2004) reported that stakeholders often encourage the adoption of Environmental Management Systems (EMS) and find these systems to be associatedwith performance improvement.Shareholders and also financial institutions, perceive companies with a poor environmental record as riskier to invest in, and may demand a higher risk premium (Henriques and Sadorsky, 1996).Green consumerism may also drive the transition toward more proactive environmental management, particularly in industries that have close contacts with final consumers (Arora and Cason, 1995).Klassen and Vachon (2003) found that customer-initiated collaborative activities increased waste prevention.

There is a growing awareness among organizations on conservation and optimum utilization of natural resources to gain competitive advantage (Hart, 1995). Firms can gain sustainable competitive advantages by reducing the adverse impactsoftheiroperationsonthe naturalenvironment (Clarkson et al., 2011). Broadly CER can be described as precautions and policies organizations adopt to reduce and prevent hazards to environment (Kusku, 2007) along with stakeholder participation to induce transparency. It makes lot of sense for companies to be environmentally responsible because of its multifarious tangible and intangible benefits (Hansen and Mowen, 2007). With this realization and growing awareness, most polluting companies have also initiated environmentally responsible programs. Hence, here is an attempt made by the authors to check about environmental responsibility of Indian Oil Corporation in India.

Methodology

Indian Oil is the largest commercial enterprise of India ranked 137 in the Fortune 'Global 500' listings for 2018. IndianOil, with its 33,157 strong team is taking the lead to meet India's energy demands efficiently and effectively, since last five decades. Indian Oil accounts for nearly half of India's petroleum products market share. During 2017-18, Indian Oil sold 88.76 million tonnes of products (including petroleum products, stgas, petrochemicals, explosives and exports). As on 31

March 2018, Indian Oil has over 47,800 customer touch points, through which it reach out to all sections of society. This paper is a case study about the public sector and its social responsibility by using secondary sources only.

The data analysis was carried out with simple linear regression model Y= a + b X +Ui framed and estimated the parameters with Ordinary Least Square Method which aids to predict the variables selected to spell out the environmental responsibility. Table 1 to Table 5 was attempting to predict the concerned dependent (Y) variable with respect to time/ period (X) as explanatory variable. In table -10 annual growth rates was found with formula:

$$\frac{current\ \ year\ \ value - previous\ \ year\ \ value}{Previous\ \ year\ \ value} \text{ X100.}$$

For the table-11 the Karl Pearson Correlation Coefficient was found by using the formula:

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

Results and Discussions

Share of Corporate Social Responsibility (CSR)

Indian Oil undertakes initiatives includes energy efficiency, energy conservation, water conservation, renewable energy, retail outlet solarization, tree plantation, waste/biomass to fuel, LED lighting, rainwater harvesting, carbon neutral events etc. Indian Oil has taken voluntary target to reduce its specific carbon and water footprint by 18% and 20% respectively by 2020, with 2012-13 as the base year which shows its commitment to reduce environment impacts.

Table 1 Share of CSR in Profits after Tax

S. No.	Year	Profits after tax in crores	CSR in Crores	CSR as % of PAT
1	2010-11	7445	128	1.719
2	2011-12	3955	83	2.099
3	2012-13	5005	79	1.578
4	2013-14	7019	82	1.168
5	2014-15	5273	114	2.162
6	2015-16	10399	157	1.510
7	2016-17	19106	214	1.120
8	2017-18	21346	331	1.551
Total		79548	1188	1.493
		Y=9943.5+2232.119X	Y=148+27.881X	
Estimated	2020-21	24452.27	329.7262	1.348
	2025-26	35612.87	469.131	1.317

Source: Row One- Row eight -Data Compilation from reports of www.ioc

Table 1 explains the share of CSR expenditure in profits after Tax. There is a wider variation in both profits and CSR expenditure.Constantly an average of Rs.148 crore was spent for CSR and a constant average profit of IOC was Rs 9943.5 crores.The range 0f CSR as % of PAT varies from 2.2 to 1.1 and the average is 1.493.The Trend shows that in due course the percentage remains within the range of 1.348 and 1.317.Lack of uniformity is visible from the raw data.

