

## Corporate Environmental Disclosures of Oil and Gas Companies in India: An Analysis of Executives' Perceptions

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### Abstract

Environmental and sustainability issues have assumed significance, leading to social and legal pressures on the companies across the world to take steps to reduce and prevent adverse impact of their activities on the environment and to disclose this information to the concerned stakeholders. The present study aims at investigating the perceptions of executives from 26 listed Indian oil and gas companies on Corporate Environment Disclosures (CEDs) in the annual reports using a structured questionnaire. The questionnaire was constructed on the basis of eleven environmental indicators provided in international oil and gas industry guidelines for voluntary sustainability reporting framework. An attempt was made to determine whether the extent and type of environmental disclosures have correlation with executives' position in the organization, their knowledge about the annual reports, their stock holdings in the company and the value stream to which the companies belonged. It was found that the responding executives were well aware of the environmental issues associated with activities across the value chain in the oil and gas industry. They agreed that these issues are material and must be disclosed in the annual reports, but had different perceptions on the importance of four environmental issues given in the questionnaire for disclosure in the reports. A significant statistical relationship was found between perceived corporate environmental disclosure index (PCEDI) and respondents' positions in the company and their knowledge on the annual reports. It is suggested that a greater role to knowledgeable senior executives at key positions should be assigned to deal with sustainability disclosure affairs.



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## Introduction

The current global energy consumption matrix is essentially based on fossil fuels. Oil and gas are the most relevant fuels. These non-renewable sources will continue to be important in the energy matrix in future also in order to sustain development over years. This is, therefore, imperative to know the negative impact of their exploitation on the environment.<sup>1</sup> The petroleum industry covers a wide range of activities, from exploration and production of oil and gas (O&G) to storage and transportation of oil, gas and derived products to retail customers. The activities of O&G companies are typically divided into three value stream areas namely upstream, midstream and downstream.<sup>2</sup> Upstream companies are engaged in activities such as exploration, and production of crude oil and natural gas. Companies in midstream conduct transportation and storage of crude oil and natural gas; while downstream companies are involved in refining and processing of oil and gas including marketing and distribution of refined petroleum products, gas and derived products at retail level.

The O&G sector in India contributes “around 15% to India’s GDP and around 37% of country’s total energy consumption”.<sup>3</sup> O&G sector in India, apart from small and medium companies, has two large upstream companies namely Oil and Natural Gas Corporation Limited (ONGC) and Oil India Limited (OIL). These two companies contributed about 71% in total oil production and 83% in gas production in India in the year 2018-19.<sup>4</sup> Down stream companies consist of 23 oil refineries and refinery-cum-petrochemicals with crude oil refining capacity of 249.37 Metric Tonne (MMT) per annum (2019-20).<sup>4</sup> There are different kinds of O&G transporting pipelines totalling 43,807 Kilometres.<sup>5</sup> The database published by Ministry of Petroleum and Natural Gas indicated that O&G companies produced 254.40 MMT of finished petroleum products, imported 220.43 MMT of crude oil and 35.89 MMT of petroleum products, whereas they exported 66.76 MMT of various finished products to different countries of the world during the year 2017-18.

## Environmental Issues of Oil and Gas Industry

While O&G companies have a vital role in improving the economy, at the same time they also add significant share of greenhouse gas (GHG) emissions causing climate change effects. Monitoring these

emissions is vital to curbing climate change. The O&G industry carry out number of processes that have direct impact on the environment, especially GHG emissions, liquid effluents, solid and hazardous waste. These processes cause a significant destruction of biodiversity and lead to environmental degradation in general.<sup>1</sup> The hydrocarbon spills, when occur, not only effect the environment of the place where these happen, but also adversely impact the corporate results.<sup>1</sup> Central Pollution Control Board (CPCB) of India has identified that Oil Refineries and Petrochemicals are the two among 17 other major polluting industries.<sup>6</sup> In general, O&G companies disclose sustainability information in their annual and other reports based on various international frameworks like framework published by Global Reporting Initiative (GRI), the International Petroleum Industry Environmental Conservation Association (IPIECA) among others. The four environmental issues which are material for reporting as corporate environmental disclosures (CED) in annual statements by these companies are:

### Climate Change, Emissions, Materials & Energy

Products from O&G companies form a high proportion of global energy demand. Consequently, companies have responsibility to improve energy efficiency, develop new technologies for alternate energy use, and reduce gas flaring to minimize Greenhouse Gas (GHG) emissions. Environmental issues arising out of O&G activities have four indicators to disclose namely GHG emissions, Energy Use, Alternative Energy Sources, and Flared Gas.

### Biodiversity and Ecosystem

Operational activities carried out by O&G companies at onshore and/or offshore locations interact with the surrounding environment and impact biodiversity and ecosystem directly or indirectly. They should report their overall environmental performances to disclose their strategies to mitigate operational dependencies and potential impact on biodiversity and ecosystem across value chain.

### Water (Fresh & Effluent)

In 2010, industrial sector that includes O&G industry, with drew 2.23% of fresh water which is a vital utility in majority of oil and gas activities.<sup>8</sup> It is important to have an effective fresh water management system across the value chain covering quantum of fresh water with drawal or consumption as well

as preservation of existing fresh water resources. Companies, in their annual reports, are required to narrate their overall approaches to water management, including waste water disposals to demonstrate sustainable water leadership. There are two indicators to be reported in the annual reports, such as freshwater management as a resource and discharge of treated effluent water containing hydrocarbons and other impurities.<sup>7</sup>

**Wastes, Spills & Local Environmental Impact:** Regional and local air, water and land are likely to be impacted by these aspects from O&G installation activities. Four indicators associated with this issue to be reported by the companies are- quantity of gaseous emissions to the atmosphere, management of spills, amount of waste disposed, and their approach to execute decommission activities.<sup>7</sup>

Most energy companies recognise the information needs of their stakeholders and make efforts to legitimise their operations by disclosing environmental information in their annual reports. Increasingly environmental sustainability issues are becoming imperative for managers who prepare input information to be disclosed in the annual reports of O&G companies. In this context, the present study finds it of utmost relevance to explore executives' perceptions on environmental disclosures to be made by a company in its annual report to fulfil stakeholders' information needs.

