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Has Climate Change Even Impacted the Valuation of Companies? An Evidence from Gujarat Fluorochemicals Ltd. in India

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Has Climate Change Even Impacted the Valuation of Companies?
An Evidence from Gujarat Fluorochemicals Ltd. in India

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Abstract
Climate change is undeniably the major challenge of our times and poses a global threat to civilization. The present study attempts to analyze the shift in the environmental changes in the Indian chemical industry and to evaluate such an impact on the financial valuation and performance of the companies by investigating the case of one of the major players in the fluorochemical industry in India, Gujarat Fluorochemicals Ltd. (GFL). Employing Discounted Cash Flow Analysis, the study discovers that climate change in the form of increased carbon credits has positively impacted the financial valuation of GFL. The findings suggest that an increase of approximately 44% in the valuation of the GFL is owing to the revenue from the sale of the carbon credits as per the Kyoto Protocol.

Keywords: Carbon credit; Montreal Protocol; Kyoto Protocol; Greenhouse gases; CFCs; HCFCs; Valuation.

1. INTRODUCTION
Climate change is undoubtedly the major challenge of our times and poses an unwanted as well as a negative risk to the entire civilization. It is a serious global threat and calls for an urgent global response. This global urgency is also manifested in one of the UN’s Sustainable Development Goals: “Take urgent action to combat climate change and its impacts.” Even the World Economic Forum’s Global Risks Report (2017) claims that out of the five major risks faced by our planet in 2017, in terms of potential impact, four risks are climate-related. Climate change is also the sole reason that brought 195 countries of the world together in an unprecedented agreement in Paris in December 2015. The objective of the Paris Agreement is to condense greenhouse gas (GHG) emissions to such an extent where global warming can remain under 2°C and preferably at 1.5°C (Rogelj et al., 2016). This dual characteristic of the climate crisis, which on one hand is poised to disrupt “business as usual” and on the other hand holds a promise of ushering in an age of collaboration and disruptive innovation, is also perhaps the prevalent opportunity of our times. The recalibration of the global economic compass toward a cleaner, greener, and low-carbon future has produced new paradigms that redefine the metric of economic growth and development. Emphasis has shifted from mere productivity to efficiency, profitability to sustainability, and from expanding footholds to minimizing carbon footprints.

Climate change issue underpins almost all facets of the economy and its effects are already being witnessed around the world. With the introduction of the Montreal Protocol and Kyoto Protocol, now every country in the world is trying to limit the carbon emissions so that the GHGs would be restricted in the environment. Although climate change is known to pose a range of risks, the Global Opportunity Report 2017 identified cost-efficient adaptation to climate change as one of the best opportunities for business. It has indeed created innovative business opportunities for companies, mainly carbon credit generation and its trading, and they are regarded as the most financially tangible. A mechanism has been introduced, where excess carbon, which has not been used, could be traded in the global market called carbon market. India is the prominent country in the world holding second...
rank in carbon emission reduction earnings subsequent to China. India accounted for approximately 15% of total certified emission reduction (CER) issued under the United Nations Framework Convention on Climate Change (UNFCCC), while more than 55% of total CERs were generated by China as of 2012. Gujarat became the leading state in the nation, amounting to Rs.127,021,481 CERs issued till 2012, which constitute nearly 18% of the total CERs in India. The existing and probable trends in carbon credit trading in India and China are depicted in Table 1.

The chemical industry is one of the most diversified industries, and it covers more than 80,000 commercial products. It is a critical element of the manufacturing industry and is highly fragmented in the downstream sector. Globally, the chemical industry was estimated at $4.3 trillion in 2015 and is projected to grow at 5.5% every year till 2020, compelled by the demand from end-use industries. China is the largest contributor, with 34% share, followed by the European Union (17%) and North America (16%), to the global chemical industry. The Indian chemical industry is estimated to be valued at $147 billion in 2015 and contributes 3% to the global chemical industry. India ranks 14th in exports and 8th in imports of chemicals (excluding pharmaceutical products) worldwide. The fluorochemical companies of India have gained a lot with the incoming cash flows by selling the carbon credits. This has changed the trends and scenario in the industry. The financial parameters of the companies have been impacted in a positive way. As the government has come up with a phaseout plan of the hydrochlorofluorocarbons (HCFCs), companies in this industry have diversified their business and moved into different verticals. Hence, there has been a profound impact on the valuation of the companies also. The inflow of the cash from the carbon credits has been proved to be effective for the companies in this industry. Hence, there arises a need to analyze the shift in the environmental changes in the industry and to evaluate such an impact on the valuation and financial performance of the companies in the chemical industry. This paper contributes to the existing body of knowledge by investigating the case of one of the major players in the fluorochemical industry in India, Gujarat Fluorochemicals Ltd. (GFL), and hence presents evidence in the field of applied finance. This paper is set out as follows: Section 2 provides the motivation and the underlying rationale of the current study, followed by the methodology adopted for the analysis in Section 3. Section 4 offers an understanding of the Montreal Protocol and Kyoto Protocol adopted in the light of the climate change as part of the sustainable development goals. Section 5 provides a brief overview of the fluorochemical industry in India and the world. Section 6 presents an overview of Gujarat Fluorochemicals Ltd., followed by its detailed quantitative analysis in Section 7 and the implications of the carbon credit revenues on the financial valuation of the company in Section 8. Section 9 finally concludes the paper.

2. OBJECTIVES OF THE STUDY

The objective of the paper is to perform an analysis of the fluorochemical industries that had windfall gains from selling the carbon credits (from 2008 to 2014, under the Kyoto Protocol) and the impact of carbon credit revenues on the valuation as well as financial performance of the company, GFL.