Energy

Energy is a key driver for economic growth, and the energy demand in India is continuously increasing due to various social and demographic factors like Industrialization, population growth, urbanization etc. India, being a fast growing economy has made great progress across sectors like industrial, agriculture, transportation, commercial and domestic sectors over the past decades. With per capita energy consumption still lower than the global

average, energy demand in India is projected to soar over the coming decades to achieve sustained and inclusive economic growth. However, the country's fossil fuel reserves are limited which entails efficient utilization of resources, deriving maximum value from the available resources. Hence, there is a greater emphasis for secured, sustainable and affordable energy as a means to underpin development, while addressing environmental concerns. As a major mitigation initiative, energy efficiency and renewable energy policies have gained lot of importance over the years. In addition, depletion of conventional energy sources and the growing environment concerns necessitate the optimum use of resources. Indian Oil has continuous focus on increasing the share of renewable energy sources in the total energy consumption.

Table 2 Total Energy Consumption in Tera Joule

S.No.	Year	Energy Consumption		Total
		Direct Energy	Indirect Energy	
1	2010-11	202465	151.65	202464.65
2	2011-12	223584	189.93	220583.93
3	2012-13	231435	207.35	231642.35
4	2013-14	221479	234.86	221713.86
5	2014-15	213967	398.47	214365.47
6	2015-16	220449	336.24	220785.24
7	2016-17	225385	274	225525
8	2017-18	291235	238.41	291473.41
Total		1829999	2030.91	0.111

Source: One- Row eight -Data Compilation from reports of www.ioc

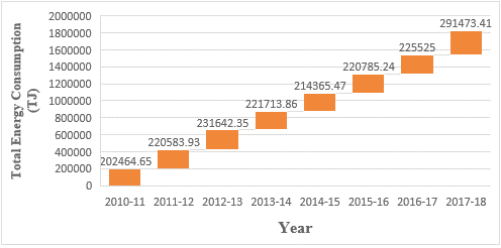

Figure 1 Increasing Trend of Energy Consumption

Table 2 shows the energy consumption of IOC in terms of direct and indirect energy.The total energy consumption had increased from the year 2010-11 to 2017-18 and the trend of 2020-21 shows a declining trend and it may be expected to increase further in 2025-2016.Figure -1 shows the increasing trend of energy consumption.

Table 3 Total Throughput in Million Tonnes

S.No.	Year	Throughput		Total
		Pipe Line	Refinery	
1	2010-11	68.51	52.86	121.37
2	2011-12	75.54	55.62	131.16
3	2012-13	75.49	54.65	130.14
4	2013-14	73.07	53.31	126.38
5	2014-15	75.68	53.59	129.27
6	2015-16	79.82	56.69	136.51
7	2016-17	82.49	65.20	147.69
8	2017-18	85.68	69.00	154.68

Total		616.28	460.92	1077.20
		Y=77.04+2.03X	Y=57.62+1.99X	Y=134.65+4.02X
Estimated	2020-21	90.23	70.56	160.79
	2025-26	100.38	80.52	180.90

Source: One- Row eight -Data Compilation from reports of www.ioc

Table 3 explains throughput of IOC during the years 2010-11 to 2017-18 both from pipeline and Refinery. Between the years 2010-11 to 2011-12 an increasing trend and then declining trend during the years 2012-13 and 2013-14 and 2014-15 onwards an increasing trend. Forecasts for the years 2020-21 and 2025-26 and the trend are increasing.

Energy Intensity

Energy intensity is the ratio of energy use to output. The distinction between energy intensity and energy efficiency is important when multiple technologies or multiple products underlie what is being compared. Efficiency improvements in processes and equipment and other explanatory factors can contribute to observed changes in energy intensity. Declines in energy intensity are a proxy for efficiency improvements.

Table 4 Energy Intensity in Per Million Tonnes

S.No.	Year	Total Energy in Tera Joules (TJ) (From Table 2)	Total Throughput in Million Tonnes (MT) (From Table 3)	Energy Intensity Per Million Tonnes
1	2010-11	202464.65	121.37	1668.161
2	2011-12	220583.93	131.16	1681.793
3	2012-13	231642.35	130.14	1779.947
4	2013-14	221713.86	126.38	1754.343
5	2014-15	214365.47	129.27	1658.277
6	2015-16	220785.24	136.51	1617.356
7	2016-17	225525.00	147.69	1527.947
8	2017-18	291473.41	154.68	1887.364
Total		1828553.91	1077.20	13575.19
		Y=228569.239+7236.273X	Y=134.65+4.02X	Y=1696.90+2.16X
Estimated	2020-21	275605.02	160.79	1710.93
	2025-26	311786.38	180.90	1721.73

Source: One- Row eight -Data Compilation from reports of www.ioc

Table 4 explains the Energy intensity per million tonnes.There is zigzag nature of energy intensity is visualized between the years 2010-11 to 2017-18. First 3 years an increasing trend and the next four years adeclining trend of energy intensity 2017-18 years shows the highest energy intensity figure of 1887.364.But the estimated energy intensity is the modest figure of 1710.93 for the year 2020-21 and 1721.73 of 2025-26.