The study aims at investigating the perceptions of executives from selected O&G companies in India about Corporate Environmental Disclosure (CED) practices in the annual reports. An attempt has also been made to examine the impact of executives' characteristics on the Perceived Corporate Environmental Disclosures (PCEDs).

The remainder of the paper is structured as follows: Section 2 presents review of existing literature in the area and rationale of the present study. This section also sets objectives of the present study. Section 3 deals with research methodology used in data collection and analysis. Section 4 presents research findings and analysis of the results. Section 5 gives discussion and policy recommendations. Finally, Section 6 concludes the paper, and presents research limitations and future perspectives.

### **Theoretical Background and Objectives of the Present Study**

One of the key determinants of the environmental disclosures made by an organization is environmental sensitivity of the industry to which it belongs.<sup>9</sup> Global Reporting Initiative (GRI) standard on disclosures for O&G sector<sup>10</sup> describes "environmental impacts of the operations of O&G companies covering the complete life cycle of projects, from development through operation to decommissioning, closure and post-closure". It also terms the sector as diverse, with some companies specializing exclusively in one part of the cycle, such as exploration and production or refining, and others large government-owned or vertically integrated enterprises. This sector-specific GRI disclosure standard emphasizes that sectoral disclosures deal with sustainable development issues which characterise a particular sector. In case of O&G sector, sustainable development issues are encountered more frequently or in greater measures than in any other sector.

Corporate annual report is the most important publication that communicates the operating performance and other relevant information of a company to its stakeholders. According to Batra,<sup>11</sup> annual report is the main source which provides information on effectiveness of managers in meeting their fiduciary duties and carrying out their functions as a leader. Batra described that the disclosure of environmental information in the corporate annual reports regarding the impact of organization's activities on natural and environmental resources has emerged as a growing area of study. Annual reporting is the most dominant and popular form of environmental information disclosure in China.<sup>12</sup> Previous researches revealed that stringent regulatory requirements, high impact environmental incidents, and growing public awareness have resulted in increase of companies' release of environmental information in the annual reports.<sup>13</sup>

Besides annual reports, some research papers documented disclosure of environmental information by corporates in different countries through other mediums like, sustainability or CSR reports, K-10 forms, company websites etc. This section reviews some of the existing works in the area of corporate environmental disclosures and sets up objectives for the present study.

The chief objective of publishing annual reports is to inform investors (shareholders) about organizational activities and to comply with disclosure requirements. However, proactive companies also engage with other stakeholders through their annual reports as a channel of communication. Such strategy would help companies to foster an amicable relationship with all the stakeholders; company's success may be impacted if such relationship is interrupted and this would finally impact its investors too.<sup>14</sup> A large number of studies have tried to analyse corporate environmental disclosure (CED) practices in the annual reports.<sup>15-22</sup> Most of these studies found that corporate environmental disclosures have increased over time. However, these disclosures were found to be mostly descriptive or narrative in nature. These disclosures varied widely across industries and even over years.

In an empirical study aimed at investigating the extent of environmental disclosure of non-financial companies listed on Borsa Istanbul 100 (BIST-100) Index of Turkey, Akbas and Canikli<sup>17</sup> used content analysis to examine the annual reports for two successive years. They found significant increase in quantum of environmental disclosures made by the Turkish companies, but these disclosures were poor in quality. This was in corroboration with findings of majority of previous researches aimed at analysing environmental information disclosure in developing countries. The authors also observed that the sample companies' environmental disclosures varied across industry sectors and these were mostly narrative in form.

Joudeh *et al.*<sup>20</sup> collected primary as well as secondary data to study CEDs of 10 mining and extraction companies of Jordan. They attempted to identify various problems in making environmental disclosures in the annual reports. Environmental disclosures published by these companies in 2016 were examined by content analysis of the annual reports. The researchers concluded that the presentation of environmental disclosures made by the sample companies was not proper, neither had they paid attention to the content (form) of environmental disclosures. Companies were more focused on declaring their positive news. They found internal and external problems as barriers to proper presentation of environmental disclosures by the companies. The authors recommended

that engagement of a team of qualified and skilled personnel may be significant in the preparation of environmental information to be disclosed by the companies.

Environmental data published in the annual reports may be monetary or non-financial. Larrinaga *et al.* described that non-financial environmental data can be quantitative, or narrative and descriptive.<sup>1</sup> In general, quantitative data describes quantum of various pollutants emitted into the atmosphere, the amounts of waste discharged into the water or soil, data on consumption of energy, water and other resources, levels of GHG emissions and reductions therein, among others. On the other side, the narrative data addresses environmental objectives of the concern, the policies and actions undertaken by it to reduce adverse environmental impacts, the description of environmental management system, and the activities carried out in research and development.<sup>1</sup>

Building public image and reputation was found to be one of the main drivers for disclosure of non-financial information by some studies.<sup>23-25</sup> Al-Khater and Naser<sup>25</sup> found that firm's involvement in issues of environment, society and ethics was likely to impact its public image. The study indicated that for some managers, company's image enhancement became the primary goal in place of benefitting the environment or society at large. Brown and Deegan<sup>26</sup> in their study confirmed that some managers even used environmental disclosures in such ways so as to change or shape the perceptions of the users of such information. Elsakit and Worthington<sup>27</sup> were also of the view that managers have a tendency to disclose positive news and omit negative information about the concern.

