

# MODULE: 10

## GHG AND CARBON FOOTPRINT ACCOUNTING AND REPORTING



# CONTENTS

1

INTRODUCTION

2

GLOBAL SCENARIOS

3

INDIAN GHG SCENARIO

4

GHG ACCOUNTING AND REPORTING

5

RELEVANT PROTOCOLS AND STANDARDS

6

ESTIMATING GHG OR CARBON EMISSIONS

# CONTENTS

7

METHODS FOR DETERMINING GHG EMISSION

8

CARBON FOOTPRINTS

9

TYPES OF CARBON FOOTPRINTS

10

REPORTING GHG EMISSIONS

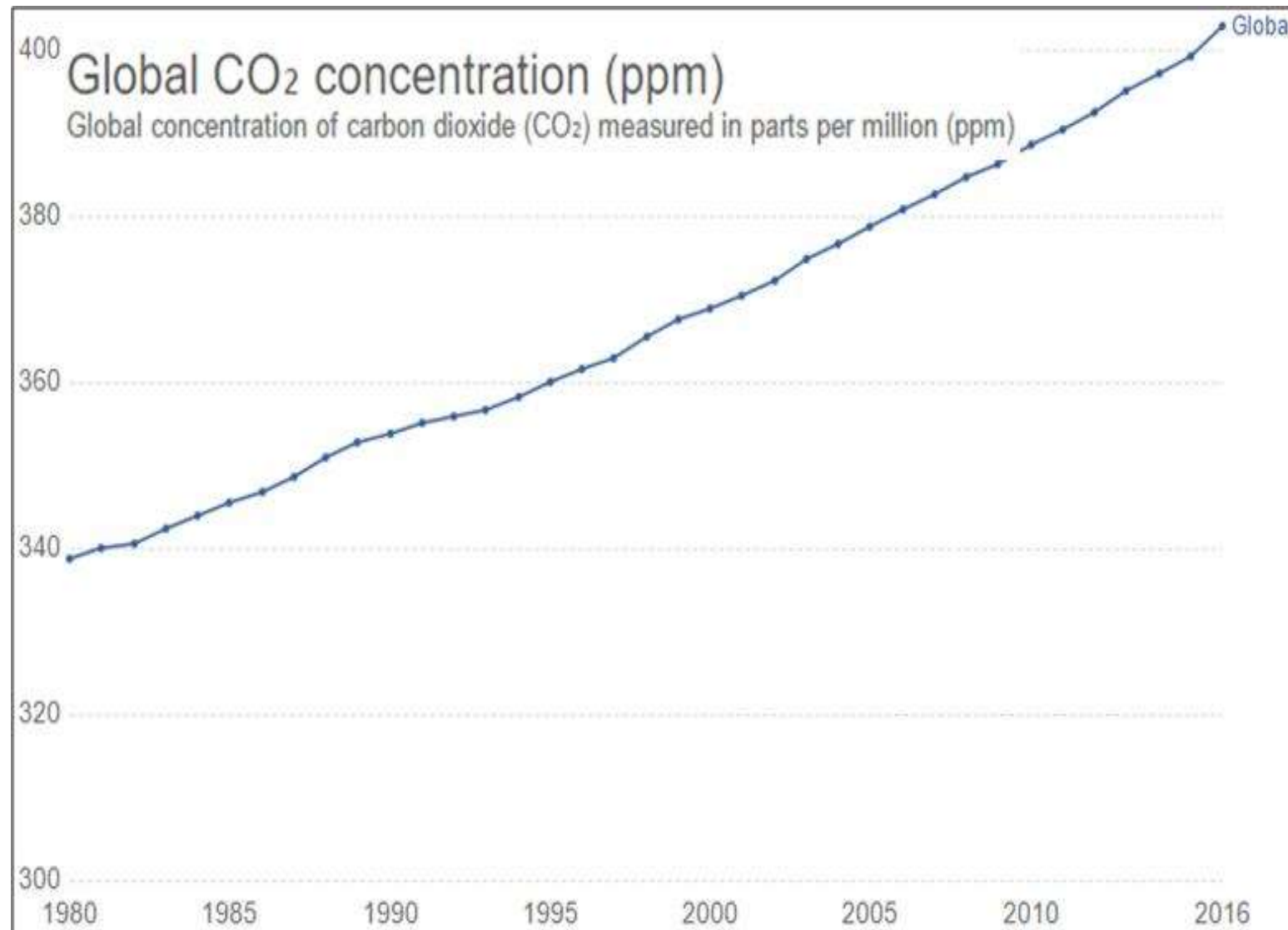


# INTRODUCTION TO GREENHOUSE GASES AND CARBON FOOT PRINT

# INTRODUCTION TO GREENHOUSE GASES AND CARBON FOOTPRINT

## 1

## Introduction



Global CO<sub>2</sub> Concentration Increase Since 1980

- The climate change is caused by a range of gases, known collectively as ‘greenhouse gases.’
- Six greenhouse gases (GHGs) contribute the most towards global warming and associated climatic change.
  - ✓ Carbon dioxide (CO<sub>2</sub>)
  - ✓ Methane (CH<sub>4</sub>)
  - ✓ Nitrous oxide (N<sub>2</sub>O)
  - ✓ Hydro-fluorocarbons (HFCs)
  - ✓ Per-fluorocarbons (PFCs)
  - ✓ Sulphur hexafluoride (SF<sub>6</sub>)
- Over the last few decades, temperatures have risen sharply at the global level at the rate of 0.17°C per decade.
- Figure shows trend in CO<sub>2</sub> levels in parts per million (ppm) over the last four decades.

