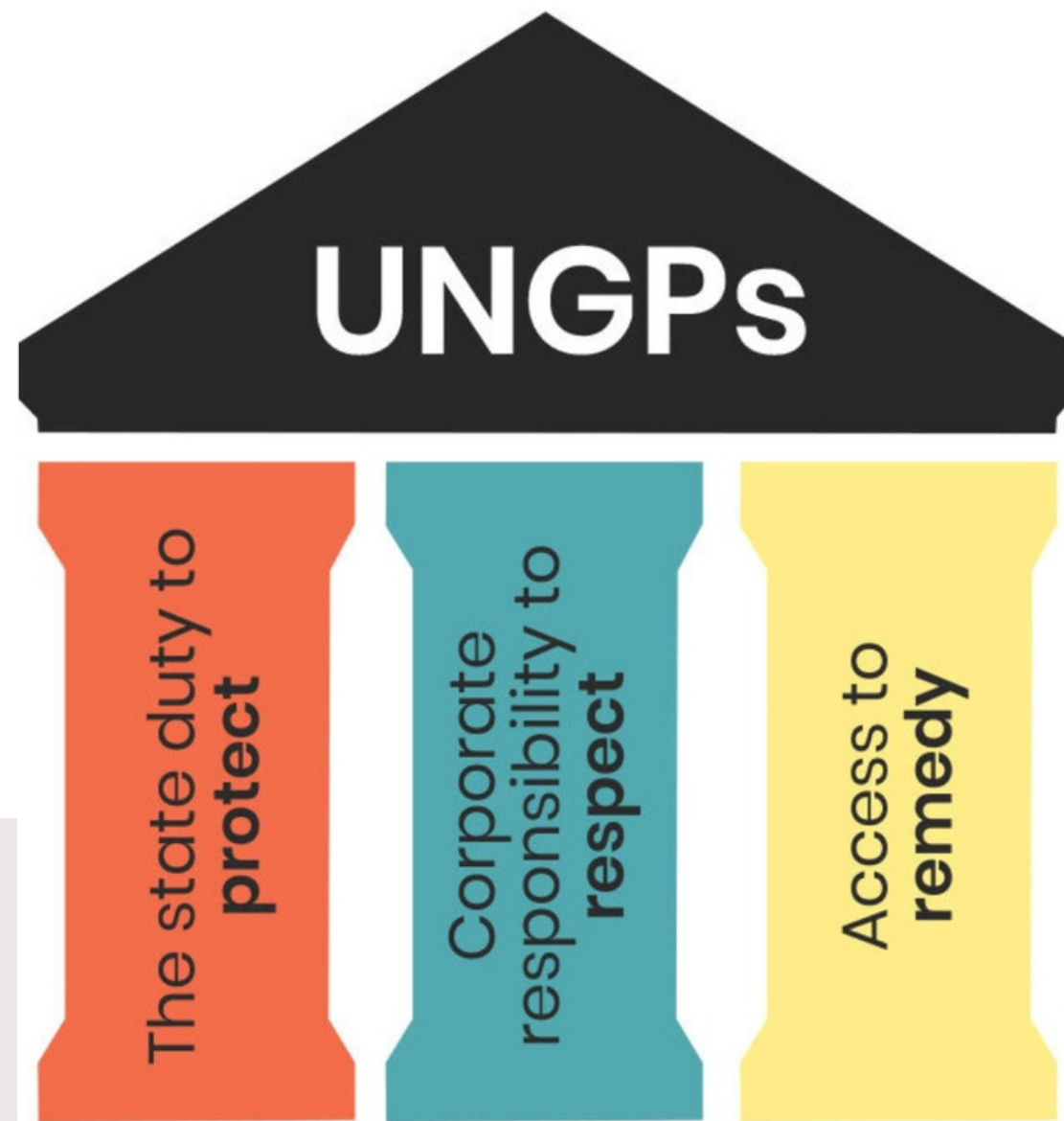# "Business and Human Rights with reference to reduction in Carbon Footprint"

GROUP 3 (29-42)

Laaraib Ghazi, Kanika Shokeen, Mili Verma, Mohd Shahid Raini, Mumal Vaishnav, Naina Gupta, L.Amrutha, Mary Mahila D.C, Neelkamal Alomayan Kalita, Mansi Saini, Mohita, Mir Kamil Nazir, Liza Gupta

Introduction

UNGPs

The state duty to **protect**

Corporate responsibility to **respect**

Access to **remedy**

- Human rights in the context of business can range from labour rights to safeguarding the environment from hazardous activity

- Business sector: historically a big impact on the CO_2 emissions, companies trying to give sustainability top priority.

- Carbon footprint: practical and eco-friendly practices can reduce emission levels
- UN Principles on Business and Human Rights; the guiding principles.

The Research Problem

Transport, Clothing, and Power sectors of India: The issues, challenges, and solutions in reducing their carbon footprint.
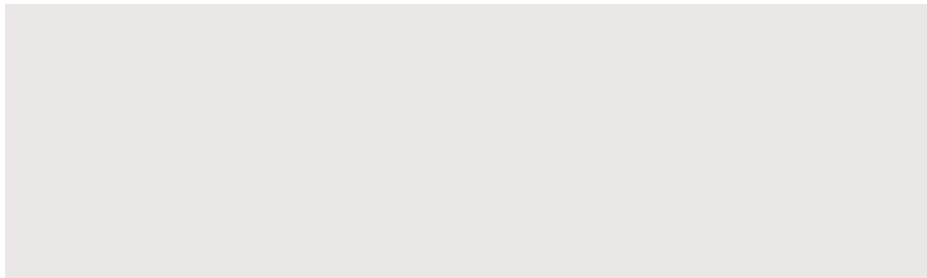
why is it interesting?

- The Transport, Clothing, and Power sectors have massive carbon footprints.
- The demand of the chosen sectors is increasing at a fast pace.
- The solutions suggested are feasible and would help reduce carbon footprint.
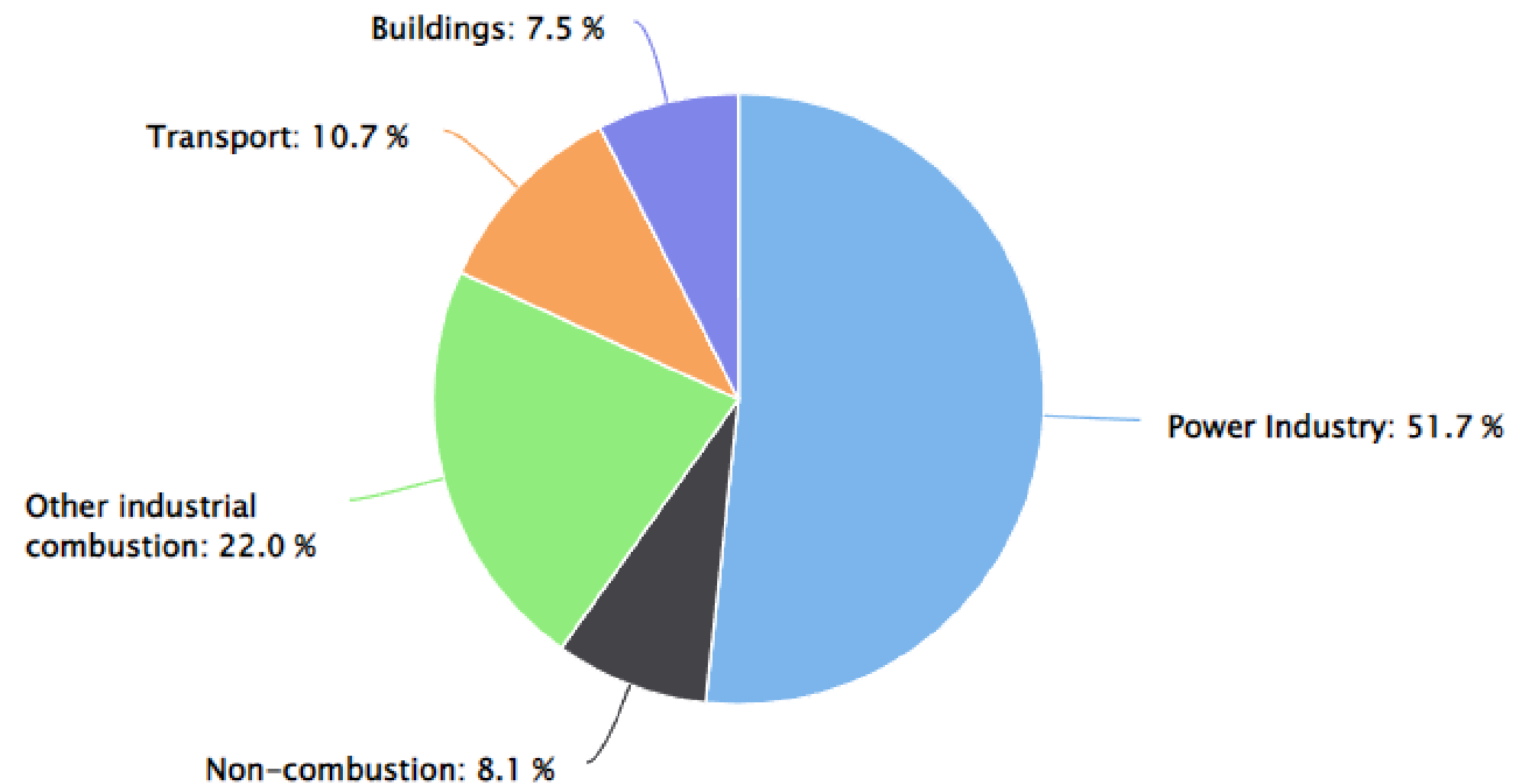
Objectives

- To analyse the quantum of carbon emissions from various industrial sectors i.e., **Clothing, Power, and Transport.**
- To analyse the **initiatives** and Policies taken by the Government to reduce carbon emission.
- To recommend **solutions** and a way forward for reducing carbon emissions in these industrial sectors.

Methodology

- Both Qualitative and Quantitative research through Secondary Data

- Sectors focused: Clothing Industry, Power Industry,& Transportation Industry

- Variables Used:
  1. CO_2 Emissions of Various Sectors
  2. Demands of the Sector
  3. Efficiency

Buildings: 7.5 %
Transport: 10.7 %
Power Industry: 51.7 %
Other industrial combustion: 22.0 %
Non-combustion: 8.1 %

CO2 Emissions by Various sectors in India
Source: IEA

Why are we talking about Carbon Emissions from Businesses?