Some studies tried to establish relationship between CEDs and corporate characteristics.<sup>28-31</sup> While most of the studies found positive relationship between CEDs and company's size and profitability; some works also found variables like leverage, ISO 14001 certification and auditors to have some impact on these disclosures. Public holding of shares, and constitution and size of board of directors were not found to have significant impact on CEDs. Pahuja<sup>28</sup> tested the impact of various company and industry related variables on environmental reporting practices of 91 large manufacturing companies

in India for a period of three years. Using an index consisting of 23 environment related items, environmental disclosure score percentages were found for each of the sample companies. Results of multiple regression showed that size, profitability, sector, industry and environmental performance of the company had significant influence on CEDs.

In a study to identify factors responsible for 182 Brazilian potentially polluting companies' environmental disclosures in annual reports from years 2005 to 2015, Santos *et al.*<sup>29</sup> observed that among other things, companies with larger size and higher profit disclosed more environmental information. However, companies whose auditor was either one of the Big Four, whose size of board of directors was big and consisted of higher numbers of independent directors, and who had shareholdings more dispersed did not disclose more environmental information, indicating that these factors were not explanatory to environmental disclosures by the sample companies.

Wijekumara<sup>30</sup> conducted a study using content analysis of annual reports published by 254 listed companies belonging to 20 sectors of Sri Lanka and found firm size and ISO 14001 certification to be significant factors in determining environmental disclosure level as per G4 checklist of GRI framework; whereas, other company attributes such as shareholders' power, financial performance, creditors, power, and firms' age were not found to be significant. Cahyono & Sudarlan<sup>31</sup> in their study of 100 listed Indonesian public companies concluded that among other things, company size, profitability, and leverage significantly influenced the extent of environmental disclosures made in annual reports. But they observed number of independent commissioners (directors) in the company board, and percentage of shares held by public had no significant effect on environmental disclosures by the sample companies.

Some researchers analysed relationship between environmental disclosures and economic performance of the company and found positive effect of CEDs on economic performance of the company.<sup>32-33</sup> Contents of enterprise annual reports as well as provisional reports of 445 manufacturing companies listed on Shanghai Stock Exchange in China were examined by Zhongfu *et al.*<sup>32</sup> to

study how the extent of environmental information disclosures influenced companies' economic performance keeping company size as the control variable. The empirical results showed that the extent of corporate environmental information disclosures in annual reports had a positive effect on enterprise's economic performance.

There were studies that analysed CEDs through different mediums namely CSR reports, sustainability reports, directors' reports or websites.<sup>34-39</sup> Company size and industry-type were found as two significant determinant variables responsible for extent of environmental disclosures provided in Corporate Social Responsibility (CSR) reports of 28 companies listed on Netherlands Stock Exchange in a study by Burgwal and Vieial.<sup>35</sup> However, the study revealed no statistically significant relationship of companies' profitability with the level of environmental disclosures in their CSR reports.

Sustainability reporting practices were studied by Orazalin and Mahmood<sup>38</sup> for Russian oil and gas industry using data from sustainability reports, annual reports and audited financial statements available on company websites of 50 companies for over five-year period from 2012 to 2016. The authors found that firm's age and type of the auditor had positive relationship with sustainability disclosures. By studying 5 years' annual reports, sustainability reports, and environmental reports published by 84 companies belonging to Indian Cement, Iron & Steel, and Information Technology industries, Roy and Ghosh found companies' overall corporate environmental performance disclosures to be limited.<sup>3</sup> The researchers stated that high ownership concentration and leverage were unfavourable to voluntary environmental disclosures. But the study gave evidence of higher public shareholding leading to better disclosure strategy.

D'Amico *et al.*<sup>37</sup> used content analysis technique to calculate environmental disclosure index with 31 items found in GRI guidelines. This index was used to conduct multiple regression analysis to determine relationship of explanatory firm variables with disclosure indices obtained from a sample of 170 companies listed on Italy's Milan Stock Exchange. The researchers used various corporate documents namely financial statements, management report, sustainability report, and corporate governance

report and found that dissemination of environmental information by Italian companies was inadequate compared to what is required as per GRI guidelines. They found a negative relationship of existence of minority shareholding, renowned auditors and overseas listing of the company with CEDs.

In another study based on Environmental Index developed from newspaper reports of purposively sampled listed mining companies of Indonesia, Verawaty *et al.*<sup>40</sup> found that type of industry (mining), company size, profitability, liquidity, environment management system, taxes and market share had no significant impact on environmental disclosures, but media coverage significantly impacted to improve company image in the eyes of public. The study concluded that media coverage is a key communication function of management to disclose environmental issues to enhance company's reputation in the eyes of the public.

Environmental accounting and reporting practices of large Indian government owned companies called 'Maharatna', having three years average annual net profit of over Rs.2,500 Crores (1 Crore = 10 millions), were studied by sourcing data from their annual and sustainability reports using content analysis technique for the period 2011-2012 to 2014-2015.<sup>41</sup> An environmental disclosure index was constructed with<sup>8</sup> characteristics to analyse environmental disclosure levels of the sample companies. It was found that the sample companies were disclosing all the items on the index, but none of these companies disclosed monetary data related to environmental activities in their annual or sustainability reports during the study period. The researchers claimed that Indian large publicly held companies were at their early stage of environmental disclosure quality. Sustainability practices of energy companies listed on the Shenzhen stock exchange and Shanghai stock exchange in China were studied by Chiu *et al.*<sup>42</sup> to examine their degree of compliance of reporting requirements as per regulations of China's Stock Exchanges. They developed an environmental disclosure index based on similar indices used by previous researchers to examine the level of environmental disclosures made by 150 sample companies in their annual or CSR reports for two years (2016 & 2017). A regression analysis to test dependence of environmental disclosure on different company attributes showed that there