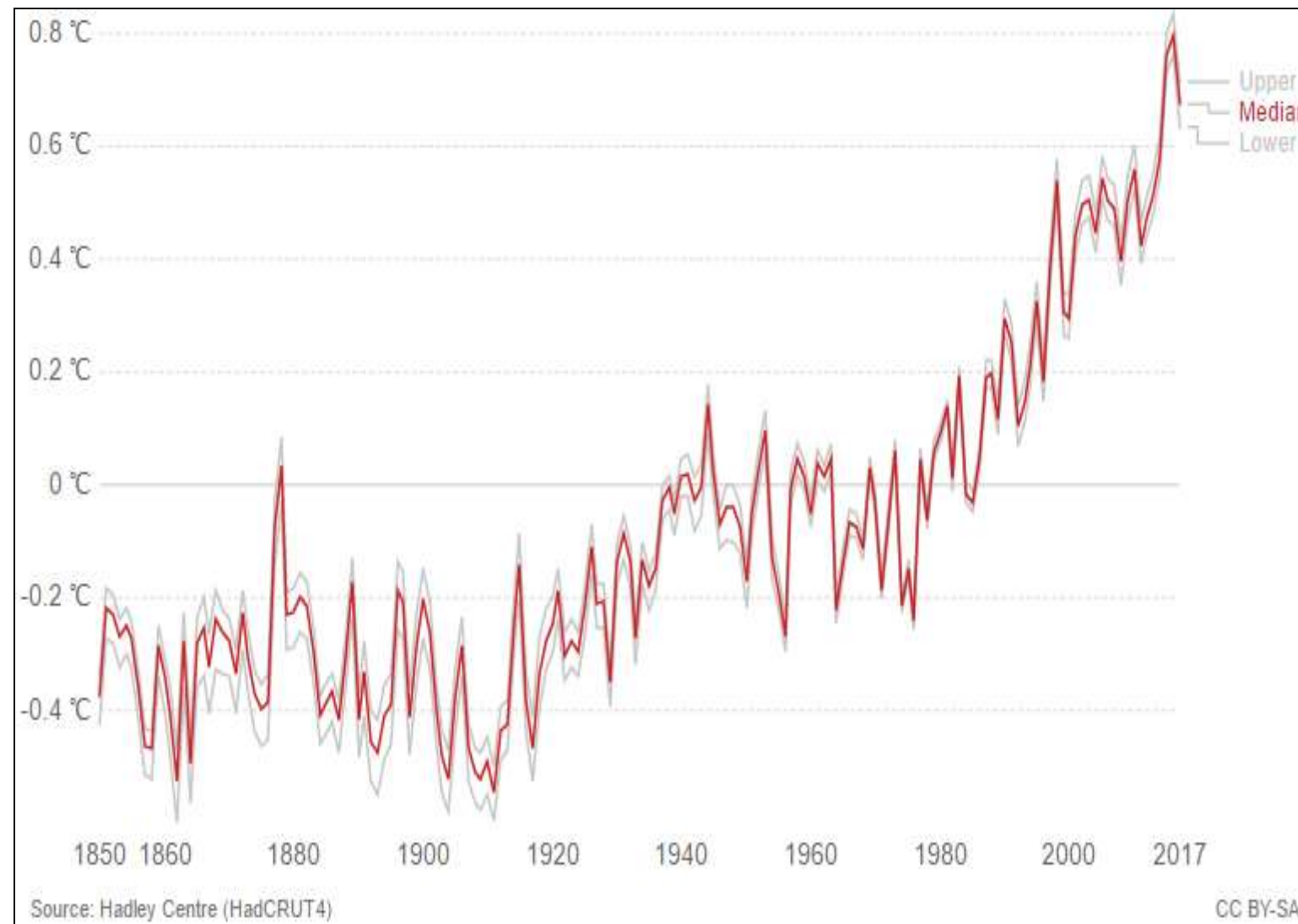


# INTRODUCTION TO GREENHOUSE GASES AND CARBON FOOT PRINT

## 1

## Introduction

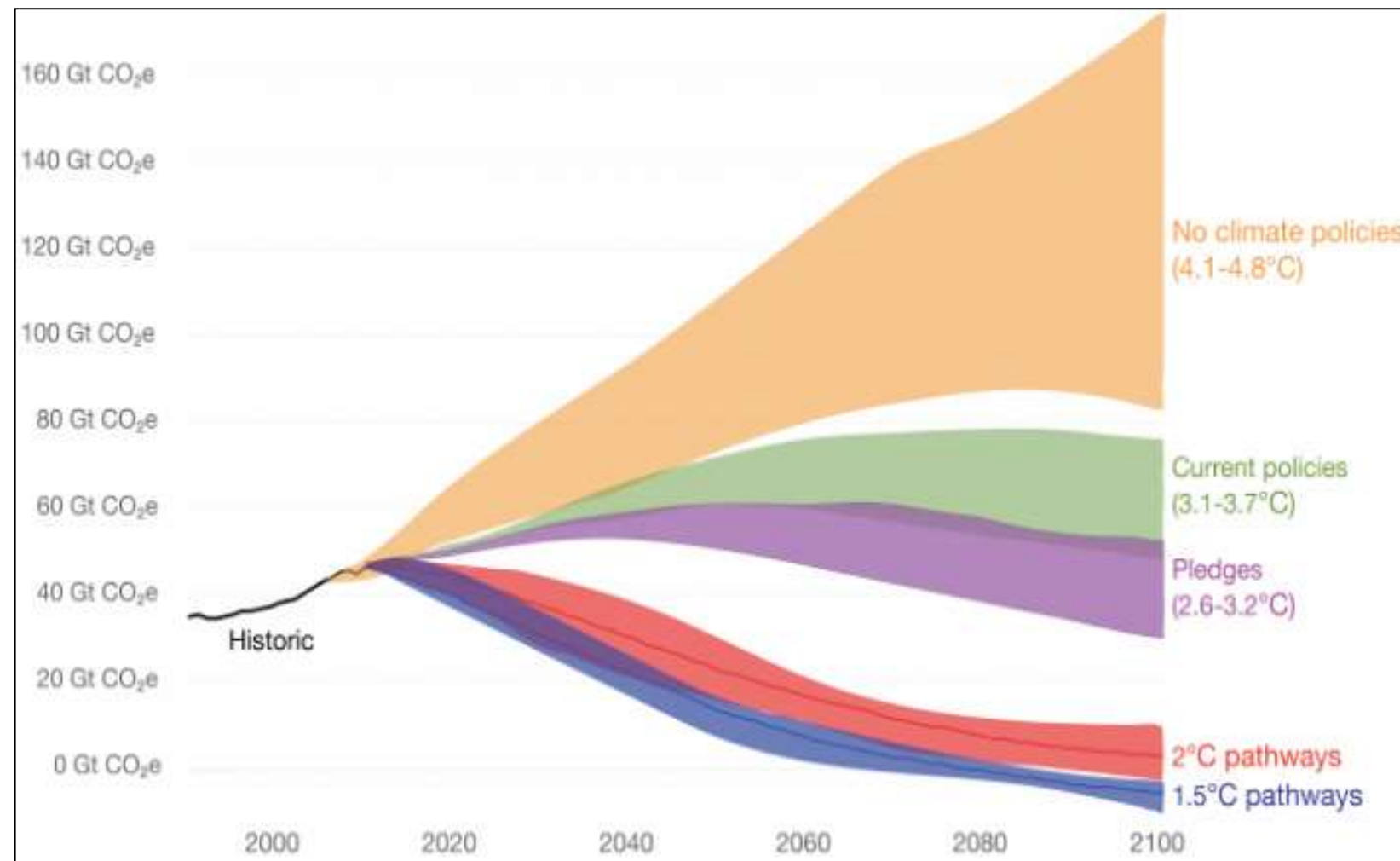
- Most common is carbon dioxide of these greenhouse gases.
- The term 'carbon footprint' is used to describe the amount of total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product.
- Simply a unit for all GHGs expressed as if they had the same climate change effects as CO<sub>2</sub>.
- At least 40 countries that emit above a certain amount of greenhouse gas emissions to account and report their GHG emissions on an annual basis.
- The focus of this chapter is on GHG and carbon footprint accounting and reporting for an organization i.e. organization carbon footprint.



Global Average Annual Temperature Trend