- **Sustainable Development Goals**

SDG 7 Affordable and Clean Energy

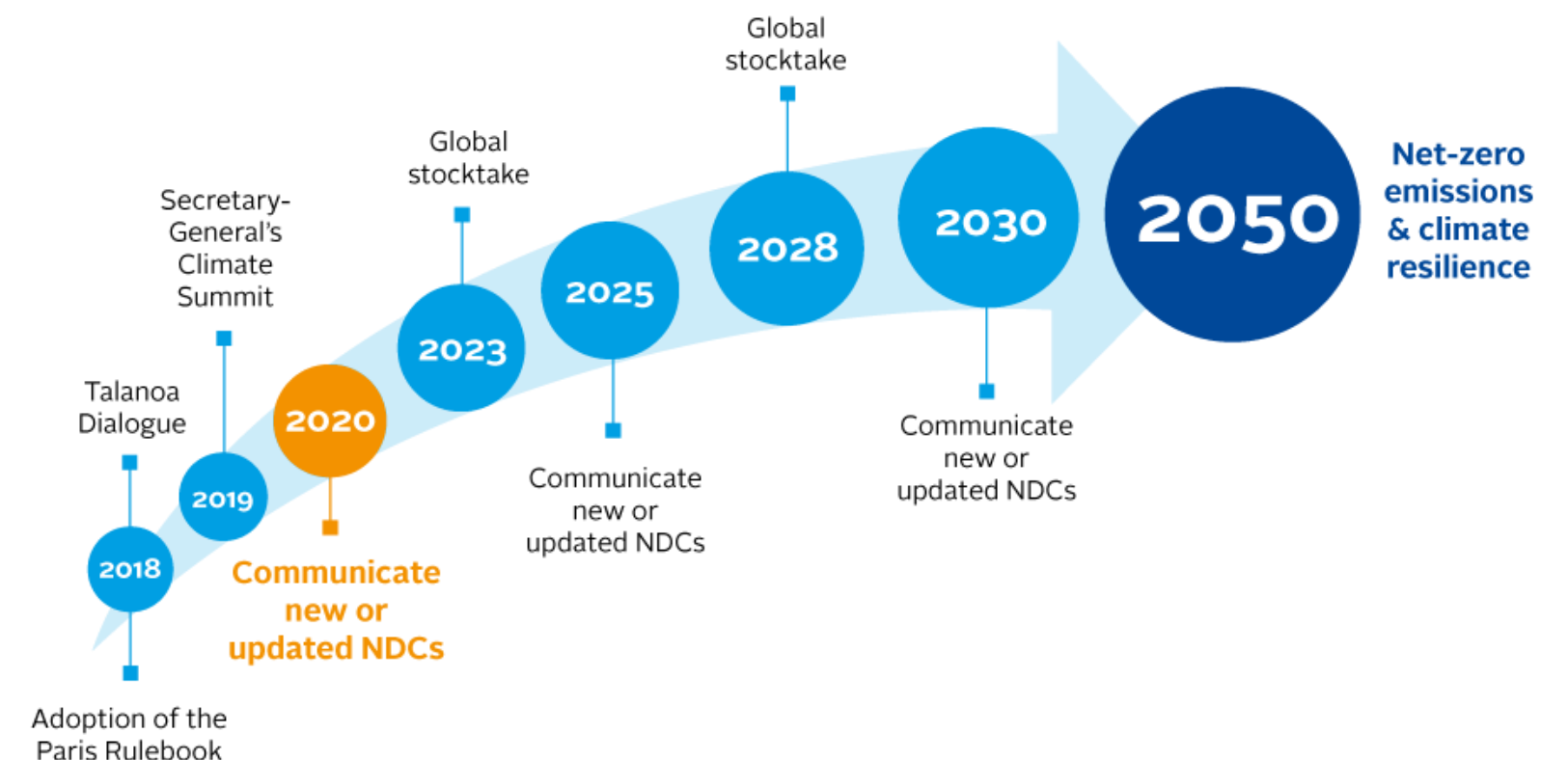SDG 9 Industry, Innovation and Infrastructure

SDG 12 Responsible Consumption and Production

SDG 13 Climate Action

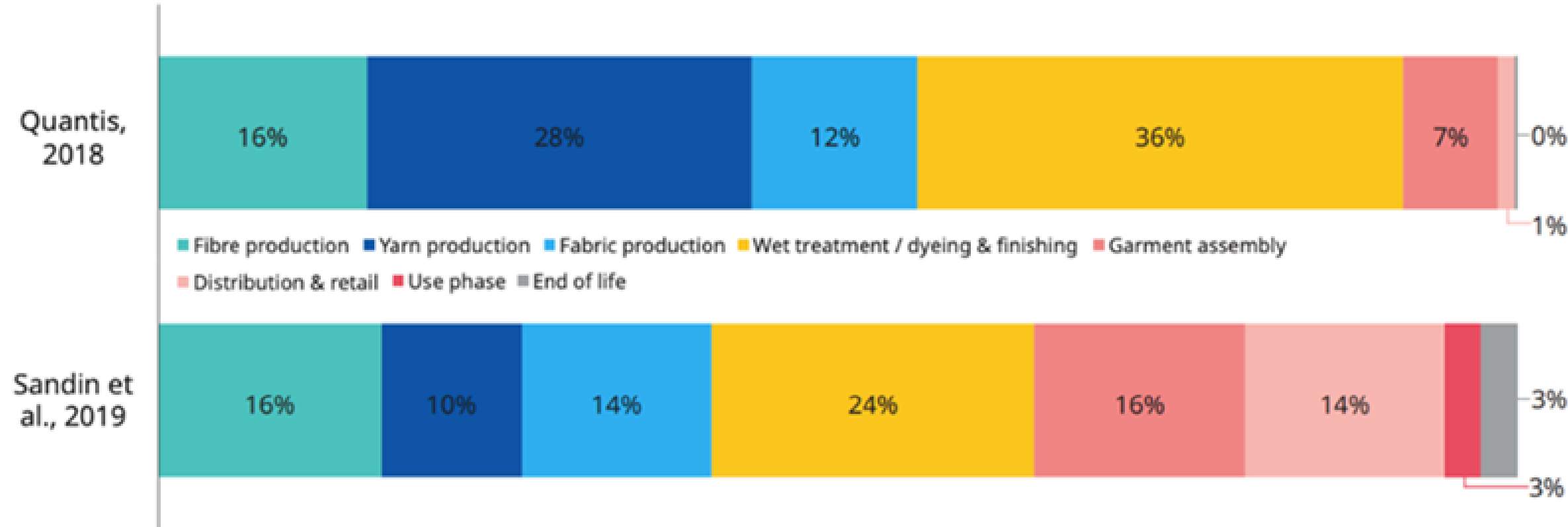- **International Relations and Climate Change Policies equation**

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

AMBITION MECHANISM IN THE PARIS AGREEMENT

Talanoa Dialogue

Secretary-General's Climate Summit

Global stocktake

Global stocktake

2018
2019
2020 — Communicate new or updated NDCs
2023
2025 — Communicate new or updated NDCs
2028
2030 — Communicate new or updated NDCs
2050 — Net-zero emissions & climate resilience

Adoption of the Paris Rulebook

INDUSTRIES AND THEIR CARBON EMISSION

A. Clothing Industry

Comparison of the distribution of emissions in the garment sector value

| Quantis, 2018 | Fibre production 16% | Yarn production 28% | Fabric production 12% | Wet treatment / dyeing & finishing 36% | Garment assembly 7% | 0% 1% |

Legend: ■ Fibre production ■ Yarn production ■ Fabric production ■ Wet treatment / dyeing & finishing ■ Garment assembly ■ Distribution & retail ■ Use phase ■ End of life

| Sandin et al., 2019 | 16% | 10% | 14% | 24% | 16% | 14% | 3% 3% |

Findings

1. Dyeing & Finishing under the production process: biggest emitters.

2. Energy consumption during the supply chain, 41% electricity share: spinning process

3. Fabrics: Polyester and Cotton

4. Fast Fashion

BRANDS

Zara

Aditya Birla Fashion and Retail

GOVT POLICIES

THE SU.RE PROJECT, 2019: sustainable roadway for the Indian Fashion Industry.

B. Power Industry

Total emissions of the power sector for the FY 2013-14 to 2017-18, in million tonnes CO_2

2013-14	2014-15	2015-16	2016-17	2017-18
727.4	805.4	846.3	888.3	922.2

Sector wise generation of electricity through various sources
Source: Ministry of Power, 2018

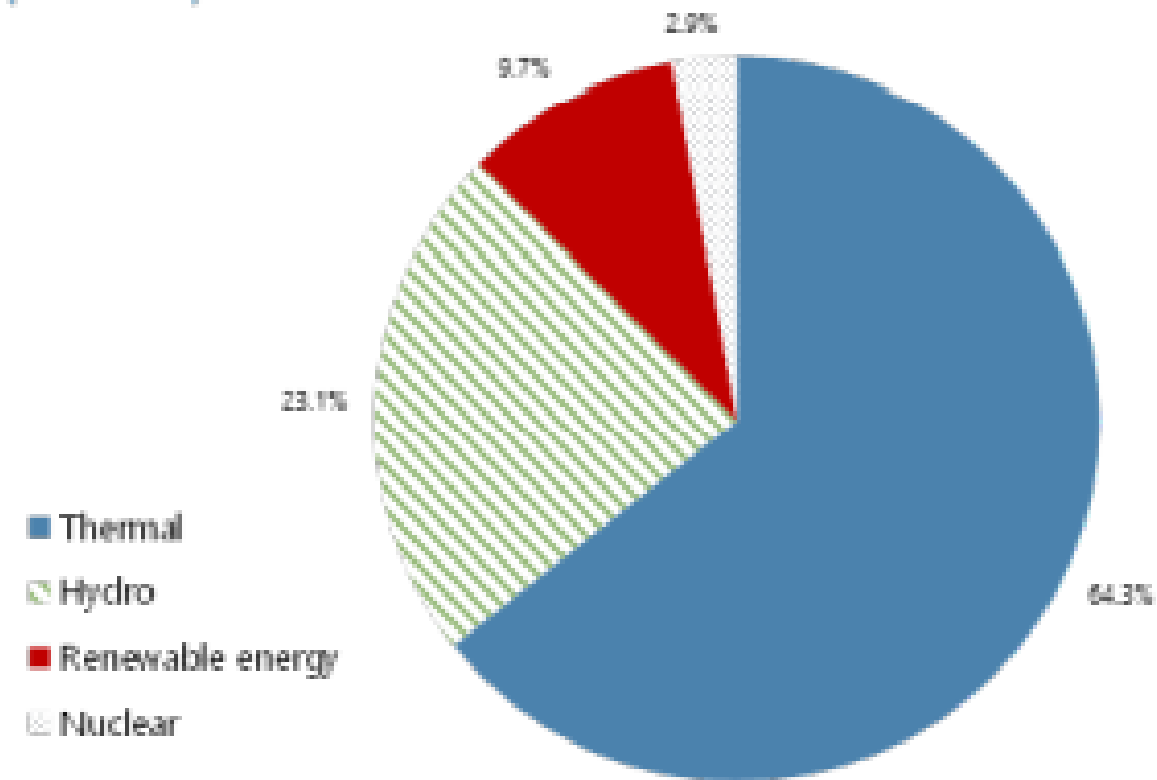| Type	Central Sector (MW)	State Sector (MW)	Private Sector (MW)	Total (MW)
THERMAL	73447.91	74404.86	86875.45	234728.22
HYDRO	15646.72	27069.50	3493.00	46209.22
NUCLEAR	6780.00	0.00	0.00	6780.00
RES	1632.30	2395.27	90406.21	94433.79
Total	97506.93	103869.64	180774.66	382151.22

. Source: Central Electricity Authority, 2021

Government initiatives and companies

*Power Generation in India by fuel source– Comparison between year 2010 & 2019*
Source: Ministry of new and Renewable Energy and IMF staff Calculations

Power generation in India, by fuel source
(as of 2010)

2.9%
9.7%
23.1%
64.3%

- Thermal
- Hydro
- Renewable energy
- Nuclear

Power generation in India, by fuel source
(as of 2019)

1.8%
12.3%
23.3%
62.6%

- Thermal
- Renewable energy
- Hydro power
- Nuclear

- National Thermal Power Corporation Limited (NTPC)