The major objectives of the study include the following:

- Understanding the Kyoto Protocol as well as the Montreal Protocol and the impact of these protocols in the fluorochemicals industry
- Analyzing the fluorochemicals industry in India

Table 1. Current and Expected Trends in Performance of Carbon Credit Trading.

|                        | India         | China          |
|------------------------|---------------|----------------|
| Clean Development Mechanism (CDM) projects registered | 886           | 2,198          |
| CERs (average annually) | 79,718        | 2,20,112       |
| CERs (till 2020)       | 51,92,17,554  | 352,56,78,490  |
| CERs (till 2030)       | 58,5,19,54,02 | 581,29,25,040  |

Source: Authors’ compilation from various reports.
• Identifying the utilization of the carbon credit revenues by GFL and its impact on the financial performance
• Analyzing the change in the valuation of the company: GFL, considering the carbon credit revenue obtained through the sale of carbon credits

3. METHOD(S)

The study is secondary in nature. For the purpose of this study, the relevant statistical data have been collected from various secondary sources—published and unpublished authenticated data sources such as GFL's annual reports, UNFCCC reports, CDM website, MCX, Energy outlook reports, various climate-centric reports by World Economic Forum, World Bank, KPMG, ICAI, etc. The research design opted is primarily descriptive along with supporting financial modeling. As the major objective of the paper is to identify the impact on the valuation of the company due to the carbon credit income emanating from climate change, for the purpose of valuation, Discounted Cash Flow (DCF) Analysis, as has been explained in the Damodaran's book on valuation (2016), has been used.

Before that, an understanding of the Montreal Protocol and the Kyoto Protocol and the implications of these protocols in the fluorochemical industry as a whole was explored via numerous reports.

4. MONTREAL PROTOCOL AND KYOTO PROTOCOL

4.1. Montreal Protocol

The Montreal Protocol on Substances That Deplete the Ozone Layer, a protocol to the Vienna Convention for the Protection of the Ozone Layer, is a landmark international treaty exclusively designed to protect the stratospheric ozone layer by gradually eliminating the production and consumption of a number of substances considered to be responsible for ozone depletion, referred to as ozone-depleting substances (ODSs). The treaty was opened for signature in 1987, and came into effect on January 1, 1989, superseded by a first meeting in Helsinki, May 1989. Ever since, it has gone through some amendments: in 1990 (London), 1991 (Nairobi), 1992 (Copenhagen), 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal), 1999 (Beijing), and 2016.

The Montreal Protocol phases down the consumption and production of the several ODS in a stepwise approach, with distinctive timetables for developed and developing countries (referred to as “Article 5 countries”). The initial aim of the Montreal protocol was to shrink the production and consumption of chlorofluorocarbons (CFCs) and halons to 50% of the 1986 level by 1999. However, the developed countries were successful in phasing out halons by 1994 and other ODS such as CFCs, carbon tetrachloride, and methyl chloroform by 1996. They also succeeded in phasing out methyl bromide by 2005. On the contrary, developing countries were able to phase out CFCs, halons, carbon tetrachloride, and methyl chloroform by 2010. Their deadline for methyl bromide phaseout was 2015. In 2010, the treaty set out to emphasize on the HCFCs, which are mainly used in cooling, refrigeration, and production of foam products. Figure 1 represents a timeline of goals that the treaty wishes to attain.

At present, CFCs are already completely phased out and the timeline has been set to wipe out HCFCs both in developed as well as developing countries. The phaseout of HCFCs has been in progress and an overall phaseout would be completed by 2020 in case of the developed countries whereas by 2040 in the context of developing countries (Figure 2). If the agreements under the Montreal protocol are adhered to in the austere sense, it is estimated that the ozone layer will be on the path to recovery by 2050. Table 2 lists down the phaseout schedule of ODS specifically for India in accordance with the Montreal Protocol.

The Montreal Protocol is extensively contemplated as one of the world's most effective multilateral environmental agreements, having phased out 97% of nearly 100 ODSs, thereby restoring the ozone layer. As various ODSs are also potent GHGs, their phaseout under the protocol has bestowed an often unobserved advantage for climate mitigation: Phasing out these 100 chemicals indeed has rendered powerful climate protection, circumventing the equivalent of projected 9.5 billion tonnes of CO₂ emissions per annum—roughly five times more than the emissions reductions of the Kyoto Protocol's first commitment period
Figure 1. Timeline of Montreal Protocol’s Goals.

1993 Halon—phased out in developed countries (Australia met this goal)
2004 Australia met 2010 goal
2015 90% reduction in HCFC use in developed countries
2020 99.5% HCFC phaseout—developed countries
2040 Total HCFC phaseout—developing countries

1993 1999 2005 2011 2017 2023 2029 2035 2041

1995 CFCs and tetrachloromethane—phased out in developed countries (Australia met these standards)
2010 65% reduction in HCFC use in developed countries (Australia met this in 2004). CFC, tetrachloromethane, and Halon—phased out in developing countries
2016 Developing countries—freeze in 2015 levels of use of HCFCs
2030 Total HCFC phaseout—developing countries

Source: Authors’ adaption from UNEP reports.

Figure 2. HCFCs Consumption Reduction Schedule.

Source: US Environmental Protection Agency, HDFC Securities Institutional Research.

Table 2. Phaseout Schedule of ODS in India.

| Ozone-depleting substances            | Total phaseout by |
|--------------------------------------|-------------------|
| CFCs                                 | 2010              |
| Halons                               | 2010              |
| Hydrobromofluorocarbons (HBFCs)      | 1996              |
| Carbon tetrachloride (CTC)           | 2010              |
| Methyl chloroform                    | 2015              |
| Methyl bromide                       | 2015              |
| HCFCs                                | 2040              |

Source: Authors’ own compilation.
(2008–2012). It has been entitled by the Economist\(^1\) to be the number one in policies that has performed best to check the alarming rates of global warming, ahead of hydropower, nuclear power, and renewables. Well-timed action under the Montreal Protocol can avoid 100–200 billion tonnes of CO\(_2\)-equivalent emissions by 2050, restrict intensification of hydrofluorocarbons (HFCs), and prevent up to 0.5°C of global warming by 2100 (Xu et al., 2013 and Zaelke and Borgford-Parnell, 2014), with supplementary climate advantages of equivalent progresses in energy efficiency of air conditioners and other appliances (Roberts, 2017).