was a significant positive relationship between environmental disclosures (ED) and return on assets (RoA) of the companies indicating that financially better performing firms improve their environmental information disclosures in these reports. The study emphasized that Chinese listed energy companies with larger sizes, higher financial leverage, and certified environmental management system appeared to be more committed to communicate their environmental practices to their stakeholders. In a report by ICAEW, UK, it was stated that management these days could be aware of the environmental problems and their potential economic impacts for the entities.<sup>14</sup> Large companies across the world have started responding to environmental issues by setting up specialist functions which take care of environment related matters of the entities and also ensure adequate flow of credible environmental information to them. The report also mentioned that the type of environmental issues disclosed by companies may vary to certain degrees, but these mostly cover major areas like environmental policy, strategies and commitments, implementation of environment management system, major environmental impacts from company activities, and actual environmental performance. If an organization has huge environmental effects, readers of yearly reports will hope to see an assertion of corporate policy, systems and responsibilities which show the significance that the organization attaches to them. Some studies<sup>9,43-46,27</sup> analysed perceptions and attitudes of corporate executives towards drivers of CEDs and CED expectation gaps. Ten9 in their study of 79 Malaysian companies used stakeholder's theory to explain environmental reporting attitude. The investigation showed that the top management's judgement regarding use of environment friendly practices and disclosure of related information largely depends upon the demand of different stakeholders. It was found that owing to low level of environmental awareness in Malaysia, the environmental reporting was still not a normal practice. There were few works which found existence of information gap between managers who are preparers of social and environmental information and users of these information.<sup>44,47</sup> This information gap can be reduced by providing adequate material information to the concerned users by managers.<sup>45</sup> Such initiatives by managers can help them to win the trust of the users of the financial statements and it may lead to many benefits for the organization.

Review of existing literature shows that most of the existing studies have examined corporate environmental disclosure practices of companies in the annual reports using content analysis, but studies analysing CEDs using primary data (based on questionnaire or interview) were not many. There are some studies which have checked these disclosures through different mediums like in sustainability/ CSR reports, director's reports, media reports or on the websites of the companies. Some empirical studies in the past were conducted to check impact of firm's characteristics like size, profitability, board attributes, auditors, listing status, type of industry etc. on corporate environmental disclosures.<sup>48</sup> But very few studies have examined perceptions of preparers of annual reports on the expected environmental reporting practices of the companies. Attitude of company executives, among other things, is a factor that impacts corporate environmental disclosure practices for annual reports of the organisations. Wilmahurst and Frost<sup>49</sup> in their study stated that the extent of environmental information disclosure in the corporate annual reports could depend on company executives' perceptions of information needs of the report users. Prior studies could not be found in databases such as EBSCO, Emerald, ResearchGate, ScienceDirect, Google Scholar etc. on how Indian O&G company executives perceive disclosure of major environmental issues such as energy conservation, GHG emissions, biodiversity and ecosystem, water management and environmental impacts in corporate annual reports of O&G companies. Hence, a gap in this area for empirical research was identified. The present study attempted to study perceptions of executives of listed O&G companies in India on corporate environmental disclosures (CEDs) in the annual reports. Additionally, efforts were also made to see if there was any significant relationship between characteristics of O&G company executives (position, knowledge, shareholding status and the value stream of their companies) and their perception on corporate environmental disclosures (PCED) in the annual reports.

### Objectives of the Study

#### The Main Objectives of the Study are

- to assess preference of the executives over different environmental issues which are to be disclosed in the annual reports of O&G

companies.

- to examine how the extent of perceived corporate environmental disclosures (PCED) in the annual reports varied in accordance with executives' positions in the organizations and their knowledge level of the annual reports.
- to find whether PCED level varied between executive groups according to different value streams of their companies.
- to evaluate how PCED varied according to shareholding status of responding executives in the sample companies.

### Methodology

This section explains the research methodology used in collection and analysis of data for the study.

### Sample Selection

The present survey on perceptions of the executives working in listed Indian O&G companies is an exploratory study. The study is based on primary data collected through a structured questionnaire. Two stock exchanges of India were chosen to identify the sample companies. There were 30 companies in oil drilling & exploration and refinery sectors listed on National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). Twenty-two (22) companies were common on both the exchanges, 4 companies were listed only on BSE and 4 companies were not traded. Therefore, 26 out of 30 listed companies were taken as sample in this study. As per a table for determining sample size from a given population, for a population of 30, the corresponding research sample size is 28 which is close to the sample size of 26 O&G companies considered in this study.<sup>50</sup> The sampled 26 companies belonged to either of the categories: crude oil and natural gas exploration and production, crude oil refining, petroleum and related products storage and distribution, and retailing to customers. The categorization of O&G firms on the basis of activities is commonly referred to as the value stream or value chain which shows the spread of business operations of the industry.<sup>51</sup>

### Construction and Administration of Questionnaire for the Survey

A structured questionnaire was constructed based on O&G industry guidance on voluntary sustainability reporting framework. The IPIECA guidance, among other things, contains 11 indicators about environmental performance designed to

reflect environmental performance of the O&G industry.<sup>52</sup> This internationally practiced reporting framework includes three major sustainability issues and indicators namely 1) environmental, 2) health and safety, and 3) social and economic which are relevant to the O&G industry. This study opted for examining executives' perceptions on the reporting of environmental issues only. The constructed questionnaire had five sections: (a) information on respondents and sample companies (b) climate change, emissions, materials & energy,

(c) biodiversity & ecosystem, (d) water (fresh & effluent), and (e) wastes, spills & local environmental impact. There were eight questions to capture the respondents' attributes and sample companies' characteristics; while<sup>18</sup> questions gathered executives' perceptions on various environmental indicators to be disclosed in the annual reports.

