INDIA GHG PROGRAM

Promoting profitable, sustainable and competitive businesses.

Tracking Emissions over time and Calculating GHG emissions

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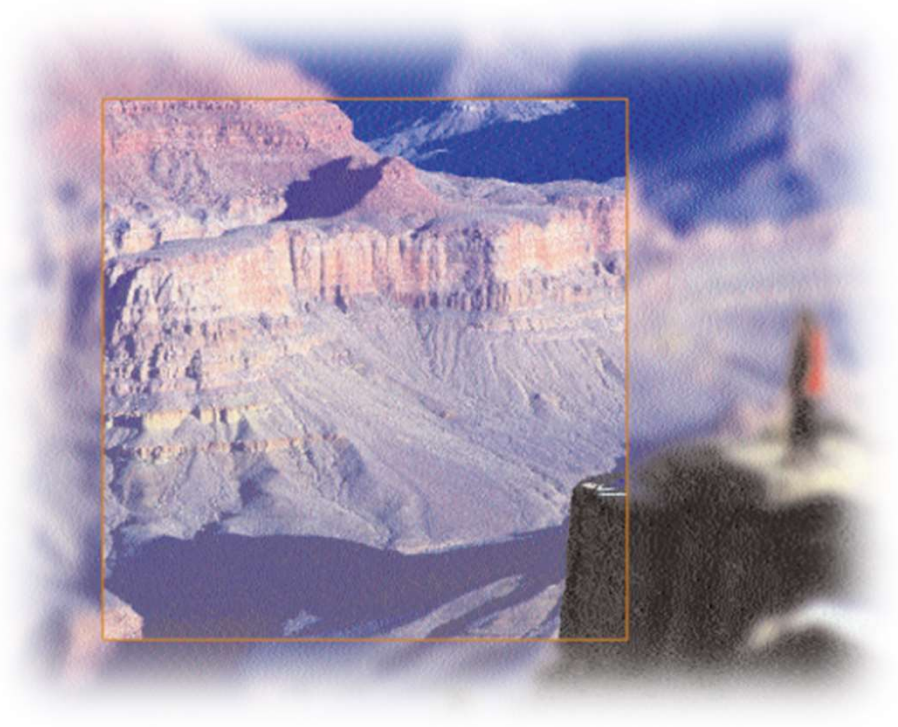


Tracking Emissions over Time

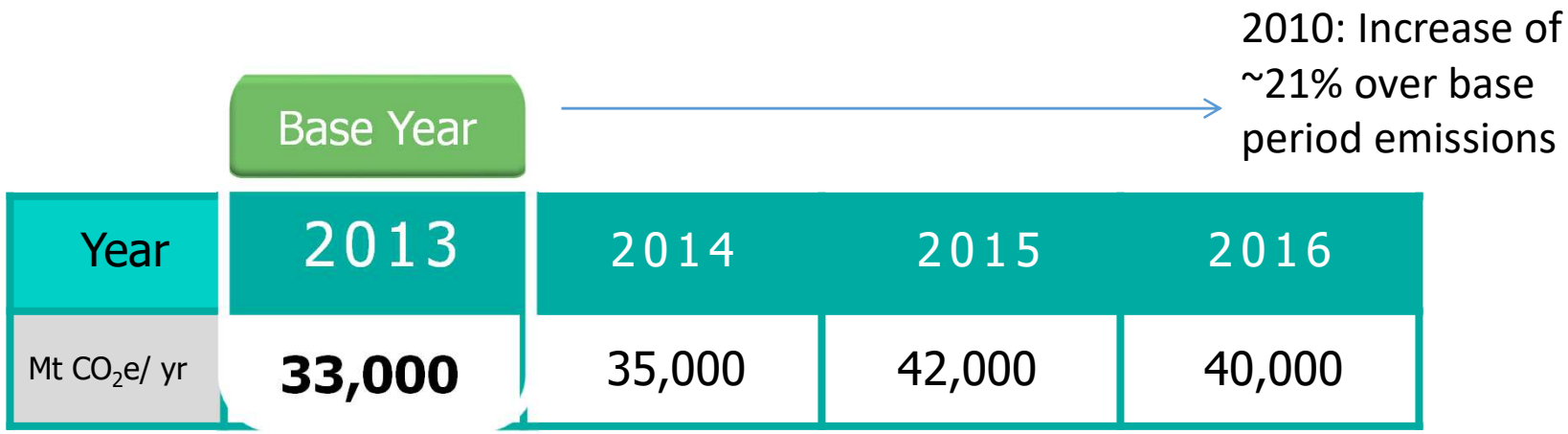
Base Year

- Base year = the period in history against which an organization's emissions are tracked over time