Due to its prevalent adoption and enactment, the Montreal Protocol has been acclaimed as an example of outstanding international cooperation with Kofi Annan cited as saying that “perhaps the single most successful international agreement to date has been the Montreal Protocol.” It is to date the sole UN treaty that has been ratified by every single country on Earth, that is, all 197 UN Member States.

4.2. Kyoto Protocol

The Kyoto Protocol to the UNFCCC is an amendment to the international treaty on climate change, committing its parties to reduce GHGs and tackle the issue of global warming by putting in place internationally binding emission reduction targets.\(^2\) The adoption of the Kyoto Protocol took place at the third conference of the Parties to the UNFCCC (COP3) in Kyoto, Japan, in 1997 and came into effect in February 2005. The comprehensive rules for the enactment of the Protocol were adopted at COP7 in Marrakesh, Morocco, in 2001, and are popularly known as the “Marrakesh Accords.” Comprehending that developed countries are predominantly accountable for the existing excessive levels of GHG emissions in the atmosphere as an outcome of more than 150 years of historical industrial activity, the Protocol lays a heavier responsibility on developed countries under the principle of “common but differentiated responsibilities.” It divides the countries into two categories: (a) Annex I parties: developed countries, who have accepted GHGs emissions reduction obligations, (b) Non-Annex I parties: developing countries, who have no GHG emissions reduction obligations, but may participate in Clean Development Mechanism (CDM).

Under the Protocol, 37 industrialized countries (referred to as ‘Annex 1’ countries) committed to reducing four GHGs viz. carbon dioxide, nitrous oxide, methane, sulfur hexafluoride, and two categories of gases such as HFCs and perfluorocarbons generated by them, and each member country gave a universal commitment. During the first commitment period ranging from 2008 to 2012, Annex 1 countries and the European Community committed to lessen their combined GHG emissions by an average of 5.2% against the 1990 levels. During the second commitment period, the parties pledged to reduce collective GHG emissions by not less than 18 percent below 1990 levels in the eight-year period from 2013 to 2020; nonetheless, the set of Parties in the second commitment period is distinct from the first. The sole objective is the normalization and restoration of GHG concentrations in the atmosphere at such a level that can impede hazardous anthropogenic meddling with the climate system.

The five prime features of the Kyoto Protocol include\(^3\):

i. Commitments to shrink GHGs that are legally binding for Annex I countries, as well as general commitments for all member countries.

ii. Implementation to fulfill the Protocol’s goals, to formulate guidelines and measures that mitigate GHGs, growing absorption of these gases (for instance via geo-sequestration and bio-sequestration) and utilize various mechanisms available, such as joint implementation, CDM and emissions trading.

iii. Curtailing the effects on developing countries by instituting an adaptation fund for climate change.

iv. Proper accounting, reporting, and review to warrant the integrity of the Protocol.

v. Compliance by bringing about a compliance committee to put in force commitment to the Protocol.

There are certain “flexibility” mechanisms that have been introduced by the Kyoto Protocol such as emissions trading, clean development mechanism, and joint implementation (Grubb, Vrolijk, and Brack, 1997) that will allow the parties to meet their GHG obligations. For instance, this could be performed by buying the GHG credits (carbon credits) from the countries that have them in excess. The countries having excess

\(^{1}\)https://www.economist.com/briefing/2014/09/20/the-deepest-cuts

\(^{2}\)https://unfccc.int/process/the-kyoto-protocol

\(^{3}\)http://www.yourarticlelibrary.com/environment/major-international-protocols-earth-summit-kyoto-protocol-and-montreal-protocol/27392
carbon credits could sell them to those who are in deficit. Consequently, carbon has become a commodity, which similar to other commodities is traded in the open market, called carbon market. As carbon dioxide is the most widely produced GHG and all other GHG gases are recorded in terms of carbon dioxide equivalents, the emission trading is known as the carbon market. A brief of main Kyoto protocol mechanisms include the following steps:

1. Compensating for emissions by augmenting the number of a nation’s carbon sinks. The forests, which act as carbon sinks, grab carbon dioxide from the atmosphere. Countries are permitted to build carbon sinks on appropriate sites outside of their own territory.

2. Emissions trading—trading of emission allowances between nations. The emissions trading mechanism provides countries the opportunity to shrink emissions where it is most cost-effective and efficient to do so.

3. Clean Development Mechanism—stimulates the channelization of environment-friendly foreign investments from industrialized nations in developing nations. The developing countries are therefore assisted in achieving sustainable development and in contributing to the ultimate objective of the Convention (Figure 3).

4. Joint implementation—permits developed economies to sponsor foreign research to reduce emission levels in countries of economic transition. In exchange for the developed nation’s investment, the host country offers the investor with emission reduction units, also called as carbon credits. The developed countries can subsequently utilize their carbon credits toward fulfilling their emission-reduction requirements under the Kyoto Protocol.