Table 1 exhibits the environmental indicators included in the questionnaire along with corresponding questions as used in the study:

**Table 1: Environmental Issues and Indicators for Questionnaire**

Environmental Issues	No. of Indicators	Indicators	No. of Questions
Climate Change and Energy	4	1. Greenhouse Gas (GHG) emissions	1
		2. Energy use	3
		3. Alternative energy sources	2
		4. Flared gas	1
Biodiversity and ecosystem	1	5. Biodiversity and ecosystem	3
		6. Fresh water	3
Water	2	7. Effluent Discharges	1
		8. Gaseous emissions	1
Environmental impact (Local)	4	9. Local Environment Spills	1
		10. Waste	1
		11. Decommissioning	1
		Total	11

The questionnaire was pilot tested with 30 respondents of Indian Oil Corporation Limited (IOCL), a major oil refining and marketing company in O&G sector in India. On the basis of findings of the pilot survey, required adjustments were made in the questionnaire. The final questionnaire was then sent through e-mails to executives of 12(46%) sample companies, mostly PSU companies, whose e-mail addresses were available from various sources. However, there were 14 (56%) smaller companies whose executives' e-mail addresses were not available and therefore, printed questionnaires were sent twice with request letters by registered posts within a gap of three weeks seeking their responses. Responses received in hard copies were manually inserted in Google Form to complete the survey data. About 2200 questionnaire were circulated to executives in different companies, which yielded 830 (37.7%) acceptable responses to be used as primary data source for this study.

### Research Variables

In order to achieve the research objectives, following research variables were constructed for analysis:

### Dependent Variable

Dependent variable or outcome variable of this study, the perceived corporate environmental disclosure index (PCEDI), was computed based on weighted means of responses to questionnaire developed on 11 indicators related to 4 environmental issues of O&G industry. The questionnaire had 18 equally weighted questions related to 11 environmental indicators as reporting elements for the annual reports. The respondents were asked to indicate their opinions about importance of various environmental items to be disclosed in the annual reports on five-point Likert scale ranging from "very high" (5), above average (4), average (3), below average (2) to "very low" (1). Data thus collected were transformed for computing in SPSS as ordinal scale variable.



Sums of individual respondent's scores for each environmental issue were normalised in percentage (%) over maximum score which is 5 multiplied by no. of questions associated with the respective environmental issue. The formula used to calculate weighted value for each response was:

*Weighted Environmental Issue score, (%)*=

$$\frac{\sum_{n=1}^n \text{Question Score}_n}{(n \times 5)} \times 100 \quad \dots(1)$$

where, = score of each question, n = no. of questions per environmental issue,

For example, Biodiversity and Ecosystem issue had 3 questions, responses received as 'above average (4)' for each of 3 questions, therefore the weighted score of this issue for a particular respondent was  $((4+4+4) * 100)/(5*3)$ , where 5 is the highest option value and 3 is the no. of questions for this environmental issue, =  $(12*100)/15 = 80.00\%$ . The perceived CED Index for the annual report as per individual respondent was obtained as a continuous scale variable by adding the weighted normalised scores of 4 environmental issues included in the questionnaire. The formula of perceived corporate environmental disclosure (PCED) Index was:

$$PCED\ Index_i = \frac{\sum_{n=1}^4 \text{Weighted Environmental Issues}_n}{4} \dots(2)$$

Where n = the normalised score of an environmental issue obtained from Eq. (1), i= no. of respondents. Example: For 4 environmental issues, if the weighted scores (%) were 77.14, 73.33, 75.00, and 85.00 obtained as per Eq. (1), then their PCED Index value calculated as per Eq. (2) is  $(77.14 + 73.33 + 75.00 + 85.00)/4 = 77.62$ .

### Independent Variables

the study used following independent variables:

#### Executives' Position

The responding executives are companies' internal stakeholders who occupy certain positions in the sample companies. Therefore, their positions in the organisation may have influence on the environmental disclosures in the annual reports. The values assigned to this nominal independent variable range from 4 for the highest position to 1 for the lowest position in the organisation.

#### Executives' knowledge

Among all reports, disclosure in the annual report is probably the most important in terms of the way a company builds its own social impression to all the stakeholders.<sup>53</sup> Therefore, an executive having knowledge about the annual report itself is a key contributor towards CED of a company. In this context, knowledge of annual report has been considered as a nominal independent variable with categories 1 as "little" to 4 as "great deal".

#### Companies' Value Streams

Oil & gas companies are divided into different streams depending on their activities in the hydrocarbon value chain. Companies may belong to different value streams, but have common sustainability issues including environment. The environmental issues related to wastewater, solid waste, oil spills and impact on ecology from different streams of O&G sector activities are reported in the annual reports as per guidelines. The respondents belonged to either of these streams and their perceptions on environmental disclosures is a matter to examine in this study to check if there existed any significant difference. These streams are labelled 1 for "upstream" to 4 for "integrated" oil and gas companies as nominal independent variable.

#### Shareholding by Employees

Employees as shareholders of an organisation are termed as internal stakeholders who also demand disclosures of environmental information by the organization. Results of a study by Huang and Kung<sup>54</sup> showed that the environmental information disclosed by a firm is significantly affected by information needs of its stakeholders. In a study of 2823 listed US companies belonging to different industries, Bova *et al.*<sup>55</sup> found that employee ownership (employee stock ownership plan - ESOP) was positively and significantly related to firms' voluntary disclosures. In a survey<sup>56</sup> of 711 employees in an Irish telecommunications firm (35% employee-owned), it was found that introduction of ESOP resulted in positive shift in attitudes and behaviour of the employees. Existing literature on the issue suggests that employee ownership is likely to contribute to improving a firm's corporate governance, by enhancing its transparency with investors and other stakeholders.<sup>56</sup> The present study tried to examine the status of responding employees' share ownership of their companies

and its association with PCED. An attempt has been made to check if there was any significant difference in PCED scores of the executives with different shareholding status in the company. The shareholding categories were labelled as 0 for "No", 1 for "Yes", and 2 for "Wish to own" oil and gas companies' shares as nominal independent variable.

### Hypothesis Development

In order to achieve research objectives of the study, following null hypotheses were developed for testing:

$H_{01}$  = The distribution of perceived corporate environmental disclosure in annual reports is same across groups of executives in different positions in O&G companies.

$H_{02}$  = The distribution of perceived corporate environmental disclosure in annual reports is same across groups of executives with different knowledge of annual reports of O&G companies.