Advantages

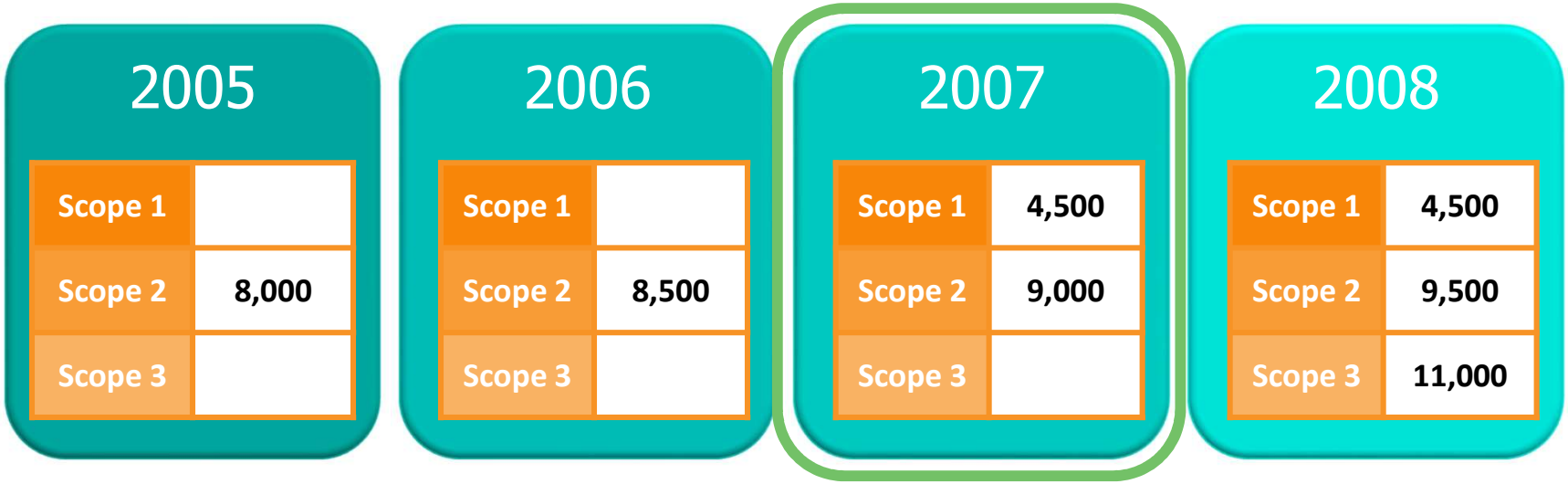
Track progress towards reduction targets

Put effects of inventory changes into context



Choosing a Base Year

- Select the earliest year as verifiable emission data for required scopes;



- Specify why you choose that particular year;
- If emissions fluctuate dramatically on annual basis, consider averaging over a series of consecutive years as your base year.

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Recalculating Base Year Emissions

- Retroactively calculating base year emissions to reflect company changes that could compromise consistency and relevance of emission data;

- Develop a base year emissions recalculation policy and apply it in a consistent manner;

- State the basis and context of any calculations.

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Recalculate for…

- Significant change in structure of organization;
  - ✓Merger, acquisitions and divestments;
  - ✓Outsourcing and Insourcing of emitting activities;

- Significant changes in calculation methodology;
  - ✓ Improved emission factors;
  - ✓ Improved activity data;

- Discovery of significant errors or small errors that are collectively significant.

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Significant Thresholds

- **Significance threshold**: a criterion used to determine whether a change is significant enough to warrant recalculation;
  - ✓ Take into account what's the cumulative effect on base year emissions of number of small acquisitions and divestments;

- The GHG Protocol does not specify a significance threshold;

- Each organization must define what significance threshold will trigger base year recalculations.

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Structural Changes

- **Structural change**: transfer of ownership or control of emitting activities from one company to another;

  - ✓Mergers, acquisitions and divestments;
  - ✓Outsourcing or In-sourcing of emitting activities;
    - ❖Don't re-calculate if out- or in-sourcing of emitting activities were previously included in a different scope;

- Structural changes happening in the middle of the year – base year emissions to be re-recalculated for entire year.