4.2.1. Carbon Credits
Carbon credits (often called a carbon offset) are the certificates that are issued to countries by UNFCCC, that have successfully reduced GHG emissions that are the major cause of global warming. A single carbon credit generally denotes the permit to emit one metric ton of carbon dioxide or the equivalent mass of another GHG. This can be used by governments, industry or private individuals to offset damaging carbon emissions that they are generating. In brief, carbon credits create a market for mitigating greenhouse emissions by providing an economic incentive (i.e., assigning monetary value to the cost of polluting the air). This mechanism, automatically, stimulates and promotes sustainable development initiatives and emission reduction mechanisms. The carbon credit system was ratified in concurrence with Article 17 of the Kyoto Protocol.

Each carbon credit denotes one tonne of CO₂ either eliminated from the atmosphere or held back from being emitted. Carbon credits can be generated in various ways; however, there are two broad forms:

1. Sequestration (retaining or capturing CO₂ from the atmosphere) such as afforestation & reforestation activities (Dumanski, 2004).
2. CO₂ saving projects such as the use of renewable energies (wind power, solar energy, biomass power, hydel power).

Carbon credits can be bought and sold in the international markets at the prevailing market prices in the carbon market. They are bought and sold through a number of international brokers, online retailers, and trading platforms. Businesses that have a deficit of carbon credits could offset their emissions by investing in renewable energy projects, reforestation projects, and forest protection. This would help the business in mitigating the emissions and to comply with the UNFCCC standards. Projects that sell carbon credits include wind, solar, geothermal, and biomass projects (Figure 4).

4.2.2. Mandatory Carbon Credits

The Kyoto Protocol was the forerunner to mandatory carbon credits. A few of the main outcomes of the protocol are as follows:

- Cap-and-trade systems—Under a cap-and-trade program, a limit on specific types of emissions or pollution is placed, and companies are allowed to sell the unused part of their limits to other companies that are struggling to comply.
- CDM—The Clean Development Mechanism only urges countries to partially comply with Kyoto goals via the financing of carbon reduction vehicles in primarily developing countries.
- EU-ETS—The European Union Emissions Trading Scheme is a group of countries that have all been provided an overall cap to work from as a sole body; it came into effect in 2005.

5. OVERVIEW OF THE FLUOROCHEMICAL INDUSTRY IN THE WORLD AND INDIA

The global fluorochemical market was 3.3 mtpa (in terms of elemental fluorine content) in 2015 valued at approximately US$ 17.5 billion. As per the industry reports, it is set to grow at approximately 5.3% CAGR to US$ 25 billion by 2020. The volume growth is expected to be lower at 4–4.3%, signifying the increase in value-added products. Fluorochemicals market can be classified into three main categories, namely fluorocarbons, fluoropolymers, and inorganic fluorides. Of the aggregate anticipated growth of about 5%, fluoropolymers and specialty chemicals (within fluorocarbons) are expected to grow at a faster pace. The inorganic fluoride segment is slated to grow at a rate of 2–2.5%, mainly in sync with the steel and aluminum industry. The refrigerants industry is going through environmental regulatory changes. Now, approximately two-third of its current portfolio is HCFCs, which needs to be phased out under the Montreal Protocol. Hence, the segment will see more value growth via replacement of HCFCs with higher-value HFC refrigerants. Fluorspar is the basic and only raw material used for the manufacturing of any fluorine compound globally. Total global production of fluorspar is approximately 6.5 million tons. China accounts for 65% of the production and the top five countries account for nearly 90%. Mexico, South Africa, Mongolia and Kenya are other key producers. China has increased its dominance in the fluorine market by increasing its share...
in the fluorspar production from 54% to 65% over the past decade. Production share from Mexico has also increased over the period from 14% to 18%.

Although fluorine chemistry is a hazardous and difficult science, the Indian players have been operating in it for over five decades. Till the previous decade, the Indian companies limited themselves to inorganic fluorides and refrigerants but this has changed with the gains from selling the carbon credits (earned under the Kyoto Protocol) over 2006–2013. The cash flows from the sale of carbon credits have been used to create manufacturing facilities for high-margin fluoropolymers and fluorochemicals. GFL, Shri Ram Fibres Ltd. (SRF), and Navin Fluorine International Ltd. (NFIL) are the major players to ride growth in the fluorine industry.

6. OVERVIEW OF GUJARAT FLUOROCHEMICALS LTD.

GFL is a part of the $3 billion INOX group of companies. GFL was incorporated in 1987 and commenced its commercial operations in 1989 by setting up India's largest refrigerant plant in Ranjit Nagar, Gujarat. GFL is one of the pioneers in the country to invest in CDM under the Kyoto Protocol by cutting down carbon emissions. The company has successfully implemented a CDM Project, which affects GHG emission reductions by thermal oxidation of HFC23, and earns carbon credits. HFC23 is a waste-product generated during the production of hydrochlorofluorocarbon, HCFC22. In fact, this project became the first project in the world, to be registered by the Executive Board of the CDM, established under the Kyoto Protocol. During FY07-14, it made Rs 35 billion windfall gains from the sale of CER. This was significantly higher compared with peers like SRF (approximately Rs 17 billion) and Navin Fluorine (nearly Rs 4 billion).

Instead of distributing the one-off gains as dividend, GFL used the money to upgrade itself from a pure commodity (CFC and HCFC) player, and to strengthen its chemicals business. The company went for forward integration and set up India's largest and the world's fourth-largest poly-tetra-fluoro-ethylene (PTFE) plant. To make itself further cost competitive, the company invested in associated raw materials such as HCFC, chloromethane, and caustic soda. Primarily a player in the refrigeration business till 2007, GFL decided to forward integrate and invested in PTFE, as HCFCs are to be phased out by 2030. It started with a PTFE capacity of 6 ktpa in financial year 2008 and expanded it to 16.2 ktpa by financial year 2014. Thus, it became the only vertically integrated player in the industry.