$H_{03}$  = The distribution of perceived corporate environmental disclosure is same across categories

of executives working in different value streams of O&G companies.

$H_{04}$  = The distribution of perceived corporate environmental disclosure is same across categories of shareholding status of employees of O&G companies

The data were analysed using SPSS, Version 26 to determine descriptive, correlational, and group difference statistics. Mean score was used to check the central tendency of variables that construct the environmental disclosures in this study. Statistical Mean was also used to suggest the order of priorities of environmental indicators as chosen by the respondents, whereas standard deviation was used to understand the spread of variables from its central point. Correlational statistics was used to test relationships between categorical/quantitative variables considered in the study. Group difference statistical technique was used to compare responses in between groups and make generalizations about the larger population of subjects.

**Table 2: Descriptive Statistics of Environmental Issues of Oil and Gas Industry (N = 830)**

Environmental Issues	Mean Statistic	Std. Deviation Statistic	Data Distribution
Local Environmental Impact	84.63	15.17	Not Normal
Biodiversity and Ecosystem	81.98	15.27	Not Normal
Climate Change and Energy	74.46	14.31	Not Normal
Water (Fresh & Effluent)	64.30	11.22	Not Normal
Overall PCED	76.34	10.89	Not Normal

To examine direction and strength of association between company value streams, respondent executives' positions in the company, their knowledge of annual report, and shareholding by employees with perceived corporate environmental disclosure (PCED) index, Spearman's Rho correlation coefficient in SPSS, a non-parametric measure, was tested because the independent variables were categorical which meet assumption for the exercise. To compare means of PCED Index across categorical independent variables, a non-parametric Kruskal-Wallis H Test was conducted.

### Results And Analysis

#### This Section Presents Findings of the Study

Descriptive statistics of environmental issues included in the questionnaire are exhibited in Table 2. The Table shows that 'Local Environmental Impact' was rated as the most preferred environmental issue by the responding executives with mean score  $M = 84.63$  ( $SD = 15.17$ ) to be disclosed in annual reports by oil and gas companies. 'Biodiversity and Ecosystem issue' was relatively less preferred factor with average score of 81.98, but with little higher standard deviation ( $SD = 15.27$ ). 'Climate Change

and Energy' factor was given lower preference at  $M = 74.46$  as compared to previous two issues, so was its  $SD = 14.31$ . Water (Fresh & Effluent) seemed to draw the lowest attention of all the issues from respondents with average score of  $M = 64.30$  ( $SD = 11.22$ ). Normality test for data distribution of four environmental issues and overall PCED Index indicated that z-value did not fall in the span of (-) 1.96 to (+) 1.96, hence data were not normally distributed. The results shown in Table 2 indicate the overall PCED Index mean score of 76.34 ( $SD = 10.89$ ) which suggests a support level between "average" (60.00%) and "above average" (80.00%) from the executive community in O&G companies for the CEDs.

The results of the Spearman's Rho test as shown in Table 3 indicate a significant positive statistical linear

relationship between environmental disclosure and company value streams ( $r_s(828) = .094$ ,  $p < .01$ ). Similarly executives' positions in the company and PCED in company's annual report also showed a significant positive linear relationship ( $r_s(828) = .148$ ,  $p < .01$ ). Knowledge of annual reports among executives' of O&G companies and PCED indicated strong evidence of significant positive linear relationship between them ( $r_s(828) = .142$ ,  $p < .01$ ). A strong evidence of significant positive statistical linear relationship between executives' position in their companies and their knowledge on annual report was also revealed from this analysis ( $r_s(828) = .211$ ,  $p < .01$ ). Shareholding status of the respondent executives also gave evidence of a significant positive statistical linear relationship with their positions in the companies ( $r_s(828) = .130$ ,  $p < .01$ ).

**Table 3: Spearman's Rho Correlations Matrix between Dependent Variables and Independent Variables**

Variables	Correlations	Disclosure	Value Stream	Executive Position	Knowledge on AR	Share holding
PCEDI	Correlation Coefficient Sig. (2-tailed)	1.000				
Value Stream	Correlation Coefficient Sig. (2-tailed)	.094** 0.007	1.000			
Executive Position	Correlation Coefficient Sig. (2-tailed)	.148** 0.000	0.063 0.068	1.000		
Knowledge on AR	Correlation Coefficient Sig. (2-tailed)	.142** 0.000	-0.027 0.443	.211** 0.000	1.000	
Shareholding	Correlation Coefficient Sig. (2-tailed)	0.064 0.067	0.048 0.169	.130** 0.000	0.030 0.391	1.000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The Kruskal-Wallis H test output given in Tables 4a and 4b showed that there was a statistically significant difference in PCEDI score between different executive positions,  $H(3) = 18.411$ ,  $p < .05$ , with a mean rank PCEDI score of 364.40 for Junior Level Executive, 412.83 for Middle Level Executive, 463.08 for Senior Level Executive, and 507.05 for Top Level Executive. Since, p value is below the significance level of .05, the null hypothesis  $H_0$  is "rejected" and it can be inferred that the extent of PCEDI significantly varies with the positions held by executives in the O&G companies.

**Table 4a: Kruskal-Wallis H Test Ranks Disclosure Across Categories of Executive Position**

Executive Position	N	Mean Rank
Junior Level Executive	182	364.40
Middle Level Executive	446	412.83
Senior Level Executive	182	463.08
Top Level Executive	20	507.05
Total	830	

**Table 4b: Kruskal-Wallis H Test Statistics<sup>a,b</sup>**

	<b>Disclosure</b>
Kruskal-Wallis H	18.411
Df	3
Asymp. Sig.	0.000

a. Kruskal Wallis Test

b. Grouping Variable: Executive Position

The second Kruskal-Wallis H test output exhibited in Tables 5a and 5b shows statistically significant difference in PCEDI score between different levels of executives' knowledge of annual reports,  $H(3) = 18.387$ ,  $p < .05$ , with a mean rank PCEDI score of 410.96 for Little knowledge, 349.51 for Some what knowledge, 407.21 for Much knowledge, and 450.66 for Great deal knowledge about annual reports. Since, p value is smaller than the significance level of .05, the null hypothesis  $H_{02}$  is "rejected" and it is inferred that extent of PCEDI significantly varies with the degree of knowledge of annual reports held by executives of the O&G companies.