- Private companies like TATA, ANIL
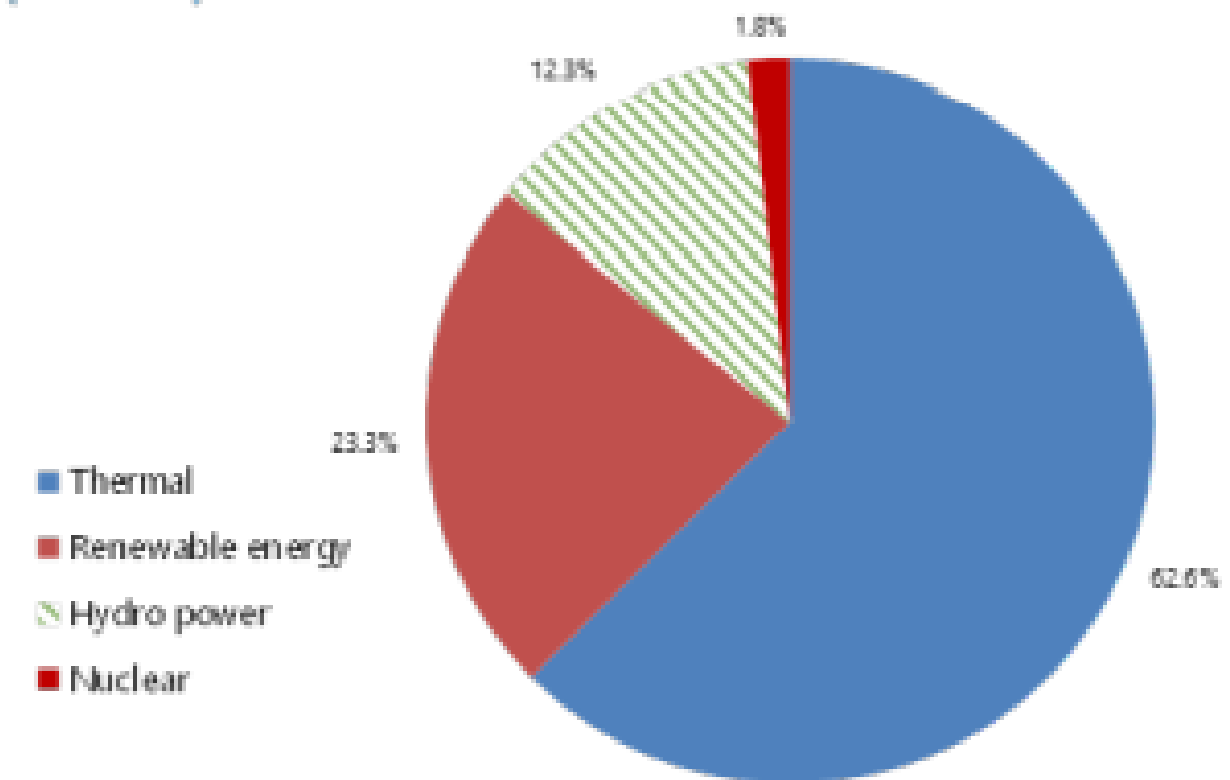
- PM- KUSUM

- CenPEEP

C. Transport Sector

1. The Indian Transport sector: **13.5%** of India's total energy related carbon emissions.

2. **Road**, **Railways**, **Aviation**, **Marine** Transport are major contributors of GHG emissions.

3. Prevalence of adverse **health effects** and **premature deaths**.

Carbon Emission from Various Modes of Transport.

4% 4% 2%

90%

- Road Transport
- Railways
- Domestic Aviation
- Other Forms
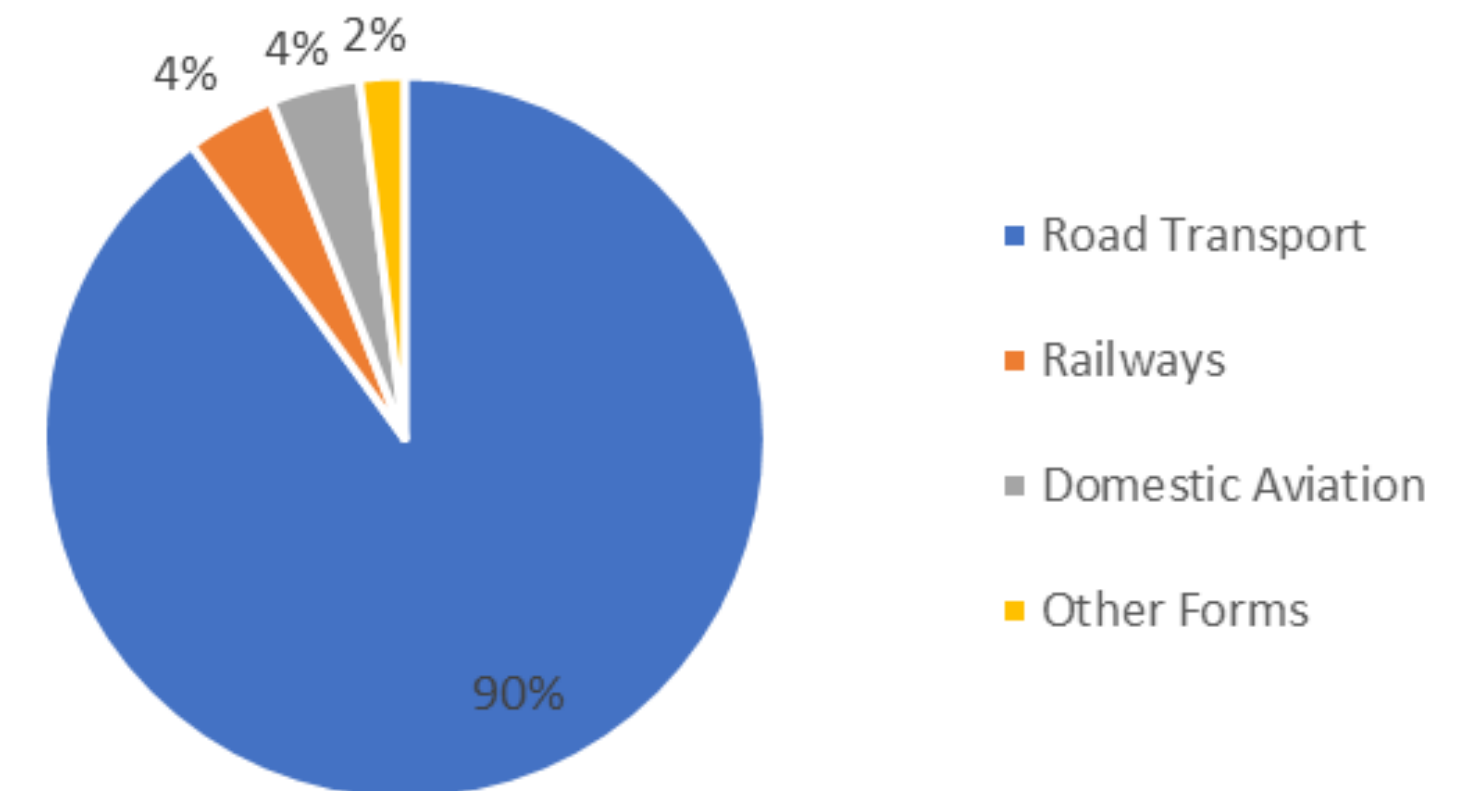
Source- Ministry of Environment Forest and Climate Change, 2018.

Companies

- CARGO SHIPS CARRYING WALMART PRODUCTS

- AIR INDIA

GOVERNMENT INITIATIVES

- National Auto Fuel Policy, 2003.

- National Action Plan on Climate Change (NAPCC), 2008.

Recommendations

A.Clothing Industry

✓ **Alternate projects**

Carbon offsetting, re-enforcing their use

✓ **Air Dyeing, Digital Printing**

Air Dyeing for synthetic fibers. reduction of ink waste by printing

✓ **Conventionally grown fibers**

Replacing organic farming thus less water & energy use

✓ **Sustainable Consumer Behaviour**

Households throw 1.17 millions of textile each year

Power

- Investment in Scientific Technology
(A Sub Critical and Ultra Critical Power Plant;
Bio-Mass Co-firing)

- A better carbon trading system for the power sector
(Illustrations include Voluntary Carbon Markets;
Selling of Carbon Credits etc.)

- One-Step Clearance Method

Replacing a subcritical unit with an advanced ultra-supercritical unit can reduce CO_2 emissions by 30 per cent

Source: IEA, 2020
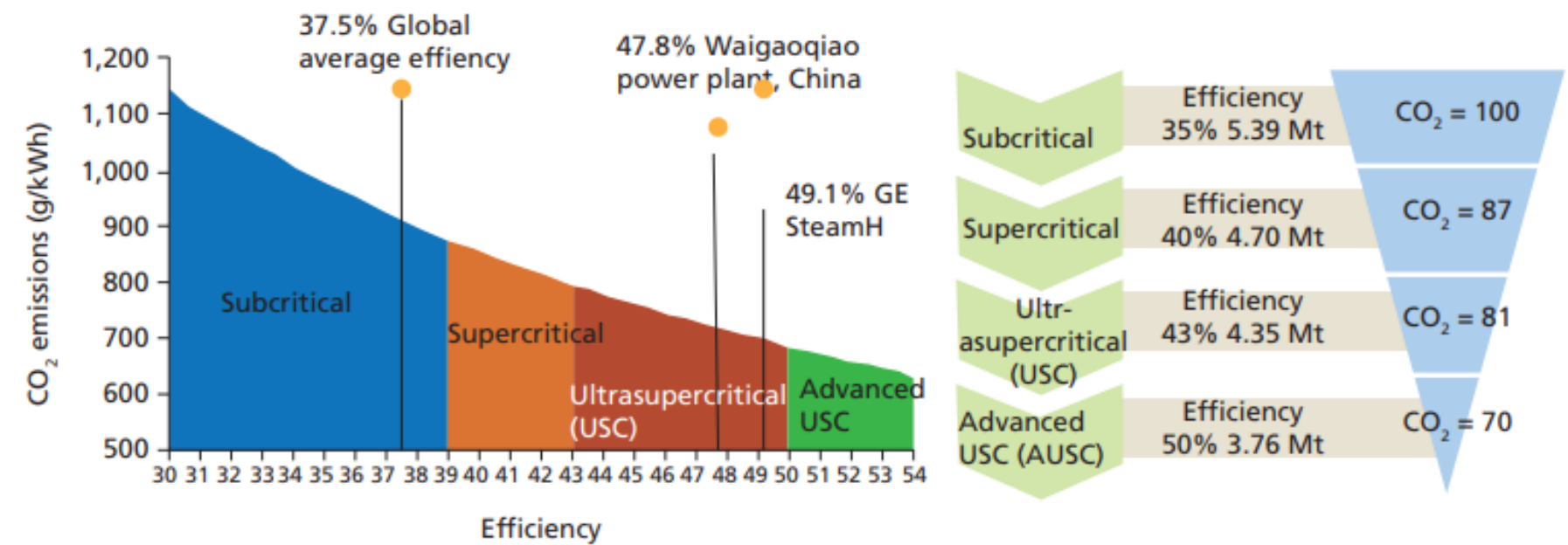
A graphical representation of co2 emissions in direct proportion to efficiency

C. Transport Sector

✓ Use of **Sustainable biofuels.**

✓ **Consumer information**
campaigns for eco-driving, use of public
transport and modal transport etc.