Renewable Energy

Renewable Energy provides reliable power supplies and fuel diversification which enhance energy security, lower risk of fuel spills and reduce the need for imported fuels. Renewable energy also helps conserve the nation's natural resources and plays an important role in reducing greenhouse gas emissions.

The share of renewable energy in the Indian energy mix continues to grow and the growth

is contributed by factors like energy security, environmental concerns in the conventional power, and improved availability of matured renewable technologies etc.. India's wind and solar power sector is expected to grow significantly in the coming decade, considering its target to increase the installed capacity of renewable energy to 175 GW by 2022.

IOC is striving to increase its installed grid-connected renewable energy capacity to 260 MW by 2020. Further, Indian Oil is targeting to implement solar Photo voltaic plants across rooftops as well as spare lands across its installations. During the year, we have invested Rs. 651 Crore in renewable energy projects. The total generation from Renewable for the year 2016-17 was 179 million units, which amounts to approximately 3.39% of Indian Oil's total electricity consumption. Due to adding 103 MW of Solar and Wind power projects the total generation during the year is 171 GWh which helped in reducing GHG emissions equivalent to 1,42,000 TCO2. Indian Oil has implemented Solar Policy in 2015-16 to install off-grid solar power systems on all the available roof-tops and land areas available across our installations.

Table 5 Total Energy Generation from Grid and off-Grid connected Renewable Energy

S. No.	Year	Grid Connected Renewable Energy in GWH			Solar Off Grid in MW
		Solar	Wind	Total	
1	2012-13	97	7	104	218
2	2013-14	132	5	137	300
3	2014-15	132	5	137	630
4	2015-16	124	5	129	1440
5	2016-17	158	13	171	7300
6	2017-18	3085	15	3100	14300
Total		3728	50	3778	24188
		Y=466+428.857X	Y=6.250+1.829X		Y=3023.500+2634.857X
Estimated	2020-21	2825	16	2841	17515
Estimated	2025-26	4969	25	4994	30690

Source: One- Row six -Data Compilation from reports of www.ioc

The total generation from Renewable for the year 2016-17 was 179 million units, which amounts to approximately 3.39% of Indian Oil's total electricity consumption. Indian Oil has implemented off-grid solar power systems on all the available roof-tops and land areas available across installations. Table 5 explains Renewable Energy generated by IOC both Grid connected and Off Grid connected.Among the Grid connected solar energy is more and in the year 2017-18 it had increased 2927 from 158 in previous year installation. Slow phase of generation of wind energy is visualized from the table.Year by year solar off grid generation is also increasing.Future trend also shows the positive picture of Renewable energy generation of IOC.

Green House Gas (GHG) Emissions

Global warming due to anthropogenic emissions has grown into one of the most complex issues faced globally. The vast consequences of climate change threaten to affect not only our environment but also economic, social and political setup. Warming of our ecosystem is unequivocal, and since the 1950s, many of the observed climatic and environmental changes have been unprecedented. The average surface temperature has risen by about 0.8°C globally since 1880, while sea level has risen by 6-8 inches in the last century. Due to changing weather patterns, our planet is already experiencing extreme climate conditions viz. heat stress, flooding, drought, reduction in agricultural yield, sea level rise, extreme precipitation and storm surges etc. The problem is further accentuated by the fact that the rate of

occurrence of these climatic extremes are increasing, e.g. the rate of rise in sea level in the past two decades is nearly double the rate observed in 100 years preceding it. Human influence on climate system is more evident with the CO levels surpassing 400 ppm in 2013 for the first 2 time in the history of mankind. In this context, it is critical that companies and governments actively pursue sustainable growth by continuously undertaking various climate mitigation and adaptation actions to prevent adverse impact on our ecosystem. The average surface temperature has risen by about 0.8°C globally since 1880 due to rising GHG concentrations and two-thirds of the warming has occurred since 1975, at a rate of roughly 0.15-0.20°C per decade. As per a recent report by NASA, 2016 is the third year in a row to set a new record high for global average surface temperatures i.e., 0.99C warmer than the global temperature in mid-20 century.