**Table 5a: Kruskal-Wallis H Test Ranks Disclosure Across Categories of Level of Knowledge of AR**

Knowledge on AR	N	Mean Rank
Little	14	410.96
Somewhat	140	349.51
Much	333	407.21
Great Deal	343	450.66
Total	830	

Note. AR – annual report

**Table 5b: Kruskal-Wallis H Test Statistics<sup>a,b</sup>**

	<b>Disclosure</b>
Kruskal-Wallis H	18.387
Df	3
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Knowledge on AR

The third non-parametric test was performed to examine how executives across categories of value streams perceived the CED publication in annual reports. The results are shown below in Tables 6a and 6b. Kruskal-Wallis H test showed that there was no statistically significant difference in PCEDI scores between different company value streams,  $H(3) = 7.508$ ,  $p = .057$ , with a mean rank PCEDI score of 384.39 for Upstream, 359.37 for Midstream, 408.80 for Downstream, and 450.81 for Integrated companies. Since, p value is higher than the significance level of .05, the null hypothesis  $H_{03}$  is "failed to reject" and it is inferred that difference of PCEDI across value streams of the O&G companies remained insignificant.

**Table 6a: Kruskal-Wallis H Test Ranks Disclosure Across Categories of Value Streams**

Value Streams	N	Mean Rank
Upstream	28	384.39
Midstream	42	359.37
Downstream	562	408.80
Integrated	198	450.81
Total	830	

**Table 6b: Kruskal-Wallis H Test Statistics<sup>a,b</sup>**

	<b>Disclosure</b>
Kruskal-Wallis H	7.508
Df	3
Asymp. Sig.	0.057

a. Kruskal Wallis Test

b. Grouping Variable: Executive Position

The final Kruskal-Wallis H test output for  $H_{04}$  exhibited in Tables 7a and 7b shows that PCEDI mean difference remained insignificant in the executives of oil and gas companies irrespective of how they held their companies' shares. The  $H(2)$  value was 4.281,  $p = .118$ , with a mean rank PCEDI score of 419.88 for Wish to own, 426.36 for Yes, and 386.87 for No. Since, p value is higher than the significance level of .05, the null hypothesis  $H_{04}$  is "failed to reject" and it

is inferred that extent of PCEDI remain similar across different shareholding status of the executives of the sample O&G companies.

**Table 7a: Kruskal-Wallis H Test Ranks Disclosure across Categories of Shareholding Statu**

Shareholding	N	Mean Rank
No	219	386.87
Yes	555	426.36
Wish to own	56	419.88
Total	830	

**Table 7b: Test Statistics<sup>a,b</sup>**

	Disclosure
Kruskal-Wallis H	4.281
Df	2
Asymp. Sig.	0.118

a. Kruskal Wallis Test

b. Grouping Variable: Shareholding status

### Discussion and Policy Recommendations

Oil and gas companies, through their environmental disclosures in the annual reports, fulfil stakeholders' information needs and secure legitimacy for their operations. The extent of such disclosures may be impacted by the perceptions of the executives preparing these reports about the importance of various issues to be disclosed. This study attempted to obtain better understanding of managerial (executives) perceptions on corporate environmental disclosures to be made in the annual reports published by O&G companies listed on Indian stock exchanges. The input data from 26 listed companies was based on executives' responses received through a self-administered questionnaire. The results of the survey showed consensus among the executives about the importance of disclosure of environmental issues in the annual reports.

The survey revealed that the respondents considered 'Local environmental impact' as the most preferred environmental issue to be disclosed in the annual reports across O&G value chain. This issue focused on regional or local impacts of O&G operations

on air, water and land. Because environmental impacts of contamination, emissions, spills and decommissioning of assets are localised, they are not same across a company's operating areas. Therefore, O&G companies should disclose their practices on these issues on local as well national level for mitigation plans.

Reporting about 'Biodiversity and Ecosystem' issues in the annual reports was chosen as the second most important environmental issue by the responding executives. O&G companies operating at onshore and offshore locations interact with environment whenever they carry out their activities.<sup>52</sup> These activities may impact biodiversity and ecosystem directly or indirectly. The entities must disclose their potential environmental impacts, mitigation strategies and targets for continuous improvement of biodiversity and ecosystem.

Most of the operations in O&G industry led to generation of greenhouse gases which add to aggregate global GHG concentrations. 'Climate Change and Energy' issue was at third priority level with over 10 points less than 'Local Environmental Impact' issue. Fossil fuel consumption by O&G companies to produce energy is responsible for generation of GHGs and other air emissions. These companies may play an important role in improving energy efficiency and developing new technologies to minimise GHGs released from their activities. To meet future energy demand, use of various alternate sources of energy as well as efficiency in use of energy would be required in O&G companies' operations. CO<sub>2</sub> equivalent of GHG emissions is to be reported in quantitative terms annually along with historical data on emissions to show emission reduction trends. Information on energy usage indicates quantum of natural resources used and is also related to release of GHGs and other air pollutants by these companies. By disclosing alternate energy use and energy efficiency improvement programs, oil and gas companies demonstrate their efforts towards reducing dependency on conventional fossil fuel sources, use of less polluting non-fossil fuel energy, and efficient use of energy. It is therefore, imperative for these companies to disclose climate change risks, natural resources usage, energy conservation and investments to provide alternate energy solutions.