✓ **Improved Transport infrastructure.**

✓ **Legal instruments**
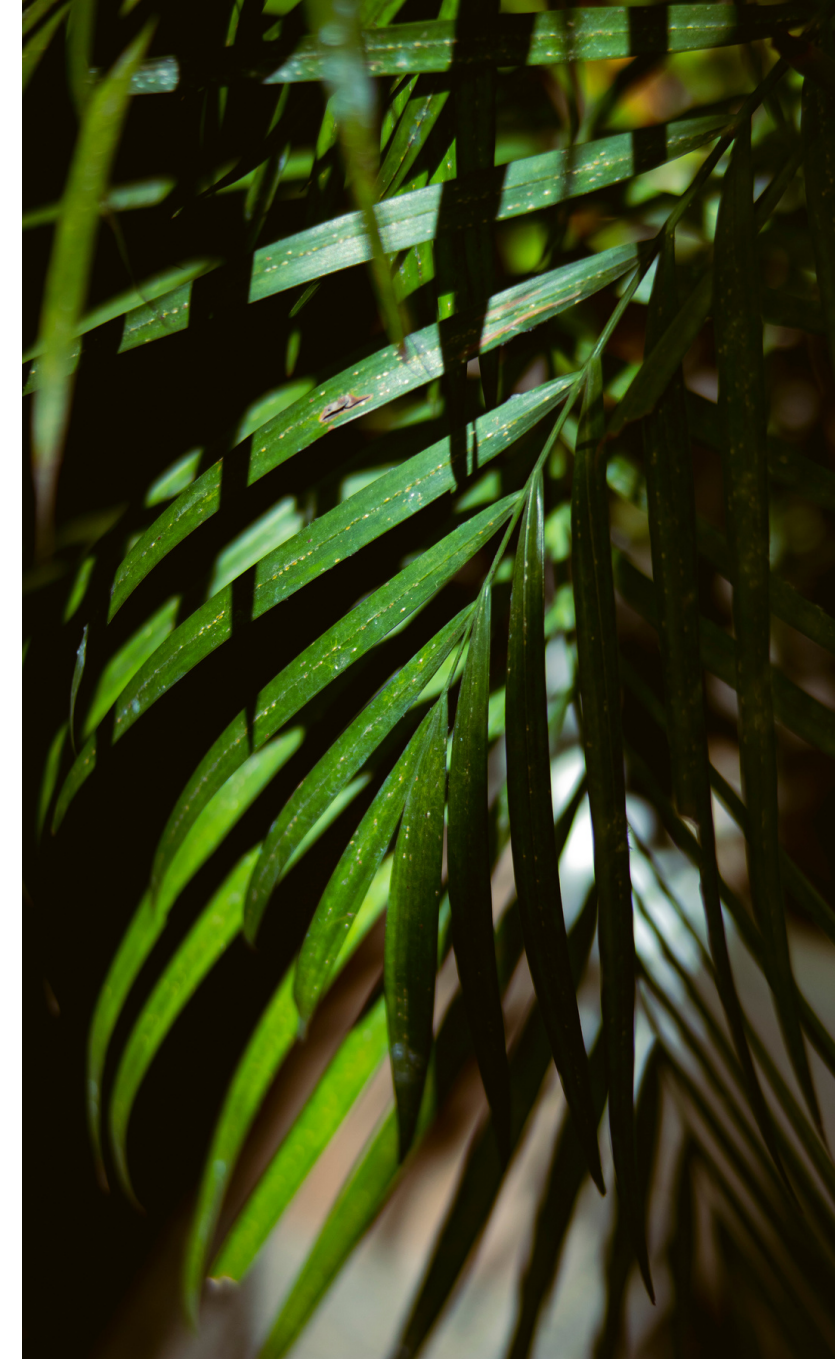Tax incentives for low carbon products and
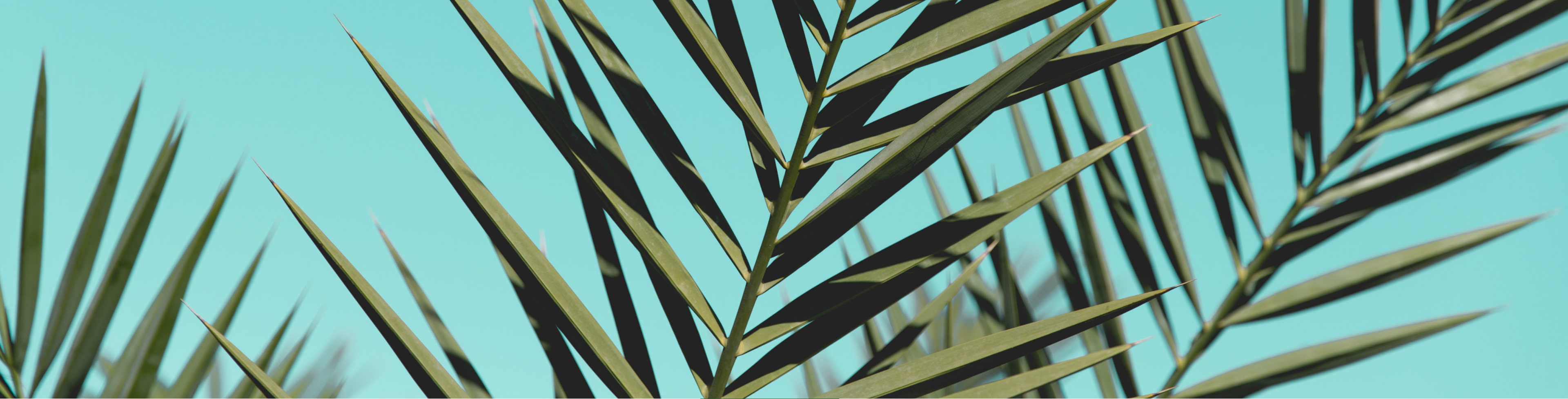processes.

Conclusion

Acknowledgements

We would like to convey our heartfelt gratitude and appreciation to all who mentored us. This project could not have taken shape without their guidance and constant support .

- Mr. Maninder , JRC NHRC
- Mr. Mukesh Kulshreshtha
- Dr. Vidya Tikoo

Thank You

"Business and Human Rights with reference to reduction of Carbon Footprint"

Research Project, NHRC

GROUP 3

Roll no. 29-42

Laaraib Ghazi *(Dr. B.R Ambedkar University,Delhi - M.A Law, politics and society)*,
Mili Verma *(Amity University, Noida: Bachelors of Journalism & Mass Communication)*,
Mumal Vaishnav*(University of Mumbai, Masters in International Relations & Strategic Studies)*,
Mir Kamil Nazir *(Department of Law, University of Kashmir - B.A LL.B)*,
Naina Gupta *(GGS Indraprastha University, New Delhi: B.A. L.L.B*,
Liza Gupta *(O. P. Jindal Global University- M. A. Diplomacy, Law and Business)*,
Mansi Saini *(M.SC in human development and childhood studies, Lady Irwin college, DU)*,
Mohita *(M.sc Human development & childhood studies (Lady Irwin college, DU)*,
L. Amrutha *(M.A ENGLISH, St. Joseph's College for women, Andhra University)*,
Kanika Shokeen *(Lady Sri Ram College, University of Delhi, B.A(H) Political Science)*,
Mohd Shahid Raini*(Dr. Ram Manohar Lohiya National Law University, Lucknow - B.A LL.B. (Hons.)*,
Neelkamal Alomayan Kalita *(IIPS, Mumbai, M.A population studies)*,
Mary Mahila D.C(SRM Institute of science and Technology, Tamil Nadu: Ba. Llb hons)

ABSTRACT

For our society to advance forward, we need to take our planet along, and in this society, Business and corporations play a substantial role. This paper elucidates on the Business sector, in particular the Transport, Clothing, and Power Industries, and their responsibility towards the environment, thereby respecting the rights. The reason for choosing these sectors is because of their colossal and huge carbon footprint, as they come under the top 5 sectors of the world that pollute the earth. The paper begins with discussing about several ways in which these industries leave their imprint thus adding to global warming, justify government efforts in minimising emissions while still attempting to meet the needs of the growing population, and finally the solutions that can help put a cap on the carbon emissions. The major findings and solutions in the paper discovered that the production process, especially the dyeing and finishing processes in the clothing industry had the biggest carbon footprint, while in the power industry the Coal-based power plants produce the most CO2 per Kilo-watt hour and Transport industry observed that 27% of the CO2 comes from fuel combustion. The key recommendations for the same were to optimize techniques of "air-dyeing" and "digital printing", setting up carbon trading systems for power sector, and installing Intelligent Transport System (ITS) as well as utilizing 'sustainable biofuels' instead.

Keywords: Carbon Footprint, Emissions, Business Industries, Human Rights, Coal, Global Warming, Environment

INTRODUCTION

Businesses are for-profit organisations or companies that engage themselves in commercial, service, industrial or professional activities. They can vary from sole proprietorships to partnerships. Whereas Human rights are the principles and norms that are entitled to each individual of the society and the environment, which are protected by both national and international laws.

When we talk about human rights in the context of Business, it can mean several things such as labour rights protection and adequate wages, protection of the environment from hazardous

business activities, equality of opportunity on the basis of social and economics class, so on and so forth.

The UN Principles on Business and Human rights provided guidance principles for state, business, civil society, and other relevant stakeholders:

Pillar one says that state governments should ensure that businesses should not violate any rights such as forced labour and pollution, ensuring that such laws are brought into place and implemented.

Pillar two discusses corporate responsibility to respect human rights: working conditions, health, environment, security, corruption among others. Companies need to perform human rights due diligence.

Pillar three is access to remedy, for redressal when something goes wrong and that companies must participate in legitimate remedy process. It is also important for them to be accessible, transparent, and equitable.

When businesses respect human rights they commit to creating mutually beneficial relationships with their stakeholders. In fact, the Indian Government formulated the National Guidelines for Responsible Business Conduct (NGBRC) in 2011, listing out principles that need to be followed by businesses in India. The main principles were:

1. Businesses should conduct themselves with Integrity and in a manner that is ethical, transparent, and accountable.
2. Provide goods and services in a manner that is sustainable and safe (safety, resource efficiency across product life cycle and value chain).
3. Businesses should respect and promote well-being of all employees.
4. Businesses should respect the interests of and be responsible to all the stakeholders,
5. Businesses should respect and promote Human Rights.
6. Businesses should respect and make efforts to protect and restore the environment.
7. Businesses should promote inclusive growth and equitable development.
8. Businesses should engage and provide value to their consumers in a responsible manner.

They also published a draft of National Action Plan (NAP), in 2019 which is yet to be framed, with a goal to set corporate responsibility to respect human rights.

This paper specifically examines the Businesses' corporate responsibility in terms of the environment, particularly their 'carbon footprint' and hence assessing their emissions. For this, we chose to focus and analyse 3 Industries that top the list of having a significant carbon footprint. These are: **Transportation, Clothing, and Power Industry.** Towards the end we have provided solutions and recommendations for the same.

The phrase "Carbon footprint" as we know refers to the overall quantity of Greenhouse Gases (GHGs) that an individual or an enterprise is liable for. It includes direct emissions from the production of electricity as well as from the burning of fossil fuels. There are plenty of ways in which corporates contribute negatively to the environment: while processing of raw materials, electricity use in power plants, gases emitted from boilers and furnaces, while distribution of goods and service, and disposal of waste materials. Facts such as "We are losing 1.2 trillions tons of Ice each year" and "CO2 is ats highest in 2 million years" (Earth.org, 2022) has made it ever more vital for us to start analysing each sector in society that contributes to climate change. The cost of inaction is greater than the opposite.

LITERATURE REVIEW

HOW ARE THE INDUSTRIES CAUSING ENVIRONMENTAL POLLUTION?

A. CLOTHING

PRODUCTION PROCESS & MATERIAL

To answer this question, we need to assess the basic production processes involved in the fashion industry. Most of the apparel industry's emissions come from upstream activities—material production and processing, while the rest is associated with downstream retail operations, the consumer use phase, and end-use activities.

To explain the fibre to fabric process in brief, there are two kinds of fibres available: Natural (wool, cotton, jute etc.) and Synthetic (polyester, rayon). These fibres are then spun to produce yarn. At the end of every process, finishing is done (seed removal, quality check and so on). The Yarn is

again twisted and hence is either weaved or knitted to create Fabric. After this, again finishing is done under which the fabrics are bleached and also dyed if required by the brands, and other kinds of efforts are made to fine tune the fabric (coating etc.) After the fabric is made, it goes under garment production process where techniques like spreading, laying, cutting (fabric cut into garments, marking, screen printing, sewing, checking, pressing and packaging is done). The production process needs two things in a great extent: water and chemicals. Many of these processes involve the use of chemicals which are harmful as they are not adequately disposed of at the end of the process.