Over the last 7–8 years, GFL has consolidated its position in the PTFE space and enjoys a top 4 ranking based on PTFE capacity. With the PTFE market facing surplus global supply over the last 3–4 years, GFL has reduced its capacity utilization for TFE and PTFE. This spare capacity can be put to use for making a range of fluoropolymers, with minimal capex infusion. These fluoropolymers require a higher value added compared to PTFE, and therefore fetch 3–6 times the realization per kilogram of PTFE products. Since 2011, GFL has moved into Wind and Film Exhibition business and the revenue from Wind has increased at a staggering rate (from 5% to 55%). However, last year, the wind business (Inox Renewables) agreed to sell its operating wind
power farms to Leap Green Energy Pvt. Ltd., a Chennai-based wind power company and the main reason for this was to decrease the leverage of GFL at a consolidated level by reducing the best of around Rs. 800 crores that was attributable to the wind farm business. The second reason was to focus on its key strengths, the chemical business, and the turbine manufacturing business. Refrigerants alone contributed nearly 94% of the total revenues in financial year 2007. However, the situation changed after setting up of the integrated chemical complex at Dahej. At present, PTFE is the largest revenue contributor with a share of 40% in financial year 2017. Caustic soda (20%), chloromethane (21%), and HCFC (16%) are the other key products. The share of PTFE is likely to rise to 65% by financial year 2018–2019 with the increase in capacity utilization (Figure 5).

7. QUANTITATIVE ANALYSIS OF GFL

The valuation model is prepared for GFL using a DCF Method.

7.1. Valuation of GFL and Its Subsidiaries
First, Weighted Average Cost of Capitals (WACC) have been calculated for GFL and its subsidiaries, INOX Wind Ltd. and INOX Leisure Ltd. (after making necessary assumptions for using DCF). G-securities, 10-year bonds, have been taken as proxies for calculating the risk-free rate and the equity risk premiums have been calculated by subtracting the risk-free rate from the 10-year market returns. Second, DCF Analysis has been conducted for all the three companies. Last, the final year cash flows have been used to calculate the terminal values by using the perpetual growth rate model and then discounting them back to get the present values. The terminal growth rate used is 4%, which is also the rough estimate of India’s long term growth rate as in 2010.

For detailed workings, please refer to Appendices 1, 2, and 3.

7.2. Enterprise Value Calculations
The overall value of the GFL is calculated based on the stakes of 63.09% and 43.09% of INOX Wind Ltd. and INOX Leisure Ltd., respectively, in the company (Table 3). The Enterprise Value of GFL is approximately Rs 91.30 billion as determined by the discounted cash flow analysis of the company. The Equity Value of the company is computed in Table 4. The Equity Value from the DCF valuation is compared with the present equity value of the company (Table 5).

| Table 3. Computation of Enterprise Value. |
|-------------------------------------------|
| Total enterprise value (lakhs)            |
| EV of GFL                               | 4,45,670 |
| EV of INOX Wind Ltd. (stake in GFL)      | 3,45,727 |
| EV of INOX Leisure Ltd. (stake in GFL)   | 1,21,620 |
| Enterprise value of total entity         | 9,13,017 |

| Table 4. Computation of Equity Value. |
|--------------------------------------|
| Total equity value (lakhs)           |
| Equity value of GFL                  | 4,05,015 |
| Equity value of INOX Wind Ltd.       | 2,46,785 |
| Equity value of INOX Leisure Ltd.    | 1,11,835 |
| Equity value of total entity         | 7,63,635 |
As shown in Table 5, the equity value of the company is slightly overvalued even though the revenue from the new business verticals is yet to begin. The gestation period for the commercialization of specialty chemicals is large, and the company has already about 28 products that are in the pipeline, out of which commercial plants for five products have been set up. Going forward, there are 12 products in the pilot stages for commercial production. These would take around 6–9 months to contribute to the top line of the company.

### 8. IMPACT OF CARBON CREDIT REVENUE ON THE FINANCIALS OF GFL

#### 8.1. Revenues from the Carbon Credits
GFL has successfully implemented a CDM Project, which affects GHG emission reductions by thermal oxidation of HFC23, and has earned carbon credits. The company is among the largest carbon credit generating projects in the world. Table 6 presents an overview of carbon credits in terms of million tons and carbon credit revenues earned by GFL over the period 2007–2014.

#### 8.2. Margin Analysis
There has been a positive impact on the margins due to the revenues earned from selling the carbon credits. The company has enjoyed higher margins due to the incoming cash flows. From Figure 6, it is evident that Earnings before Interest, Tax, Depreciation and Amortization (EBITDA) margins are much higher after the inclusion of the revenues earned from the sale of the carbon credits over the entire period 2011–2017. Similar can be witnessed in the context of Earnings before Interest and Tax (EBIT) and Profit after Tax (PAT) margins (Figures 7 and 8). Based on the turnover and the margin analysis, we can easily interpret the variations in

| Year | Carbon credit revenue (lakhs) | Carbon credit (million ton) |
|------|-----------------------------|-----------------------------|
| 2007 | 39,002.88                   | 2.781                       |
| 2008 | 45,393.83                   | 3.141                       |
| 2009 | 62,931.2                    | 6.960                       |
| 2010 | 47,295.89                   | 4.811                       |
| 2011 | 20,243.24                   | 1.799                       |
| 2012 | 87,614.1                    | 13.495                      |
| 2013 | 44,169.26                   | 11.091                      |
| 2014 | 58.1                        | 0.011                       |
| Total| 3,46,708.5                  | 44,090                      |
the performance of the company post and past the carbon credit revenues that it has accrued. The EBITDA
and EBIT margins of the company are hovering around 25–27% and 13–16%, respectively, for the duration
under consideration. These margins are increasing for the last 3–4 years due to the increase in the busi-
ness efficiencies. These margins were higher in 2011–2013 due to the incoming cash flows from the car-
bon credits. The dip in the margins in 2012 is because of the increase in the cost of raw materials (mainly
Fluorspar). However, now the company has a long-term contract with the suppliers of Fluorspar from the
international market and the company is also venturing into the speciality segment of the fluorochemical
industry, where the margins would be double of what the company is having now. Hence, these percent-
ages would be on an increasing trend for the next few years with the increase in the capacity utilization
of the assets. As of now, the capacity utilization is under 60%, and it will increase above 90% in the next
couple of years.
8.3. Solvency Analysis
The cash flows from the sale of carbon credits were used to establish and increase the capacities in the PTFE plant. If the inflow of cash was absent, then the company would have taken loans to establish the industry; thus, the balance sheet of the company would have been impacted (Figure 9). The interest payment would also be on a higher side if not for the carbon credit revenue (Figure 10).