# GLOBAL GREENHOUSE GAS EMISSION SCENARIOS



Potential Future GHG Emission Pathways

- An increase of temperature beyond 2°C relative to pre-industrial levels is considered to be catastrophic.
- To mitigate the impacts of climate change, countries in the world entered into international climate agreement at the U.N. Framework Convention on Climate Change (UNFCCC) organized Conference of the Parties (COP 21) in Paris in December 2015 to limit the temperature rise to 1.5°C, and to achieve net zero emissions in the second half of this century.
- The Paris climate agreement set actions to keep warming limited to 1.5–2°C by the end of the century.
- 2°C and 1.5°C consistent pathways are shown in Figure.



- Temperature figures represent the estimated average global temperature from pre-industrial to 2100. The five scenarios are:
  - ✓ **No climate policies:** Projected future emissions if no climate policies were implemented; this would result in an estimated 4.1-4.8°C warming by 2100.
  - ✓ **Current climate policies:** projected warming of 3.1–3.7°C by 2100 based on current implemented climate policies.
  - ✓ **National pledges:** If all countries achieve their current targets/pledges set within the Paris climate agreement, it is estimated average warming by 2100 will be 2.6 - 3.2°C.
  - ✓ **2°C consistent:** There are a range of emissions pathways that would be compatible with limiting average warming to 2°C by 2100.
  - ✓ **1.5°C consistent:** There are a range of emissions pathways that would be compatible with limiting average warming to 1.5°C by 2100.