Environmental impacts are focused at certain points in the supply chain, principally in four areas:

- Weaving, dyeing and finishing processes in textile manufacturing: As per the study conducted by Quantis in 2018, the biggest emissions in the industry come from dyeing and finishing processes, followed by yarn preparation and fibre production[1]. The study is consistent with other two studies of Sweden[2] and the brand H&M[3]. The heavy carbon footprint of these stages is because of their need for high energy and dependency on fossil fuels for the same. Dyeing is a high energy intensive process and involves direct use of natural gas and coal.
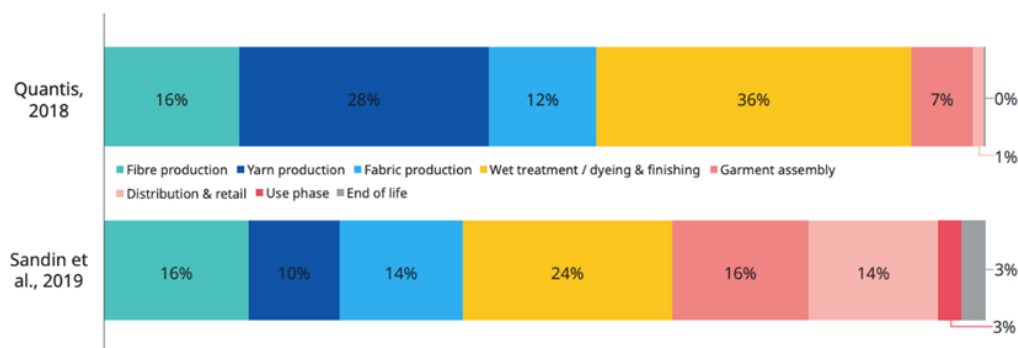

Figure 1. Comparison of the distribution of emissions in the garment sector value chain between two key studies, Source: International Labour Organisation website

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[1] Reducing the footprint? How to assess carbon emissions in the garment sector in Asia ILO Asia-Pacific report. International Labor Organization. 2021.

[2] Measuring Fashion: Insights from the Environmental Impact of the Global Apparel and Footwear Industries study,2018

[3] H&M Group. 2019. Sustainability Performance Report 2019.

- Energy consumption throughout the supply chain, but mostly in textile manufacturing and to a lesser extent in garment assembly. Electrical energy is considered to be one of the major energy consumption sectors in industry, primarily being used in the following processes: Driving machinery; Cooling; Temperature control; Lighting and office eqquipment. Under it, spinning process takes the major share of electricity with 41%, followed by weaving and wet processing units[4].

  Textile/fabric waste associated with garment assembly

- The transport emissions throughout the supply chain as materials and then final products are shipped globally.

The heaviest impacts however are within the 'first two' areas, with the main impacts being because of the use of water resources with intensity (the sector is the largest user of fresh water in the world, consuming 79 billion cubic metres of fresh water), chemical use (including toxic chemicals), waste water discharges and lack of treatment processes, as well as energy use and the carbon intensity of electricity.

Meanwhile some studies like that of Marks and Spencer (M&S)[5] and Levi's[6] say that consumer use-phase is the largest contributor to emissions. The way people do laundry and wash products make a lot of difference. Here also, the tendency of the people to be irresponsible and throw away clothes at a faster rate contributes to huge piles of clothes in the landfills.

As we know, India has led the world monopoly in cotton textiles since 1500 BC. The country also belongs to the world's top producers of yarn and fabrics and now comes second, as a cotton producer after China contributing about 21.5% of the world's total production[7]. There are more than 3000 spinnings and composite mills spread across the country, making India an outsourcing hub for the apparel supply chain. India profoundly relies on hard coal and natural gas for electricity and heat production, increasing the carbon footprint of each apparel product. This makes our nation ever more responsible in reducing its clothing industry's carbon footprint.

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[4] Carbon Footprint of Textile and Clothing Products, 2015
[5] Streamlined Life Cycle Assessment of Two Marks & Spencer plc Apparel Products, 2002
[6] Levi Strauss & Co. 2018. Climate Action Strategy 2025.
[7] Report of the Working Group on Textiles & Jute Industry. Ministry of Textiles. 2018.

If we talk about the GHG emissions of fibres themselves such as hemp, cotton etc., their impact is also determined by the kind of garments that are made of them. A UK study informed that laundry processes in the use phase have high energy use with the cotton t-shirt as compared to a viscose garment[8]. The natural fibres do have a higher rate of carbon emission than synthetic fibres but at the same time, these synthetics are not biodegradable. Once made, it is hard to break them down or recycle them. Under natural fibres like cotton, CO_2 emissions happen during preparation, planting, and field operations (irrigation, pest control etc.). The use of synthetic fibres is the main component of conventional agriculture equating to a large carbon footprint.

Although cotton continues to have an influence, Polyester, a ubiquitous source of plastic has overtaken cotton in production in the world. Clothes made of polyester are the foremost source of microplastic pollution, specially harming the marine life. Fast fashion takes lead in advocating for making polyester garments. This production of fossil fuel-based clothing is projected to grow in the coming two decades.

OTHER TRENDS

Another important doing that businesses conduct which harms the environment needs no introduction: Fast Fashion. "Fast fashion is based on the idea of creating a false demand for fresh looks so that more clothes are produced for sale." The problem is that much of the cost of fast fashion is not reflected in the price tag. All of the elements of fast fashion--over production, low quality, competitive pricing--have a detrimental impact on the environment and the people involved in the production."[9]

"A lot of this clothing ends up in the dump. The equivalent of one garbage truck full of clothes is burned or dumped in a landfill every second"

This trend, which refers to retailers relying on cheap and fast production of low quality clothing has grievous effects on the planet. Majority of the clothing is quickly discarded, releasing 500,000 tonnes of synthetic fibres into the oceans each year. The brands say that they help in the cause by motivating people to buy sustainable fabrics, but in reality, it leads to more consumption.

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[8] United Kingdom, House of Commons, Environmental Audit Committee. 2019.
[9] Flavia Lopes, Indiaspend.com, 2021

The consumer behaviour at the end of the supply chain is also a cause of worry. A study in the U.K. observed that 1 in 3 participants consider clothes old after one or two wears[10]. This tendency of throwing clothes instantly and not using them to their maximum potential is concerning. Not only this, but the need and greed to want more is ever increasing.

INPUT OF BRANDS

Under the clothing industry, several brands are notorious for their carbon footprints. Some of them are:

H&M

H&M came under scrutiny in 2018 when it revealed its annual report that it had piled up $4.3 billion of unsold inventory and the stock has remained at the same level[11]. Grariella Santaniello, the founder of A-Line Partner says that overproduction happens because the companies face pressure of increasing sales. It has been made a need for them to make more products so that they don't miss out. Also, a pair of jeans requires 7,600 litres of water to make it through production line.

The brand has since then been making conscious efforts to be more eco-friendly. They implemented a Conscious collection in 2011 where their products were made with "50% sustainable materials". The company also set the target to be completely carbon-neutral by 2030. However, they have been criticised for claiming vague goals and hence engaging in Greenwashing.

ZARA

Figure 2. Zara store, Source: Google

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[10] The Real Environmental Impact of the Fashion Industry, Bloomberg, 2022
[11] ibid.

One of the world's largest fashion brands, Zara, got a D in their carbonising efforts as per the report given by the Environmental Campaign group called *Stand.Earth*. They persisting to rely heavily on cheap fossil fuel products like Polyester. Along with this, Zara with H&M developed the business model of introducing 52 'micro seasons' a year, that means launching new collections every week. Since then, Fast Fashion came into play.

The clothing company announced its great targets of only using cotton and polyester that are recyclable and sustainable, as well as reducing and eliminating all kinds of emissions by 2040. As yet, they are nowhere nearby. One can still go to their stores and find new products literally each week.

UNIQLO

UNIQLO has once got the lowest grade for this: F[12]. The brand has not really committed to switching to organic cotton which is sourced from regenerative agriculture. They have not shown progress in eliminating deadstock, removing harmful materials contributing to deforestation.

Any measures taken? To improve its sustainability, Uniqlo introduced a recycling and donation programme, which motivated customers to bring unwanted clothing to its store some of which will be provided to refugees, victims of disaster and others. Second hand garments can be converted into new products. Although the brand is making effort to reach its carbon footprint, reports say that the company has yet to disclose any advancements made to achieve their targets.

ADITYA BIRLA FASHION AND RETAIL

Aditya Birla Fashion and Retail (ABFRL), an Indian Multinational Company Ranked Asia's 'Most Sustainable Company' in the Textile, Apparel & Luxury Goods Industry' by S&P Global CSA, 2020. It has been complying to resonate with their core values of sustainability.

Earth Chinos: launched by *Peter England*, use agro-waste based dyes as colourants. While most dyes are made using petrochemicals, they use waste material from beetroots, orange peels, olives, etc. **Recycled Polyester** by *Pantaloons* has actively worked towards reducing its carbon footprint by using polyester recycled from PET bottles in its products. These bottles are rescued from

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[12] Fossil Free Fashion Scorecard Report, Stand.Earth, 2021

landfills and recycled, to reduce greenhouse emissions, thus leading to reduction of 35 % polyster content.

The company is also a signatory of SU.RE project, as a commitment to walk on the sustainable path.

2. POWER

ELECTRICITY PRODUCTION AND DISTRIBUTION PROCESS

If we talk about the electricity generation process, the current is produced by the motion of electrons. The technique most usually used to generate this current is still the conversion of mechanical motion into electrical energy. This is often done by rotating a turbine connected to a generator; doing so causes a conductor to move through a magnetic field, which attracts electrons. The turbine is often propelled by either steam, which is produced when water is heated in various types of fossil fuel-fired power plants, or by renewable energy sources like wind and water.

Generating Capacity in Power refers to the maximum output that can be produced of a certain kind of power source, (for e.g. electricity), under specific conditions. In India, most of this generating capacity is owned by the government. This authority comes from the 1948 Electricity Supply Act, which led to the creation of State Electricity Boards.

Even in the case of renewable sources, such as solar energy, independent households may install solar panels, however this is followed by a contract signed between them and the state government. All power generated is collected by the state, and then supplied to the households from a common generator. If their consumption is less than the total kilowatts of energy produced, they are compensated for the difference by the government. This also acts as an incentive.

CARBON EMISSIONS FROM POWER SECTOR

Graph 1 : CO₂ emissions based on sector and fuel usage in India
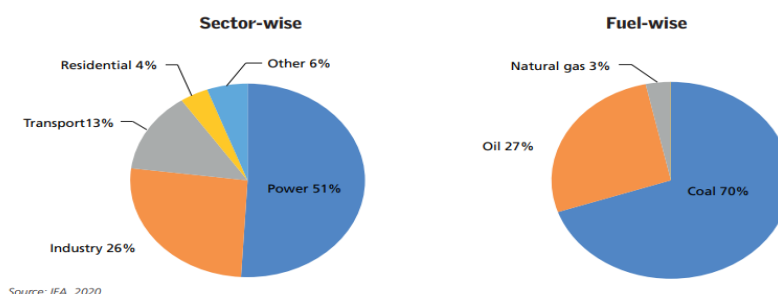*Coal and coal-based power are the single largest contributors of CO₂ emissions in India*

Sector-wise

Residential 4%
Other 6%
Transport 13%
Power 51%
Industry 26%

Fuel-wise

Natural gas 3%
Oil 27%
Coal 70%

Source: IEA, 2020

Figure 3: CO2 emissions based on sector and fuel usage in India
Source: International Energy Agency, 2020

Consider that, on the global scale, the creation of power is responsible for 42.5 % of global CO2 emissions. This comes from the power sector's reliance on coal, since coal-fired power plants produce nearly 950 grams of emissions per unit of electricity produced. Compare this to generators propelled by water, wind, solar PV and solar thermal energy, which only produce emissions during construction which shows that shifting to these sources would reduce carbon emissions.