New GHG regulations aligning with India's commitment to the Paris agreement may have an influence on its business.IndianOil is committed towards low carbon growth by achieving operational excellence that would reduce its carbon footprint. In view of the same, various mitigation measures like energy conservation, energy efficiency, renewable energy generation and tree plantation etc. across our operating locations.

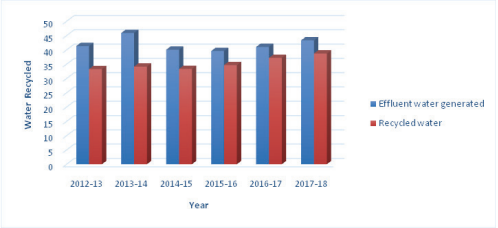

Figure 6 Effluent Water Recycled

Table 6 GHG Emissions Reduction due to Grid connected and Off Grid connected (Renewable power in 000 tonnes of CO2Emission)

S. No.	Year	Grid Connected	Off Grid Connected	Total GHG Emissions Reductions
1.	2012-13	85	179	264
2.	2013-14	115	246	361
3.	2014-15	114	517	631
4.	2015-16	108	1181	1289
5.	2016-17	142	6059	6201
6.	2017-18	265	11726	11991
Estimated	2020-21	2330	14362	16692
	2025-26	4095	25166	29261

Source: One- Row six -Data Compilation from reports of www.ioc

Table 6 explains the total GHG emission Reduction due to Grid connected and off Grid connected Renewable power in IOC. The total GHG emissions increased year by year and it is projected to increase in 2020-21 and 2025-26 also.

Table 7 GHG EmissionCo-efficient

S. No.	Year	Grid Connected Renewable Energy in GWH From Table 5	GHG Emissions From Grid Connected in tonnes of Co2e From Table 6	Off Grid Solar Energy generated	GHG Reduction by Off Grid in tonnes of Co2e
1.	2012-13	104	85	218	179
2.	2013-14	137	115	300	246
3.	2014-15	137	114	630	517

4.	2015-16	129	108	1440	1181
5.	2016-17	171	142	7300	6059
6.	2017-18	3100	265	14300	11726
7.	2020-21	2841	2330	17515	
8.	2025-26	4994	4095	30690	

Source: Manipulated by researcher

Note: Grid Ratio= GHG/Energy=85/104=0.82,Off Grid 179/218=0.82,

Therefore, Energy Generation x 0.82 = GHG Emission, ReductionEmissionco-efficient: 0.82

Rainwater Harvesting

Indian Oil Corporation had implemented rainwater harvesting policy. The total water saving potential through installed rainwater harvesting systems is estimated to be 3 billion liters per annum, which is approximately equivalent to 3% of IndianOil's annual water consumption. IOC aims to recycle maximum waste water generated in an effort to reduce the fresh water intake.

Table 8 Rain Water Harvesting in million m2

S. No.	Year	Total Water Consumed in Million m2	Rain Water Harvested in Million m2	Cumulative Number of RainWater Harvesting Systems
1	2010-11	82.63	1.72	-
2	2011-12	88.43	2.17	-
3	2012-13	86.18	2.85	316
4	2013-14	87.94	2.56	370
5	2014-15	88.87	2.49	439
6	2015-16	84.64	2.71	505
7	2016-17	81.83	2.96	558
8	2017-18	99.44	3.26	561

Source: Compilation of data from reports ofwww.ioc

Table 8 shows the water consumed by IOC and rain water harvested.Though the Rain water harvesting depends upon the quantum and pattern of raining ,the increase in number of Rain watersystems indicate the concern of IOC towards the importance of Rain water Harvesting.

Table 9 Effluent Water Recycled in million m3 and Trees Planted

S. No.	Year	Effluent water generated	Recycled water	Percentage of Effluent Water Recycled	Trees Planted in Numbers
1.	2012-13	41.34	33.29	81	62724
2.	2013-14	45.91	34.15	74	55754
3.	2014-15	40.06	33.34	83	51817
4.	2015-16	39.61	34.68	88	51542
5.	2016-17	41.04	37.20	91	136677
6.	2017-18	43.34	38.74	89	122336

Source: Data Compilation from reports of www.ioc

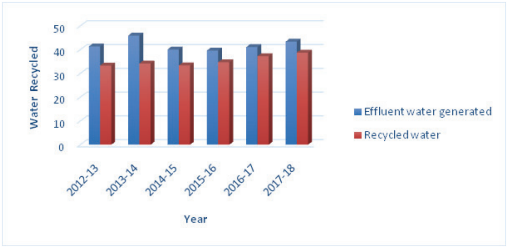

Figure 2 Effluent Water Recycled

While the usage of water is increasing year by year the effluent generated due to various processes is also increasing. Here IOC is adopting water conservation strategy through which the prudent usage of recycled water. Certain percentage of Effluent water is recycled and reused. Table 9 and Figure 2 explain the same. Further Table 9 explains year by year trees planted by IOC. Except the years 2014-15 and 2015-16 Trees planted had increased. Trees are sources of rain, preserving ground water and helps carbon sequestration.