Water (Fresh and Effluent) is an integral natural resource for most oil and gas companies in the world to sustain their operations, yet this issue was perceived to be at 4<sup>th</sup> position. This is, perhaps due to low sourcing cost and ease of availability of water locally. Due to the perception of free availability of freshwater and its unrestricted supply volume, the responding executives might have considered this item as less important for disclosure in the annual report. According to a report by Acquastat,<sup>57</sup> consumption of fresh water by industry sector including O&G industry is much lesser than that of other sectors such as agriculture, thermal power generation, and urban water supply. This might be another reason why respondents considered this issue as less significant for disclosure in the annual report. However, fresh water management across value chain is essential in terms of volume consumed and sources of withdrawal. Water withdrawals from underground as well as surface sources have local impact and should be disclosed in quantity (M3). Similarly fresh water quantity returned to fresh water sources after consumption should also be reported. Oil & gas companies discharge large volume of treated effluent water. The key concerns for the O&G companies regarding discharge of treated effluent water from its operational sites are the concentrations of oil, grease, and other sediments present in this discharged water. In this context, water related disclosures in the annual reports both in quantitative and descriptive terms are essential for stakeholders' information needs.

Attempt was also made in the study to explore direction and strength of association of PCEDI with respondents' characteristics such as the executive positions they held in their companies, level of their knowledge about the annual reports in which environmental information is published and their shareholding status in the organization. For this purpose, Spearman's rank-order correlation was used. Similar test was also run to verify if PCEDI is associated with different value streams of O&G industry. Results of Spearman's Rho Correlations test confirmed a strong, positive and statistically significant association between PCEDI and some predictor categorical variables.

A strong and positive correlation was observed between respondent executives' positions in the organisation and their PCEDI score. That signalled

an increase in level of awareness and concern about environment as one grows along organisational hierarchy. Values and culture of an organisation influence attitudes of its executives to deliver better governance. Concern for sustainable operations of a company is addressed through the leadership of the executives who are responsible to meet the environmental requirements.

Spearman's association test results lead to another finding which suggested that the level of executives' knowledge about annual report significantly affects PCED in the company's annual report. This correlation indicates that in order to improve CEDs to gain competitive advantage, executives ought to have higher knowledge about company's annual report. Proactive management may plan suitable training programme for imparting knowledge and give trainings to executives responsible for environmental affairs in the company.

Contrary to the common belief that variation exists in degrees of environmental impact disclosures due to different sectoral activities, this study indicated that PCEDI did not significantly vary among executive groups working in different streams of O&G industry. This finding emphasised the need to ensure that companies do not make any discrepancies in quality of environmental disclosures across value chain. This study also revealed that employees' company share ownership status made no significant difference in how they perceived the corporate environmental disclosures to be made in the annual reports. It indicated that ownership of company's shares by executives have little or no significant effect on their attitude towards how O&G companies disclose environmental information in the annual reports. This might be due to the fact that most of the employees in PSU O&G companies own their companies' shares due to government policy of divestment of company ownership and not because of a pro-active investment perspective.

Out of four null hypotheses, two were "rejected" and two were "failed to reject". These hypotheses were developed on the basis of assumptions that there are no significant differences in means of PCEDI scores of the respondents belonging to different executive positions in the company, having different levels of knowledge about annual reports or different shareholding status and across corresponding

companies' value streams. The rejection of  $H_{01}$  hypothesis confirmed statistical significance of difference in executives' perceptions about corporate environmental disclosures at different positions in the company. Bonferroni Correction revealed a statistically significant difference in means of PCEDI score between Junior level and Senior level executives. The "rejection" of second null hypothesis  $H_{02}$  established the assumption that executive's knowledge of annual report influenced perceived importance of publication of environmental information in annual reports for stakeholders. Bonferroni Correction revealed a statistically significant difference in means of PCEDI score between groups whose knowledge of annual report were "somewhat" and "great deal" levels.

Null hypothesis  $H_{03}$  was accepted as the test result "failed to reject" the null hypothesis inferring that perception of extent of CED in annual reports remains same across the value streams of O&G sector. This finding showed no significant difference in PCEDI of executives from different value streams. Finally, null hypothesis  $H_{04}$  was accepted because the test result could not reject the hypothesis. Hence, it was inferred that PCEDI level had no change among different group of executives with respect to status of company shareholding categories.

### **Conclusions, Limitations and Scope for Future Research**

Environmental information inputs for annual reports of O&G companies are prepared by company executives. Degree of association of PCEDI with executive related variables was an indication of management's attitude towards sharing of environmental information for the stakeholders voluntarily. Findings of this study confirmed that senior executives are well aware of the need for environmental information in the annual reports. This implies an effective and committed practice at the higher levels to ensure improved reporting of environmental information for the benefit of concerned stakeholders. Further, executives' knowledge of annual reports helps them in knowing information needs of the stakeholders. Therefore, management of the company may decide to place senior executives with the responsibility to prepare material for CEDs in annual reports.

Survey data analysis results supported legitimacy theory that necessitated O&G companies to disclose environmental information in the annual reports to seek societal permission to operate their business wherever these are situated at. Such disclosures are important for building stakeholders' trust through transparency. The responding executives of O&G companies perceived disclosures of environmental performance indicators in the annual reports as a strategy to justify a company's operations which might have caused environmental damage and to seek legitimacy from the society to continue its business. The study pointed out that O&G companies should adopt a practice to place senior executives who are well conversant with annual reports to deal with sustainability disclosure affairs. It is also suggested that environmental disclosure guidelines for oil and gas industry should be framed in such a way that environmental disclosure

This study covered 26 listed companies operating in oil and gas industry in India. A future research based on a wider sample from companies in other energy sectors like coal, power, and renewable energy sectors can be conducted to provide stronger evidence of how energy sector executives perceive CEDs in the annual reports. Opinions of executives from companies operating in different countries on CEDs can also be examined for cross-country analysis. This study has examined relationship of four characteristics namely executives' positions, their knowledge of the annual reports, value stream of the company where they work and their shareholding status in the company with the perceived corporate environmental disclosures (PCEDs). Inclusion of more company as well as executive related characteristics would provide further insight into how these could impact the extent of CEDs.

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