Total emissions of the power sector for the FY 2013-14 to 2017-18, in million tonnes CO₂

2013-14	2014-15	2015-16	2016-17	2017-18
727.4	805.4	846.3	888.3	922.2

Figure 4: Sector wise generation of electricity through various sources
Source: Ministry of Power, 2018

There has been a continuous rise in the amount of carbon emitted from the power sector. These emissions lead to an increase in the carbon footprint. In just about 4 years there has been an increase of more than 100 million tonnes. If this trend continues, emissions would reach a high in the coming years.[13]

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[13] Ministry of Power, Central Electricity Authority. *CO2 baseline Database for the Indian Power Sector (Version 14.0) p. 14*

In India today, major power is produced through thermal energy in both government and private sectors. It can be seen from the table below that all sectors are still majorly dependent upon thermal power plants for production.

Type	Central Sector (MW)	State Sector (MW)	Private Sector (MW)	Total (MW)
THERMAL	73447.91	74404.86	86875.45	234728.22
HYDRO	15646.72	27069.50	3493.00	46209.22
NUCLEAR	6780.00	0.00	0.00	6780.00
RES	1632.30	2395.27	90406.21	94433.79
Total	97506.93	103869.64	180774.66	382151.22

Figure 5. Source: Central Electricity Authority, 2021

As we can see, the generation of electricity remains mainly through thermal power plants and the emissions have continuously risen in the past years. Therefore, to reduce the carbon footprint, these carbon emissions must be brought under control.

INPUT OF VARIOUS CORPORATIONS IN CARBON EMISSIONS

Government-owned state and center power generating corporations (NTPC) and private businesses produce the majority of the electricity in India (Adani, TATA, etc):

National Thermal Power Corporation Limited(NTPC)

NTPC is the largest coal-power producing company in India. Its power generation capacity is about 265461.25 MU and remains to be one of the highest carbon emitting companies.[14] Though it has taken initiatives to reduce its footprint, lack of economic opportunities and ever-increasing demand prove to be a hindrance.

Private companies

Like TATA, many private companies have made the commitment to achieve net-zero carbon emissions or are being pushed to decarbonize their operations. TATA committed to not constructing any new coal-fired power stations in order to meet goals of generating 70% of all

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[14] CEA Annual Report 2020-21, *Annexure 3A*

electricity from renewable sources by 2025.[15] Adani New Industries Limited (ANIL), which will concentrate on the development and commercialization of green hydrogen in India, recently saw the acquisition of a 25% stake by French powerhouse Total Energies.

3. TRANSPORTATION

All transportation systems ranging from existing transportation modes such as Road and Marine and integrated transportation systems, to new or promising technologies (e.g. electric vehicles, air mobility, alternative fuels) impact the environmental change.

Aviation Sector: The aviation sector may contend with increased atmospheric turbulence and heat-related degradation of aircraft performance. Overall, in 2005 the radiative forcing caused by aviation amounted to 4.9% of all human-caused radiative forcing on Earth's heat balance.

Marine Sector: The marine sector may have access to new shipping routes as sea ice melts. Sulfur and nitrogen compounds emitted from ship will oxidize in the atmosphere to form sulfate and nitrate. Emissions of nitrogen oxides, carbon monoxide, and volatile organic compounds (VOC) will lead to enhanced surface ozone formation and methane oxidation, depleting the ozone.

Road Transport: Roads may be subjected to more freeze-thaw cycles in some areas, and road systems could experience direct heat damage. The largest sources of transportation-related greenhouse gas emissions include passenger cars, medium- and heavy-duty trucks, and light-duty trucks, including sport utility vehicles, pickup trucks, and mini vans. These sources account for over half of the emissions from the transportation sector.

Railway Sector: Electric trains contributes relatively less to the pollution as pollution happens in the power plants which are lot more efficient than diesel driven engines. However, pollution can occur from boxcars carrying materials such as iron ore, coal, soil, or aggregates and exposing these materials to the air. This can release Nitrogen oxide, Carbon monoxide, Sulphur dioxide, or Hydrocarbons into the air.
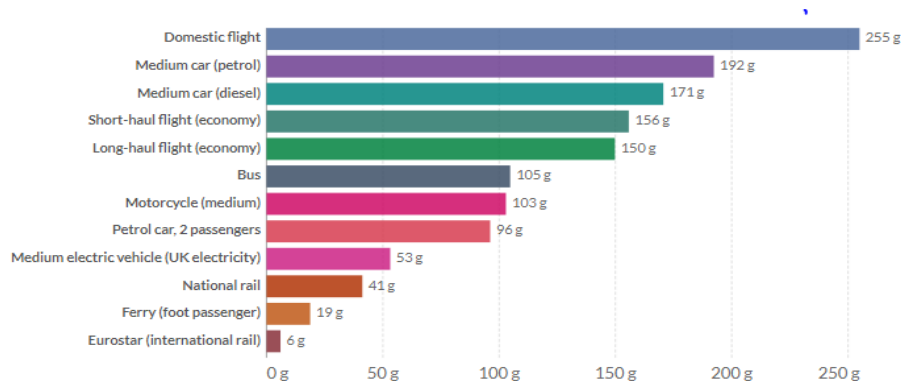
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[15] TNN (2020, November 6), *Times of India*

Figure 6. Carbon Foot Print of Travel per Kilometer, 2018

The Indian Transport sector is responsible for 13.5% of India's energy related Carbon Dioxide (CO_2) emissions, with road transport accounting for 90% of the sector's total final energy consumption followed by rail and domestic aviation both at 4 per cent. [16] Globally the transport sector is responsible for 27% of total carbon dioxide (CO_2) emissions from fuel combustion. It is the fastest growing sector and is a major contributor of global greenhouse gas emissions.

The buildup of Carbon dioxide (CO_2) and other Greenhouse gases like Methane (CH_4), Nitrous oxide (N_2O), and Hydrofluorocarbons (HFCs) is causing the Earth's atmosphere to warm, resulting in changes to the climate.

The Transport sector is also a major emitter of other, poisonous gases, such as Nitrogen Oxides, which cause local air pollution, resulting in a prevalence of adverse health effects and premature deaths. 21 of the world's 30 most polluted cities are located in India (World AQ Report, 2019). In 2015, approximately 1,800 premature deaths were attributed to noxious gases stemming from the transport sector in New Delhi alone, with 74,000 premature deaths registered across India (The International Council on Clean Transportation, 2019).[17]

THE CHALLENGES

The initial-cost barrier is a major problem, in particular for individuals and despite available information on the relevant payback periods. The key factor inhibiting improvement of the vehicle

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[16] International Energy Agency (2020), World Energy Outlook 2020, IEA. Licence: Creative Commons Attribution CC BY-NC-SA 3.0 IGO.

[17] Our World Data, Where Do CO2 Emissions From Transport Come From, by Hannah Ritche, October 6,2020. https://ourworldindata.org/co2-emissions-from-transport

fleet's efficiency is the split incentive between individual-cost and economy-wide benefits, which is very strong in the transport sector. Vehicle purchases are made by individuals who apply discount rates as high as 20 %, while most car buyers do not account for cost-savings from fuel efficiency beyond 2–3 years. As such, only a fraction of the economy-wide benefits are considered by individuals when making a purchase decisions, with negative consequences on the [18]economy-wide benefits/costs over the roughly 15 year lifetime of the vehicle. An additional issue affecting energy efficiency measures is the Rebound or Take-back Effect. The effect refers to the tendency for total demand for energy decrease less than expected after energy efficiency improvements are introduced, due to the resultant decrease in the cost of energy services. One of [19]

the most typical examples in the transport sector is improved vehicle efficiency failing to lead to the desired reduction in energy consumption, as efficiency gains are 'taken back' by increased travel.

INPUT OF BRANDS:

AIR INDIA

Air India is the first airline in India to establish an environment policy and follow an Environment Management System (EMS). The EMS is responsible for maintaining data and information pertaining to fuel consumption, carbon emissions, and energy demand, among other things. It also aids in developing future action plans to reduce the carbon footprint of the airline and identify and comply with legal and other regulatory obligations.

Air India has adopted an integrated approach to carbon emissions reduction, which covers every aspect from ground to the air. New procedures have been established which take into consideration current aircraft performance, uneconomical use of aircraft systems and unnecessary carrying of weight.

CARGO SHIP CARRYING WALMART PRODUCT

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[18] United States Environmental Protection Agency, Sources of GreenHouse Gas Emission, 2019, IPCC (2014).
[19] Emissions inventory for road transport in India in 2020: Framework and post facto policy impact assessment

Cargo ships carrying truckloads of clothing, cheap furniture, toys, and other goods destined for Walmart stores emitted an estimated 3.7 million tons of carbon dioxide in[20] 2019—more than a coal-fired power plant running for a year, according to a new report. The report, from the non-profits Pacific Environment and Stand.earth, calculates the carbon footprint and air pollution from fossil-fuelled ships for the top importers of products sold in the U.S. As per Ocean import CO2 emissions by country based on available 2019 U. S import data, Walmart is the retail polluter through its use of dirty shipping emitting 3,720,000 metric tones of CO2 as much an US coal fired power plant burning for an entire year.

INITIATIVES TAKEN BY THE GOVERNMENT AND INTERNATIONAL LAWS

A.CLOTHING

THE SU.RE PROJECT, 2019

The Sustainable Resolution (herein after referred to as SU.RE) launched by the Union Textiles Ministry, with Clothing Manufacturers Association of India (CMAI); United Nations in India; and IMG Reliance is a commitment by India's apparel industry to set a sustainable roadway for the Indian fashion industry. The objectives of the project are as follows:

1. Develop a complete understanding of the environmental impact of the garments being presently produced.

2. Build a sustainable sourcing framework for constantly prioritizing and utilizing certified raw materials that have a optimal impact on the environment.

3. Deduce the right decisions about how, where, and what we source across the supply chain by selecting sustainable and renewable materials and processes and ensuring their variability.

4. Commutation of our sustainability initiatives effectively to consumers and media through our online and offline outlets, item/article tags/labelling, social media, advertising campaigns and events.

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[20] Fast company, Companies with Biggest foot print from Cargo shipping, 7-20-21 by Adele Peters

5. Addressing critical global issues such as climate change, contributing to the UN SDGs by the year 2025, and cultivating a world secure future generations.

UNFCCC Fashion Industry Charter for Climate Action

During COP24, the UNFCCC Fashion Industry Charter for Climate Action was first proposed, it was renewed at COP26 held in 2021. It started with the aim to support commitments made in the Paris agreement to limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels by the sourcing of environmentally friendly raw materials by 2030. It encourages brands to set science-based targets to reduce their carbon footprint.

National Textile Policy (NTP) 2000

The Ministry of Textiles, Government of India announced the National Textile Policy (NTP) 2000, to promote the textile industry to achieve and sustain a pre-eminent global standing in the production and export of apparel. The main objectives of the policy are as follow-

● To encourage Foreign direct investments and research and development to improve the production capabilities and infrastructure under the environmental standards.
● Providing financial support to the sector.
● Amplifying contribution of the private sector by setting up environment-friendly and technologically advanced textile units and complexes.
● Maintain and strengthen the traditional skills, knowledge and skills.

B. POWER

Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM – KUSUM)[21]

By 2022, the scheme hopes to increase capacity for solar and other renewable energy sources by 25,750 MW, with a total Central financial support of Rs. 34,422 Crore, including service charges to the implementing agencies. The Scheme consists of three components:

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[21] Ministry of New & Renewable Energy, Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan

- 10,000 MW of Decentralized Ground Mounted Grid Connected Renewable Power Plants.
- Installation of 17.50 lakh standalone Solar Powered Agriculture Pumps.
- Solarisation of 10 Lakh Grid-connected Agriculture Pumps.

Policy for Repowering of the Wind Power Projects[22]

Wind energy makes up a large portion of India's renewable energy capability. After China, the United States, and Germany, the installed capacity at this time is over 27 GW, making it the fourth largest in the world. The majority of wind turbines installed up until the year 2000 have capacities under 500 kW and are located at locations with significant wind energy potential. Over 3000 MW of installed capacity is thought to come from wind turbines with 500 kW or less power. Repowering is necessary to make the best use of the wind energy resources. The Repowering Policy's goal is to encourage the best possible use of wind energy resources by establishing a framework that is conducive to repowering.