Environment Expenditure

Indian Oil complies with all the local and national laws and regulations without fail. Indian Oil ensures 100% compliance with local and national laws and regulations. Further, no grievances were filed regarding environmental and societal impacts caused by our operations.

Table 10 Environmental Expenditure

S. No.	Details of Items	2016-17	2017-18	Annual Growth Percentage Change
1.	Treatment and Disposal costs of waste	17.68	8.94	-49.43
2.	Expenditure of treatment of Effluent Air Pollution control	34.52	53.53	55.07
3.	Expenditure on Environmental monitoring Stack and Ambient monitoring Effluent	15.16	10.11	-33.31
4.	Expenditure for consent/authorisation/ Ecetc	3.34	2.81	-15.87
5.	Other Environmental costs like green Belts	7.77	10.3	32.56
6.	External Services of Environmental costs	-	26.63	-
7.	Total Environmental Expenditure	78.47	112.32	43.14
8.	Total CSR Expenditure	214	331	54.67
9.	Percentage of Environmental Expenditure to CSR Expenditure	36.67	33.94	-7.44

Source: Compilation of data from reportsof www.ioc

Table 10 shows the picture of various items of environmental expenditures. Between the years 2016-17 and 2017-18 There was an negative annual growth change or declining growth expenditures on Treatment and Disposal costs of waste, Expenditure on Environmental monitoring Stack and Ambient monitoring Effluent, Expenditure for consent/authorization /ECetc., and Percentage of Environmental Expenditure to CSR Expenditure . Contrary to this between the years 2016-17 and 2017-18 positive change or increasing expenditures on Expenditure of treatment of Effluent Air Pollution control, Other Environmental costs like green Belts and total Environmental Expenditure. As total growth rate of Environmental Expenditure is increasing and this shows the environmental concern of Indian Oil Corporation.

Bio-Diversity

IndianOil recognizes biodiversity as a key component of environment pillar of ESG framework. Conservation of biodiversity is seen as

a crucial element for wellbeing of whole society and maintaining ecological balance. Thus, extensive tree plantations have been undertaken across the refineries, townships and other installation to develop green cover. Native tree species have been chosen to carry out the plantation activity.

Table 11 Correlation Result

S. No.	Correlation between	Pearson Correlation Co-efficient	Significant*
1.	Correlation between Profits and tree plantation	0.919	0.010
2.	Correlation between profits and CSR	0.940	0.005
3.	Correlation between tree plantation and rainwater harvesting	0.817	0.047

Source: Manipulated by researchers

Table 11 shows the Correlation between Profits and tree plantation, profits and CSR and tree plantation and rainwater harvesting are positive and significant. It is a welcoming featureand environmental concern of IOC.

Conclusion of The Study

From the findings it is understood that there is a variation in both profits and CSR expenditure. The range of CSR as percentage of PAT varies from 2.2 percentage to1.1 percentage and the average is 1.493.The Trend shows that in due course the percentage remains within the range of 1.348 and 1.317. The pipeline and Refiner forecasts for the years 2020-21 and 2025-26 trends are increasing.The estimated energy intensity is the modest figure of 1710.93 for the year 2020-21 and 1721.73 of 2025-26.The total Environmental Expenditure is increasing and this shows responsibility of IOC.The Correlation between Profits and tree plantation, profits and CSR and tree plantation and rainwater harvesting are positive and significant. Gross amount required to be spent by the Company during the year March 2021 for Corporate Social Responsibility Expenditure was Rupees 460.37 crore in that Rs.252.48 was spent for Covid19 (2% of average Net Profit as per Section 135(5)), health and sanitation was Rupees 29.54 croresand for Swatch Bharat was Rs.16.38 crores,It is a welcoming feature and environmental concern of Indian Oil Corporation, otherwise Corporate Social Responsibility.

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