8.4. Return Analysis
The Return on Equity and the Return on Assets are analyzed for the company with and without considering the revenue from the carbon credits. We could observe that the returns for the company would be below average if there was no revenue from the carbon credits (Figure 11). The Return on Equity is negative if the revenue from the carbon credit is not considered. The Return on Assets is also negative if the carbon credit revenue is not considered. The value of the company would have been much lower if not for the credits from carbon emission reductions (Figure 12).
8.5. Impact on the Valuation of the Company

With the implementation of CDM, GFL has reduced the emission of R22 gas and hence accrued the carbon credits. The R22 gas production is not reduced by the company, but this refrigerant gas is used as a raw material for the PTFE division. Thus, the emission of this gas is reduced, and this is primarily due to the Kyoto Protocol by UNFCCC. GFL has used the money from the carbon credits to enter into new business vertical and expand on that. It has gone through a huge capital expenditure from 2008 to 2016, in expanding into PTFE division. Now, the company is also foraying into a specialty segment of the PTFE division, the fluororubbers and fluoroelastomers divisions. GFL has entered into high margin business, leaving behind the refrigerants business.

Hence, there is a huge impact of the revenues from the carbon credit on the valuation of the company. The revenue was used as an investment for entering into a new business and an analysis could be performed in terms of the percentage of the valuation of the company because of this revenue. The WACC used for the chemical business has been used for the valuation of the carbon credit revenue. To investigate the impact of carbon credit revenues on the valuation of the company, a detailed valuation analysis has been performed for the revenue generated from the sale of the carbon emission reductions (for detailed workings, refer to Appendix 4) and the comparison of this value with the total enterprise value of the company, would give a clear understanding of the impact on the valuation of the company (Table 7).

From Table 7, it can be observed that 43.61% of the Enterprise Value of GFL (Chemical Business) is due to the carbon credit revenues that it has accrued by selling the excess carbon emissions that are saved during each year.

9. CONCLUSION

Climate change is one of the biggest and most incessant sustainability megatrends of the present generation and for various companies, the pinch points are quite evident. Although certain companies may not recognize climate change as the utmost pressing issue they confront today, it cannot be denied that the issue is pertinent for virtually all companies as it poses a wide range of risks, as well as presents novel business opportunities for generating revenues in the form of carbon credit trading.

Table 7. Change in % Valuation Due to Carbon Credits.

| Enterprise value of total entity | 9,13,017 |
| Enterprise value of GFL (chemical) | 4,45,670 |
| Enterprise value (carbon credits) | 1,94,376 |
| % EV of total entity due to carbon credits | 21.29% |
| % EV of GFL (chemical) due to carbon credits | 43.61% |

Figure 12. Return on Assets Analysis.
India holds tremendous opportunities for its industries to generate carbon credits and harness gains out of its trading because it has lower carbon emission levels as compared to other developed economies. Currently, next to China, India is generating the highest number of carbon credits in the world. India's average annual CERs stand at 12.6% or 11.5 million that can escalate up to 25% (Nair and Nandakumar, 2013).

The specialty segment of the chemical industry in India is expected to be one of the fastest growing segments in the upcoming years. The company discussed in this paper, GFL is the only company with the whole integrated manufacturing plant in India, with a huge capacity (11% of the global PTFE market). With the shutdown of the chemical manufacturing plants of China and all the environmental implications that are changing, GFL would fill in the void of demand and increase its capacity utilization, and hence its operating revenues. The paper concludes that climate change in the form of increased carbon credits has positively impacted the financial valuation of the company in question, as it has forayed into different verticals of the chemical business. It has been observed that an increase of approximately 44% in the valuation of the GFL is owing to the revenue from the sale of the carbon credits as per the Kyoto Protocol. The financial performance analysis gauged through various parameters such as EBITDA, EBIT, PAT, and Return on Assets further reveals that the company has a great future potential in the forthcoming years, owing to the generation of carbon credits. However, there exists still a huge potential for the development of the CDM project by GFL in exploring the potentialities through future planning and documentation.

In brief, it can be said that companies that look forward and that can transform comprehensive climate risk assessments into innovation potentials coupled with rigorous economic valuations and planning can stand better equipped to tackle the emerging risks, fluctuating marketplace conditions, and policies, in a world highly influenced by climate change.

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APPENDIX 1

Gujarat Fluorochemicals Ltd.