India's shift to other sources

India has made significant attempts to switch from thermal electricity generation to alternative sources like hydro, solar, nuclear, etc. with an increase in shift towards renewable energy through collaborations like CenPEEP.[23]
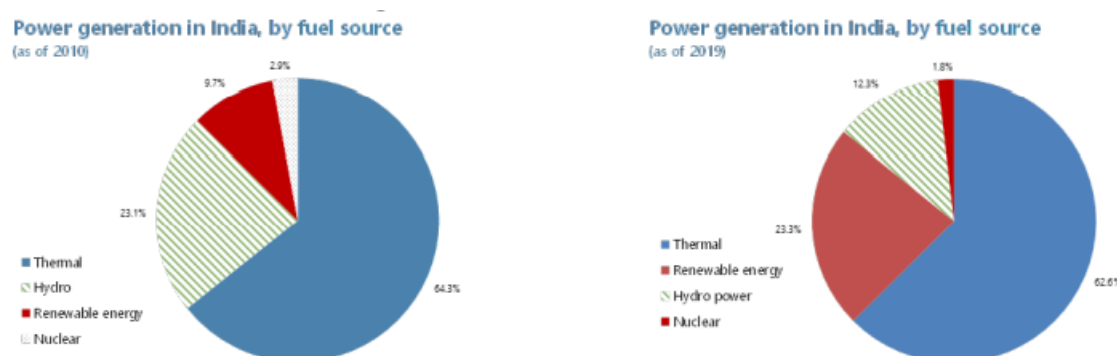

Figure 7: Power Generation in India by fuel source– Comparison between year 2010 & 2019
Source: Ministry of new and Renewable Energy and IMF staff Calculations

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[22] Ministry of New and Renewable Energy (Wind energy Division), Policy for repowering the Wind Power Projects.
[23] Centre for Power efficiency and environmental protection was established by NTPC to takes initiatives to improve performance of overall coal-fired power plants.

C.TRANSPORT

Numerous Legislative Acts have been enacted so far which have aimed at mitigating climate change and adapting to sustainable transport. Pertinent amongst them are listed as follows[24]:

National Auto Fuel Policy, 2003.

India adopted a roadmap for progressively tighter fuel quality and vehicle emission standards through 2010. As a result of the implementation of this policy, vehicular emissions of particulate matter (PM10) declined throughout the decade and growth in emissions of oxides of nitrogen (NOx) slowed, even as the number of vehicles on the road doubled.

National Urban Transport Policy (NUTP), 2006

Created to motivate the building of people centric urban transport solutions instead of focusing on improving the conditions for private motor vehicles, promoting use of public transport, mixed land use and Priority to non-motorized transport are the main features of NUTP.

Mission 100% Electrification of Indian Railway

Railways has framed a well-designed policy – Mission 100% electrification – a game changer in Indian energy sector and there is tremendous opportunity for India to develop and successfully meet the aspirations of its citizens both for freight & passenger segment; without following the high-carbon pathway that other economies have pursued in the past.[25]

National Action Plan on Climate Change (NAPCC), 2008

The Government formulated the National Action Plan on Climate Change (2008) that provides for eight missions to help the country adapt to the effects of climate variability and change, and also the National Mission on Sustainable Habitat which is a component of the National Action Plan for Climate Change emphasizes on Better Urban Planning and Modal Shift to Public Transport in order to reduce GHG emissions from the transport sector.

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[24] Urban Transport Policies in India in context to Climate Change: An International Perspective. National Institute of Advanced Studies. (2015)

[25] Ministry of Indian Railways. Mission 100% Electrification: Moving towards Zero Net Carbon Emissions. February 2021

National Environment Policy (NEP), 2006

Formulation of a national strategy for urban transport to ensure adequate investment, public and private, in low pollution mass transport systems. In February 2021, the government announced an incentive-based vehicle scrappage program to be implemented in India soon. Implementation of this policy is expected to reduce the age of vehicles in the fleet and, therefore, reduce emissions.

National Green Aviation Policy

The National Green Aviation Policy emphasizes on the Government's approach and sets out a strategic framework to address the major environmental challenges of the aviation sector. Vision Statement is "To enable, promote and strengthen all inclusive, green and sustainable growth of air transportation in India." Mission Statement is "Provide safe and sustainable air travel to various parts of India and the world by minimizing the adverse environmental impacts of civil aviation activities."[26]

NEW SEGMENTS TO EXPLORE

A classic case of 'what goes up, must come down' is the climate conundrum. Only, our goals may not be achieved by emission reductions and simply removing carbon from the atmosphere, but we must also work on the complex interaction of global warming with the oceans and other carbon sinks, Human Development Indexes, and Food Security.

Drawdown is that point of time where the atmospheric concentration of greenhouse gases begins to decline on a year-to-year basis. Strategist Chad Frischmann and his team, through project Drawdown, work on just this. Paul Hawken's Drawdown project is no different.

So, what do these projects do differently, that can be applicable on our local businesses?

Out of the '100 solutions to reverse global warming by 2050', highlighted by Frischmann's team, 80 already exist today. These solutions are viable, scalable and financially feasible.

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[26] International Civil Aviation Organization. National Green Policy Presented by India. A40-WP/372 EX/151 15/8/19.

Figure 6. (GT refers to the Gigatons of carbon dioxide that is estimated to be reduced from the atmosphere through the application of these techniques over a 30 year period)

Notice that only 5 of the top twenty involve recommendations on power, or electricity. This means, most peculiarly, that a plant-based diet can help reduce the same GTs of co2 as rooftop solar technology. That educating girls marks the same value points as conserving agriculture and afforestation combined. This works because the reinforcement mechanisms of systematic disenfranchisement within our economy inhibit us from adoption of cleaner fuels and practices. Land Use is also very important. Protecting forests and wetlands safeguards, expands and creates new carbon sinks that directly draw down carbon. By providing men and women the right to choose when, how and if to raise a family through reproductive health clinics and education, access to contraception and freedom devoid of persecution can reduce the estimated global population by nearly 2050. That reduced population means reduced demand for electricity, food, travel, buildings and all other resources.

RESEARCH PROBLEM

The Transport, Clothing, and Power sectors of India: The issues, challenges, and solutions in reducing their carbon footprint.

OBJECTIVES OF THE PAPER

Following are the objectives we aim to achieve:

- ➢ To analyse the quantum of carbon emissions from various industrial sectors i.e., clothing, power, and transport.
- ➢ To analyse the initiatives and policies taken by the government to reduce the carbon emission
- ➢ To recommend solutions and a way forward for reducing carbon emission in these industrial sectors.

METHODOLOGY USED

The methodology used to understand the research problem and achieve the objectives was conducting Secondary Research. It refers to synthesizing the data that already exists. For this paper, we collated information by reading news articles, journal reports, research papers and so on. Therefore, it was a mix of quantitative and qualitative research done in a descriptive manner.

The variables involved in the paper discuss about the carbon emissions in the industry and the environment health in general, the metric tons and percentages of emissions released by the industries and also lists the initiatives taken by the Indian government and international bodies. A few international case studies and citations have been done; however, the focus has been on India.

The industries selected for the paper are: The Transportation Industry, Clothing Industry, and Power Industry.

The reason of choosing the clothing industry is because its carbon footprint is massive. The world with ever increasing trends in clothing is moving swiftly day by day. Textile production is the world's second most polluting industry, currently contributing 1.2 billion tonnes of Greenhouse Gas Emissions (GHGS) annually which is more than all the international flights and shipping combined in the world. (Sumner,2019). Whereas the fashion industry in specific accounts for 10 per cent of global carbon emissions and they are to keep rising by 60%. India in particular is a massive contributor.

Another industry, Transportation, was chosen because it is the major emitter of poisonous gases such as Nitrogen Oxide. It accounts for one-fifth of global CO2 gas emissions which is huge. Globalisation and liberalisation, with the increasing pace of our lives in the 21st century has increased the number of vehicles on the road, ships in seas, and planes in air.

Lastly, the emissions by the Power Sector remain at all time high, which is dependent on burning of coal and natural gases. In India particularly, 49 per cent of total CO2 emissions come from the power sector.

DATA ANALYSIS

Clothing: According to the research done, it has been analysed that the Apparel Industry comes to be a significant holder of Carbon Footprint, where the production process tends to be the largest holder, followed by yarn and fabric production with garment assembly and end-use of products coming later. This along with the increased use of non-biodegradable fibres has made the task even harder. The production of raw materials such as Cotton require a great source of water and energy, therefore the cultivation is unsustainable. This in particular is of concern to India as the country is the second largest producer of cotton in the world. Also, India exports in a significant portion internationally, which makes them responsible to manage the manufacturing process of garments.

Meanwhile Fast Fashion is on high tides, with its probability to increase by 60% in the near future. Brands like H&M and Zara have been the major contributors in the clothing industry, stocking about 4.3 billion dollars of inventory.

Power: Through the secondary research and evaluation of data, it has been found that the coal-fired power plants contribute majorly to the carbon emissions in the electricity sector. Both government and private owned companies contribute to these emissions therefore required steps must be taken by both to reach the desired SDGs. Inefficiency in policies, old technology in power plants, insufficient research on newer technology and incoherent policies on carbon trading prove to be a challenge in achieving the targets. Major companies like TATA and NTPC LIMITED which are involved in both generation and transmission of electricity find it hard to shift to other sources due to lack of economic opportunities and increased demand.

Transport: One of the Research Study says that since 2010, the growing demand for internal combustion engine (ICE) vehicles has more than doubled the sector's energy consumption and related emissions. Further growth in transport emissions will also exacerbate air pollution and mortality, placing an increasing strain on an already overburdened public health system, as well as increasing traffic congestion.

India is already taking action by requiring municipalities to comply with TOD standards to be eligible for national support in developing metro lines. Such urban planning has high co-benefits such as reduced congestion and travel time, lowered traffic-related injuries and deaths, noise and air pollution reduction, and improved mobility and accessibility.

RECOMMENDATIONS FOR EACH SECTOR

Clothing Industry

- **Recycling in the textile industry** is a must. "This removes approximately 2.5 billion lb postconsumer waste from landfill"[27]. For e.g. reuse of 1 ton of cotton fiber needs only 2.6% of the energy required for the virgin material.

- Alleviation of Carbon footprint by re-encouraging and **re-enforcing use of alternate projects**, such as solar and wind energy (renewable energies) often referred to as **Carbon Offsetting** for the manufacture of fiber and fabrics, especially Cotton for India, considering they utilize huge amounts of water and energy.   Why? Carbon offsetting has been successful in the case of EU and China Emission Trading Systems (ETS) and has helped in reducing emissions. Between 2005 and 2019, there was 35 percent reduction in emissions in installations covered by this ETS.

- The industry must adopt more energy efficient processes that contribute to eco-efficient production for mills. Such as the **"air dyeing"** technology that needs only 1/4th of water

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[27] Sohel Rana et al. Carbon Footprint of Textile and Clothing Products. 2015

which reduces hydro and energy usage, and optimising **"Digital Printing"** that reduces fabric and ink waste and hence greatly reduces carbon footprint. Why? Air-Dye technology can save up to 95% water, 86.5% of energy, and 84.5% of GHG[28]. In the making of only one garment, around 45 gallons of water can be saved.

- Businesses must invest in technologies and the manufacturing units to replace organic fibers with **conventionally grown fibers** as they use less energy and support organic farming. These could include wool, linen, hemp and so on. Companies such as Nike, Marks & Spencer, Timberland, and Wal-Mart that currently provide organic goods, are leading the way in the organic market.