# INDIAN GHG SCENARIO

## 3

### India's GHG Scenario

- The total GHG emission is about 2.34 billion tonnes of CO<sub>2</sub>/year which is about 7% of global CO<sub>2</sub> emissions. Per-capita CO<sub>2</sub> emission is 1.84 tonnes (2016). BP Statistical Review of World Energy-2018 .
- India is facing challenges which include water availability, changing rainfall patterns, and disaster management.
- India has committed to reduce its GHG emissions by 33-35% by 2030 compared to 2005 levels as its as Intended Nationally Determined Contributions (INDC) commitments.
- Accordingly the following focus areas are set as part of its INDC communication.
  - ✓ To reduce the emissions intensity of its GDP by 33–35% of the 2005 levels by 2030.
  - ✓ To achieve about 40% cumulative electric power installed capacity through non-fossil fuel sources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).
  - ✓ To create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030.



# GHG ACCOUNTING AND REPORTING

## 4

### Accounting and Reporting

- GHG accounting concerns the consolidation of GHG emissions from operations in which a company holds an operational or financial control and linking the data to specific operations, sites, geographic locations, and business processes.
- Accounting for emissions can help identify the most effective reduction opportunities.
- GHG reporting, on the other hand, concerns the presentation of GHG data in appropriate formats to meet the needs of various reporting uses and users.
- Concerns over climatic change grow, NGOs, investors and other stakeholders are calling for greater corporate disclosure of GHG information.
- In response, companies are preparing stakeholder reports containing information on GHG emissions as a stand-alone report or as a part of broader sustainability reports.





# RELEVANT PROTOCOLS AND STANDARDS

## 5

### Protocols and Standards

- Two global approaches to organizational (sometimes called “corporate” or “entity-level”) greenhouse gas accountings are available:
  - ✓ The Greenhouse Gas Protocol (GHG Protocol) was developed by a consortium convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), and second revision is now available.
  - ✓ ISO 14064-1:2006 Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
- It specifies principles and requirements at the organization level for quantification and reporting of greenhouse gas (GHG) emissions and removals.



# ESTIMATING GHG OR CARBON EMISSIONS

- GHG emissions or carbon dioxide equivalent emissions refer to emissions of all GHGs stated in terms of tonnes of carbon dioxide equivalent (CO<sub>2</sub>eq).
- The carbon dioxide equivalent (CO<sub>2</sub>eq) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO<sub>2</sub>.
- CO<sub>2</sub>eq is calculated by multiplying the emissions of each of the greenhouse gases by its 100 year global warming potential (GWP).
- The equivalence is based on Global Warming Potential (GWP) of each GHG and CO<sub>2</sub> is considered as common denominator with an equivalence of 1 and other GHGs are expressed in CO<sub>2</sub>e using their respective GWP. For example methane (CH<sub>4</sub>) has GWP is 28. Hence 1 kg CH<sub>4</sub> emissions equal 28 kgCO<sub>2</sub>eq.

- The GWPs for different GHGs are presented in Table Below:

GHG	GHG Name	GWP (100 year time horizon)
CO <sub>2</sub>	Carbon Dioxide	1
CH <sub>4</sub>	Methane	28
N <sub>2</sub> O	Nitrous Oxide	265
HFC's	Hydro fluorocarbons	Up to 12400
PFC's	Per-fluorocarbons	Up to 11100
SF <sub>6</sub>	Sulfur hexafluoride	23500





# METHODS FOR DETERMINING GHG EMISSIONS

**The following methods can be used to estimate GHG emissions:**

- Measuring GHG emissions from identified sources and converting them to CO<sub>2</sub> equivalent using GWP.
- Measuring energy use and converting it to CO<sub>2</sub> equivalent using notified emission factors.
- Estimating GHG emissions from production using product emission factors.
- Estimating GHG emissions based on fuel consumed and its composition (ultimate analysis).
- Approaches for estimating GHG emissions from transport.
- Estimating GHG emissions from chemical reaction using material balance.