Table 1A. WACC Calculation.

| Last financial results | 31- Mar-2017 |
|------------------------|--------------|
| WACC calculation       |              |
| Risk-free rate         | 7.00%        |
| Equity risk premium    | 6.00%        |
| Beta                   | 0.60         |
| Cost of equity         | 10.60%       |
| Pre-tax cost of debt   | 8.51%        |
| Marginal tax rate      | 30%          |
| Post-tax cost of debt  | 5.96%        |
| Equity to total capital ratio | 87.17%   |
| Debt to total capital ratio | 12.83%     |
| WACC                   | 10%          |

Table 1B. DCF Analysis.

| Particulars            | 2016-17 | 2018F  | 2019F  | 2020F  | 2021F  | 2022F  |
|------------------------|---------|--------|--------|--------|--------|--------|
| Total revenue          | 1,60,318| 1,79,289| 1,92,979| 2,07,625| 2,23,650| 2,39,403|
| Cost of sales          | 38,606  | 46,285 | 44,753 | 48,313 | 52,208 | 56,667 |
| Gross profit           | 1,21,712| 1,33,004| 1,48,226| 1,59,312| 1,71,442| 1,82,736|
| SG&A                   | 84,598  | 88,351 | 95,382 | 1,02,914| 1,11,140| 1,19,499|
| EBITDA                 | 37,115  | 44,653 | 52,845 | 56,398 | 60,303 | 63,237 |
| D&A                    | 14,884  | 15,549 | 14,361 | 14,436 | 14,711 | 15,248 |
| EBIT                   | 22,230  | 29,104 | 38,484 | 41,962 | 45,592 | 47,989 |
| Finance costs          | 3,518   | 4,628  | 4,228  | 3,028  | 5,228  | 7,028  |
| PBT                    | 18,712  | 24,476 | 34,256 | 38,934 | 40,364 | 40,961 |
| Tax                    | 4,612   | 7,343  | 10,277 | 11,680 | 12,109 | 12,288 |
| PAT                    | 14,100  | 17,133 | 23,979 | 27,254 | 28,255 | 28,673 |

Adjustments

|               | 2016-17 | 2018F  | 2019F  | 2020F  | 2021F  | 2022F  |
|---------------|---------|--------|--------|--------|--------|--------|
| D&A           | 14,884  | 15,549 | 14,361 | 14,436 | 14,711 | 15,248 |
| Capex         | 11,471  | 5,000  | 2,000  | 2,000  | 10,000 | 10,000 |
| Working capital change | 569    | 9,589  | 6,585  | 10,421 | 5,845  | 7,660  |
| Interest paid after tax | 2,675 | 3,240  | 2,960  | 2,120  | 3,660  | 4,920  |
| FCFF          | 19,619  | 21,333 | 32,714 | 31,388 | 30,780 | 31,181 |
| Discount rate | 1.10    | 1.21   | 1.33   | 1.46   | 1.61   |        |
| Present value | 19,393  | 27,037 | 23,583 | 21,023 | 19,361 |        |
### Table 1C. Computation of Terminal Value.

| Description                              | Value  |
|------------------------------------------|--------|
| Final year cash flow                     | 31,181 |
| Growth rate                              | 4%     |
| Discount rate                            | 10%    |
| Terminal value                           | 5,40,471 |
| PV of terminal value                     | 3,35,273 |
| Enterprise value using forecasted performance | 4,45,670 |

### APPENDIX 2

**Inox Wind Limited**

### Table 2A. WACC Calculation.

| Last financial results | 31- Mar-2017 |
|------------------------|--------------|
| **WACC calculation**   |              |
| Risk-free rate         | 7.00%        |
| Equity risk premium    | 6.00%        |
| Beta                   | 0.60         |
| Cost of equity         | 10.60%       |
| Pre-tax cost of debt   | 8.51%        |
| Marginal tax rate      | 30%          |
| Post-tax cost of debt  | 5.96%        |
| Equity to total capital ratio | 42%      |
| Debt to total capital ratio | 58%      |
| **WACC**               | 8.67%        |

### Table 2B. DCF Analysis.

| Particulars     | 2016-17 | 2018F | 2019F | 2020F | 2021F | 2022F |
|-----------------|---------|-------|-------|-------|-------|-------|
| Total revenue   | 3,96,284| 4,15,683| 4,36,052| 4,53,161| 4,70,955| 4,80,208|
| Cost of sales   | 2,71,481| 2,85,282| 2,99,546| 3,11,528| 3,23,989| 3,30,469|
| Gross profit    | 1,24,803| 1,30,401| 1,36,506| 1,41,634| 1,46,967| 1,49,740|
| SG&A            | 45,132  | 64,399 | 67,449 | 71,486 | 75,975 | 77,206 |
| EBITDA          | 79,672  | 66,002 | 69,057 | 70,147 | 70,992 | 72,534 |
| D&A             | 3,023   | 3,325  | 3,488  | 3,625  | 3,768  | 3,842  |
| EBIT            | 76,649  | 62,676 | 65,569 | 66,522 | 67,224 | 68,692 |

(Continued)
### Table 2B. DCF Analysis (Continued).

|                        | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   |
|------------------------|--------|--------|--------|--------|--------|--------|
| Finance costs          | 10,286 | 13,631 | 14,486 | 13,729 | 12,652 | 13,194 |
| PBT                    | 66,363 | 49,045 | 51,082 | 52,793 | 54,572 | 55,498 |
| Tax                    | 16,400 | 12,261 | 12,771 | 13,198 | 13,643 | 13,874 |
| PAT                    | 49,963 | 36,784 | 38,312 | 39,595 | 40,929 | 41,623 |
| Adjustments            |        |        |        |        |        |        |
| D&A                    | 3,023  | 3,325  | 3,488  | 3,625  | 3,768  | 3,842  |
| Capex                  | 13,452 | 14,818 | 34,082 | 16,053 | 36,119 | 24,079 |
| Working capital change | 8,320  | 9,410  | -966   | 1,236  | 1,256  | 1,258  |
| Interest paid after tax| 7,744  | 10,223 | 10,865 | 10,297 | 9,489  | 9,896  |
| FCFF                   | 38,959 | 26,105 | 26,550 | 36,228 | 16,811 | 30,023 |
| Discount rate          | 1.09   | 1.18   | 1.28   | 1.40   | 1.52   |        |
| Present value          | 24,015 | 22,470 | 28,207 | 12,042 | 19,784 |