- Upholding and encouraging **sustainable consumer behaviour:** It is the Corporate Social Responsibility of the companies to inform people how they use products costs the environment. "Households currently throw out **1.17** million tonnes of textiles each year, most of it clothing, which could be recycled or reused.[29]"

- Utilisation of Dyeing processes like **Cold Pad Batch (CPB) and Thermosol** in the dyeing process as they consume less water. The energy consumption is the lowest with elimination of salt addition. Less number of wash chamber can be used to improve the process.

- Not only this but, customers should be encouraged to use **the garments to their maximum potential so as to increase their longevity** and abstain from clothes more than often. Example T-shirts can be used as wipes and polishing clothes.

Power Industry

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[28] Dyeing without Water. Dyeing and Processing. 2013.

[29] Text

valuechain. 2013

- By the **middle of the 21st century, 90 percent** of electricity should come from non-fossil fuel sources. The present trajectory of 70 percent renewable energy under business as usual is 20 percentage points higher than this aim. This can be achieved through adoption of newer technologies and methods:
  - ❖ Invest in **Biomass co-firing**- Biomass co-firing is the process of combustion of biomass and fossil fuel together at thermal power plants**. UK has become a pioneer** in adopting biomass co-firing which has helped reduce the country's carbon emissions. **NTPC Dadri** is the first to adopt this method in India. More initiatives and research must go into biomass co-firing for better results with miniscule investments.[30]
  - ❖ Invest in super-critical and ultra-critical power plants**:** Making the switch to **supercritical and ultra critical power plants** will significantly reduce emissions and, consequently, the carbon footprint. The efficiency of subcritical power plants is 32%, but supercritical and ultracritical power plants use less coal per megawatt and have higher efficiency. Replacing a sub-critical unit by an ultra-critical unit can help in reducing carbon emissions by 30%. [31]

- Strive for the **planned shutdown of coal-fired power facilities** and invest significantly in transmission and distribution infrastructure, demand response, and a doubling of storage capacity from BAU projections (450 GW by 2050). Through these initiatives, India's electricity infrastructure will be made more adaptable and prepared for a future driven by renewable energy.

- **Set up a better carbon-trading system for power sector:** Carbon trading is the process of purchasing and selling carbon credits in order to lower one's carbon footprint and achieve SDGs. It also helps these businesses upgrade their technologies. **Carbon TradeXchange** is a trading platform that provides services for "certification, project

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[30] Trivedi.V 2020, Reducing CO2 footprints of India's Coal-Based Power, *Centre for Science and Environment, New Delhi*

[31] Trivedi.V 2020, Reducing CO2 footprints of India's Coal-Based Power, *Centre for Science and Environment, New Delhi. p 14-16*

development and footprint"[32]. CTX has traded over 100 million tonnes of CO2 offsets and have also exchanged 61 million credits out of which 85% were found to be Verra VCS certified.

- **Voluntary Carbon Markets:** Setting up VCMs will significantly cut the carbon emissions produced by private enterprises. The considerable impact of VCM's have been seen in the UK. **The UK Financial Stability Board** took measures like disclosing carbon emissions and carbon costs through the Task Force on Climate-related Financial Disclosures (TCFD) in 2015. Though some important considerations must be made when establishing this policy in India:

❖ Improved implementation of Article 6 of the Paris Agreement with more modern and workable processes.

❖ Sound techniques need to be created for choosing offsets, guaranteeing the reliability of net zero financial instruments, and standardising due diligence to check on the success of nature-based projects.[33]

- **One-step Clearance method**- one of the main challenges in implementing any policy or technique in India is the cumbersome process of getting various clearances from different sectors. There needs to be a coherent and efficient way to get faster clearances for such projects as suggested by the CEA report 2020-21.

Transport Industry

- India to achieve the pledge of **Nationally Determined Contributions** under the Paris Agreement, to reduce emissions intensity of GDP by 33-35 per cent by 2030. In fact, it is just two per cent short of the 2030 target of 40 per cent of installed non-fossil fuel electricity capacity.
- The use of **sustainable biofuels**, not only of the first generation (vegetable oil, biodiesel, bio-alcohols and biogas from sugar plants, crops or animal fats etc.), but also of the second

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[32] Rosales. R.C et al. Voluntary Carbon Markets in ASEAN: Challenges and Opportunities for Scaling Up, *imperial college London,2021 p. 25-28*

[33] National Carbon Market Report 2020-21, Ministry of Power, India

(biofuels from biomass, non-food crops including wood) and third generations (biodegradable fuels from algae).[34]

- **Consumer information** (campaigns for eco-driving, use of public transport and modal transport etc.), Legal instruments (such as tax incentives for low carbon products and processes, taxation of CO2 intensive products and processes, etc.).

- An improved transport infrastructure together **with Intelligent Transport Systems (ITS)** to avoid traffic congestion and to foster the use of intermodal transport (road, rail and waterways). "Why? Typically, ITS can address traffic congestion, and thereby mitigate environmental externalities generated by road transport."[35]

- New data collection techniques and modelling exercises to **integrate larger sample sizes, cover a wide geography and give real-time insights.** The adoption and advancement of GPS, IoTs, Bluetooth, NFC and Wi-Fi, Smart Cards and Smartphone apps have become a disruptive form of data collection

- **Legal instruments** (such as tax incentives for low carbon products and processes, taxation of CO2 intensive products and processes, etc.).

  Reforms may also include mandatory emission norms for vehicles or a complete ban on certain kinds of vehicles. The short-term benefits are similar to road pricing schemes i.e., reduced congestion and faster average speeds, leading.[36]

Others

- Adopting **anti-harassment policies** in the workplace, increasing the number of women on interview panels and making wages more transparent is a way of tackling climate change. This makes workplaces more accommodative, more female employees will be inclined to contribute to labor full time. This means more aggregate annual income for households, and greater their ability to be able to support organically produced food, switch to greener alternatives of energy and the likes.

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[34] United Nations Economic Commission for Europe. Climate Change and Sustainable Transport. available at:https://unece.org/climate-change-and-sustainable-transport#

[35] United Nations Economic and Social Council for Asia and the Pacific' Development of Model Intelligent Transport Systems Deployment for the Asian Highway Network (December 2017).

[36] *Supra*

- Businesses can also **significantly promote food security.** Consider the example of lunch. In workplaces that do not offer lunch, often require employees to order in. If lunch were a commonplace commodity provided by the workplace, it could significantly reduce the carbon costs from food delivery, packaging, and food wastage. This would also incentivize workers to come to work, thus increasing the unit of work done and offsetting costs from the aforementioned lunches. A generally well-fed workplace is more productive, less prone to disease and malnutrition. The business at large could also tie up with food NGOs to deal with their extra food, and at the level of the company, this would utilize a lot of food that would've otherwise been wasted.

CONCLUSION

Businesses, if they must exist in the society, need to fulfill their social responsibility. The UN Intergovernmental Panel on Climate Change (IPCC) has made a remark that Climate Change would be irreversible by the year 2030 if urgent actions are not implemented. Thus, the Transport, Power and Clothing industries need to buckle up, as it is in our hands to protect and nurture the environment, forming a balanced ecosystem.

The solutions we present before you are not revolutionary to a fault. The recognition that the power sector in India must work in tandem with the people's need to provide an uninterrupted supply posits that any shift to a more efficient system must be brought about without interruptions to daily functioning. The implementation must occur in an organised manner for shutting of coal fired power plants. Here, organized must mean partnership between the public and the private sector. They may use new methods like carbon trading, cap and trade and investing in new scientific methods and research to reduce Carbon Emissions, in turn, positively influencing the foot print.

As a developing country, it is potent for us to balance out the aspirations of people and economic growth with environment and sustainability. In this context, our ability to break the data and leverage the massive amount of available data in a meaningful manner is of pivotal importance. It would enable us to design policies that are firmly grounded in data and which are likely to be highly efficient and impactful across the entire transport ecosystem in the country, paving the way for a paradigm shift in the future of mobility in India. Meanwhile the clothing industry also requires sufficient upgradation in terms of switching to organic production and limiting overuse plus exploitation of natural fibers used in designing garments. Additionally, the citizens of the society also must do their part in advocating, contributing, and promoting sustainable practices.

REFERENCES

Bloomberg, Asia Edition, *The Real Environmental Impact of the Fashion Industry*, By Rachael Dottle and Jackie Gu, February 23, 2022

https://www.bloomberg.com/graphics/2022-fashion-industry-environmental-impact/

Down to Earth, *Fashion industry may use quarter of world's carbon budget by 2050*, By Kiran Pandey, 18 July 2018

https://www.downtoearth.org.in/news/environment/fashion-industry-may-use-quarter-of-world-s-carbon-budget-by-2050-61183

International Labour Organisation, *Taking climate action: Measuring carbon emissions in the garment sector in Asia*, by Ms Elsa Dominis

https://www.ilo.org/legacy/english/intserv/working-papers/wp053/index.html#:~:text=The%202018%20study%20by%20Quantis,preparation%20(12%20per%20cent)

McKinsey & Company, *THE FASHION INDUSTRY CAN REDUCE EMISSIONS ACROSS THE ENTIRE VALUE CHAIN* by Anna Granskog, Libbi Lee, October 19, 2020

https://www.mckinsey.com/business-functions/sustainability/our-insights/sustainability-blog/the-fashion-industry-can-reduce-emissions-across-the-entire-value-chain

Textile school, *GARMENT PRODUCTION PROCESS: APPAREL MANUFACTURING PROCESS - COMMON STEPS*, Jan 24, 2022

https://www.textileschool.com/193/garment-production-process/

Textile value chain, *ROLE OF CARBON FOOTPRINT IN TEXTILE AND APPAREL INDUSTRY* by Rena Mehta; Chavi Goyal, Jun 4, 2013

https://textilevaluechain.in/in-depth-analysis/articles/textile-articles/role-of-carbon-footprint-in-textile-and-apparel-industry/

Earth.org, *FAST FASHION GIANT SHEIN PLEDGES $50M TO TACKLE TEXTILE WASTE* By Olivia Lai, June 9TH 2022

https://earth.org/fast-fashion-giant-shein-pledges-50m-to-tackle-textile-waste/

Our World Data, *Where Do CO2 Emissions From Transport Come From,* by Hannah Ritche, October 6,2020.

https://ourworldindata.org/co2-emissions-from-transport

United States Environmental Protection Agency, *Sources of GreenHouse Gas Emission,* 2019, IPCC (2014).

Climate Change 2014: Mitigation of Climate Change (PDF)

https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

Atmosphere Environment, *Emissions From India's Transport Sector: Statewise synthesis*, by Energy Research Group, Center for Ecological Sciences, Indian Institute of Science, Bangalore,

http://wgbis.ces.iisc.ernet.in/energy/paper/IISc_Emissions_from_Indias_Transport_sector/

Climate Action Tracker, *Decarbonising the Indian Transport Sector Pathways and Policies,* December 2020

https://climateactiontracker.org/documents/832/CAT_2020-12-09_Report_DecarbonisingIndianTransportSector_Dec2020.pdf

Research Square, *Emissions Inventory for Road Transport in India in 2020: Framework and Post Facto Policy Impact Assessment,* by Namita Singh, Trupti Mishra, Rangran Banerjee, Indian Institute of Science and Technology, April 2nd 2021.

https://assets.researchsquare.com/files/rs-297185/v1/6b5bbc3e-2930-4898-8845-35b1d4a44b72.pdf?c=1646463449

Explore, India's Challenges Over Carbon Footprint, Content on the challenges that India has been facing in managing its carbon footprint and CO2 emissions.

https://unacademy.com/content/railway-exam/study-material/general-awareness/indias-challenges-over-carbon-footprint/

https://pib.gov.in/Pressreleaseshare.aspx?PRID=1568750

https://www.business-humanrights.org/en/big-issues/un-guiding-principles-on-business-human-rights/

https://www.business-standard.com/article/news-ani/air-india-bags-award-for-contribution-to-reduce-carbon-emissions-115121200430_1.html