# CARBON FOOTPRINTS

- The total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product. .A carbon footprint considers all six of the Kyoto Protocol greenhouse gases.
- The related terms are carbon neutral and carbon offset.
  - ✓ A company becomes carbon neutral when its net greenhouse gas emissions become zero.
  - ✓ To become carbon neutral, company must calculate its emissions, reduce these emissions as much as possible, and purchase carbon credits equivalent to the remaining emissions which is called carbon offset.

### Benefits

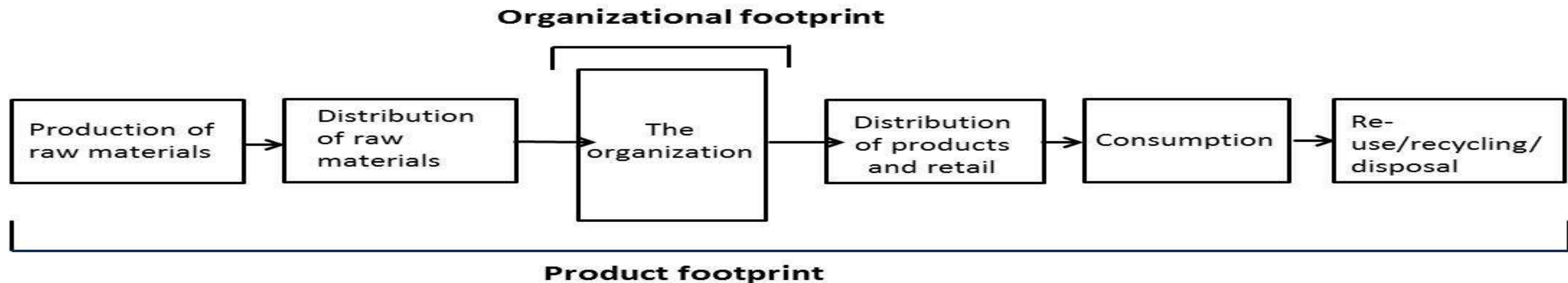
- Identify cost savings opportunities and Plan GHG emissions reductions.
- Determine what level of emissions they need to offset to become carbon neutral.
- Demonstrate environmental/corporate responsibility leadership.
- Meet customer demands for information on product carbon footprints.
- Differentiate and meet demands from ‘green’ consumers (for improving marketing).
- Help meet national INDC targets.



# CARBON FOOTPRINTS



- Broadly carbon footprint is assessed for organization as a whole (organizational carbon footprint) or for a product (product carbon footprint).
  - ✓ **Organizational carbon footprint:**
    - The GHG emissions from all the activities across the organization, including energy used in buildings, industrial processes and company vehicles. It measures both direct and indirect GHG emissions.
  - ✓ **Product carbon footprint:**
    - GHG emissions of the product over the whole life, from the extraction of raw materials, transportation to plant and manufacturing right through to its use and final re-use, recycling or disposal, or to the extent it controls the production, process based on boundaries it defines itself.



- Organizational Footprint: Categorizing emissions into three groups or ‘scopes’
- Activities covered under each scope:
  - **Scope 1:**  
Direct GHG emissions: Fuel combustion, Company vehicles, Process emissions, Fugitive emissions
  - **Scope 2:**  
Indirect GHG emissions: Purchased electricity, heat and steam
  - **Scope 3:**  
Other indirect emissions: Purchased goods and services, Upstream transportation and distribution, Employee commuting, Downstream transportation and distribution, Use of sold products, Fuel- and energy related activities



# REPORTING GHG EMISSIONS

## 10

### Reporting GHG Emissions

- A credible GHG emissions report presents relevant information that is complete, consistent, accurate and transparent be based on the best data available at the time of publication.
- The GHG Protocol Corporate Standard requires reporting a minimum of scope 1 and scope 2 emissions:
  - ✓ Required Information
  - ✓ Description Of The Company And Inventory Boundary
  - ✓ Information On Emissions
  - ✓ Optional Information
  - ✓ Information On Emissions And Performance

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