### Table 2C. Computation of Terminal Value.

| Final year cash flow | 30,023 |
|----------------------|--------|
| Growth rate          | 4%     |
| Discount rate        | 8.67%  |
| Terminal value       | 6,68,964 |
| PV of terminal value | 4,41,472 |
| Enterprise value     | 5,47,990 |

### APPENDIX 3

**Inox Leisure Limited**

### Table 3A. WACC Calculation.

| Last financial results | 31- Mar-2017 |
|------------------------|--------------|
| WACC calculation       | 7.00%        |
| Risk-free rate         | 7.00%        |
| Equity risk premium    | 6.00%        |
| Beta                   | 0.60         |
| Cost of equity         | 10.60%       |
| Pre-tax cost of debt   | 11.97%       |

(Continued)
### Table 3B. DCF Analysis.

| Particulars      | 2016-17   | 2018F     | 2019F     | 2020F     | 2021F     | 2022F     |
|------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Total revenue    | 1,22,977  | 1,47,391  | 1,76,688  | 2,03,056  | 2,33,378  | 2,68,249  |
| Expenses         | 1,07,594  | 1,27,619  | 1,53,720  | 1,79,204  | 2,08,835  | 2,40,606  |
| EBITDA           | 15,383    | 19,773    | 22,968    | 23,851    | 24,543    | 27,643    |
| D&A              | 8,407     | 8,789     | 10,547    | 10,108    | 9,299     | 10,694    |
| EBIT             | 6,976     | 10,983    | 12,421    | 13,744    | 15,245    | 16,949    |
| Finance costs    | 2,528     | 4,058     | 4,292     | 4,531     | 4,786     | 5,058     |
| PBT              | 4,448     | 6,925     | 8,129     | 9,212     | 10,458    | 11,891    |
| Tax              | 1,473     | 2,234     | 2,622     | 2,972     | 3,374     | 3,836     |
| PAT              | 2,975     | 4,691     | 5,507     | 6,241     | 7,085     | 8,055     |
| **Adjustments**  |           |           |           |           |           |           |
| D&A              | 8,407     | 8,789     | 10,547    | 10,108    | 9,299     | 10,694    |
| Capex            | 5,476     | 3,327     | 6,820     | 3,492     | 7,157     | 3,665     |
| Working capital change | 1,394 | 364 | −133 | 1,310 | 1,194 | 1,386 |
| Interest paid after tax | 1,691 | 2,749 | 2,908 | 3,070 | 3,242 | 3,426 |
| FCFF             | 6,202     | 12,538    | 12,275    | 14,615    | 11,275    | 17,125    |
| Discount rate    | 1.09      | 1.19      | 1.30      | 1.42      | 1.55      |           |
| Present value    | 11,482    | 10,294    | 11,224    | 7,929     | 11,029    |           |

### Table 3C. Computation of Terminal Value.

|                  |            |
|------------------|------------|
| Final year cash flow | 17,125    |
| Growth rate      | 4%         |
| Discount rate    | 9.20%      |
| Terminal value   | 3,54,678   |
| PV of terminal value | 2,30,289 |
| Enterprise value using forecasted performance | 2,82,247 |

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**Table 3A. WACC Calculation (Continued).**

| Last financial results | 31- Mar-2017 |
|------------------------|--------------|
| Marginal tax rate      | 32%          |
| Post-tax cost of debt  | 8.14%        |
| Equity to total capital ratio | 58.46% |
| Debt to total capital ratio | 41.54% |
| WACC                   | 9.02%        |
APPENDIX 4

Valuation of GFL after considering the carbon credit revenues

Table 4A. DCF Analysis.

| Particulars          | 2016-17 | 2018F | 2019F | 2020F | 2021F | 2022F |
|----------------------|---------|-------|-------|-------|-------|-------|
| Total revenue        | 57,938  | 70,194| 78,618| 87,708| 1,02,154| 1,14,866|
| Expenses             | 45,414  | 54,335| 59,212| 67,153| 77,747| 87,641|
| EBITDA               | 12,524  | 15,859| 19,406| 20,554| 24,407| 27,226|
| D&A                  | 4,726   | 5,017 | 4,633 | 4,658 | 4,746 | 4,920 |
| EBIT                 | 7,798   | 10,843| 14,772| 15,897| 19,660| 22,306|
| Tax                  | 1,922   | 3,253 | 4,432 | 4,769 | 5,898 | 6,692 |
| PAT                  | 5,876   | 7,590 | 10,340| 11,128| 13,762| 15,614|

Adjustments

| Particulars          | 2016-17 | 2018F | 2019F | 2020F | 2021F | 2022F |
|----------------------|---------|-------|-------|-------|-------|-------|
| D&A                  | 4,726   | 5,017 | 4,633 | 4,658 | 4,746 | 4,920 |
| Capex                | 8,642   | 1,936 | 968   | 283   | 3,267 | 3,388 |
| Working capital change| 216     | 3,963 | 2,824 | 4,623 | 2,797 | 3,844 |
| FCFF                 | 1,744   | 6,708 | 11,182| 10,880| 12,445| 13,302|
| Discount rate        | 1.1     | 1.21  | 1.33  | 1.46  | 1.61  |
| Present value        | 6,098   | 9,241 | 8,180 | 8,524 | 8,262 |

Table 4B. Terminal Value Calculation.

| Particulars                      |       |
|----------------------------------|-------|
| Final year cash flow (discounted)| 8,082 |
| Growth rate                      | 4%    |
| Discount rate                    | 10%   |
| Terminal value                   | 2,79,701|
| PV of terminal value             | 1,18,620|
| Enterprise value using forecasted performance | 1,94,376|