Recalculation for Structural Changes

If A acquires B

(assuming B existed in A's base year)

- A should include B's emissions in
  - ✓A's base year inventory and
  - ✓A's current year inventory

If A divests of B

(assuming B existed in A's base year)

- A should exclude B's emissions from
  - ✓A's base year inventory and
  - ✓A's current year inventory

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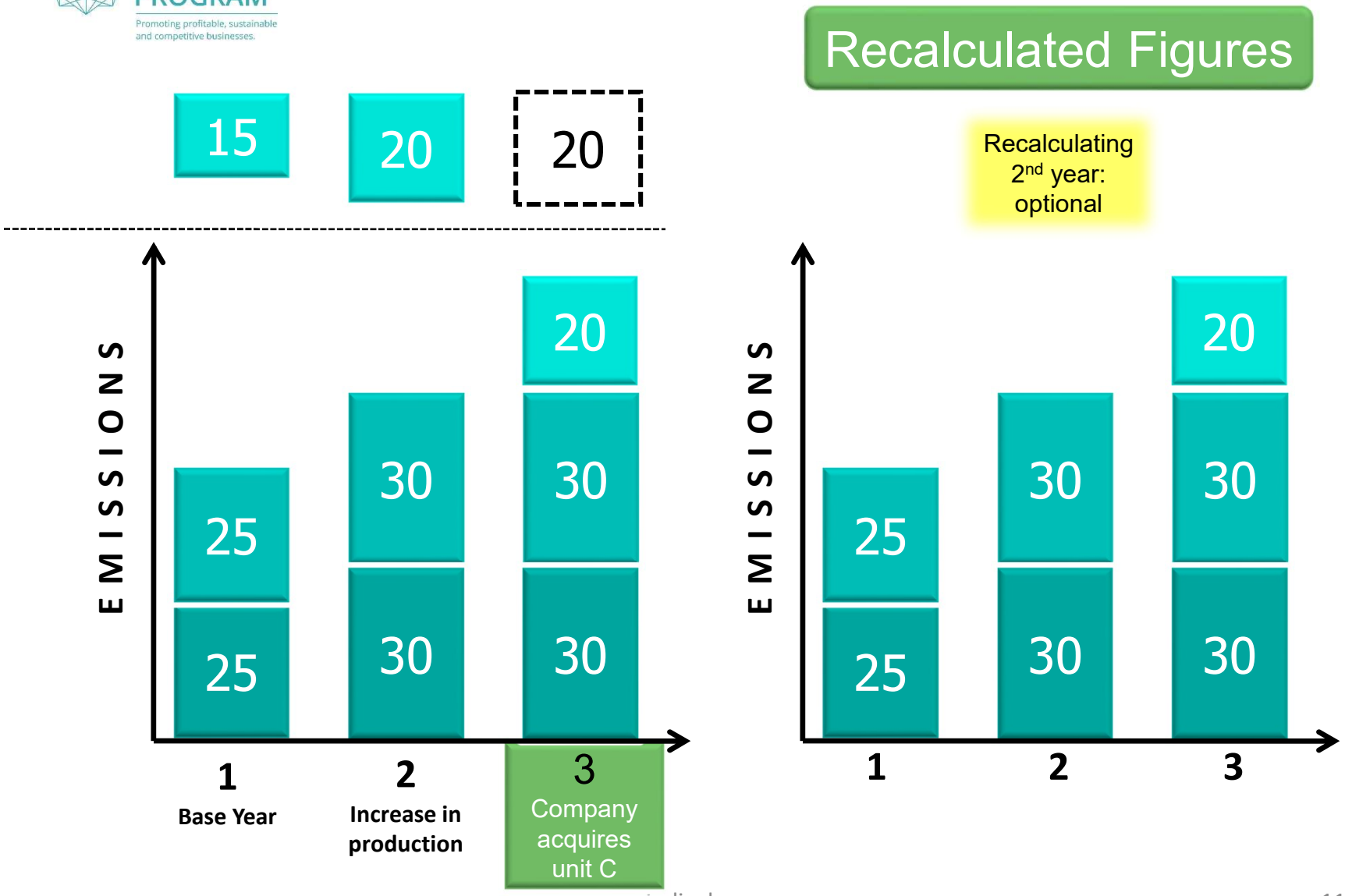
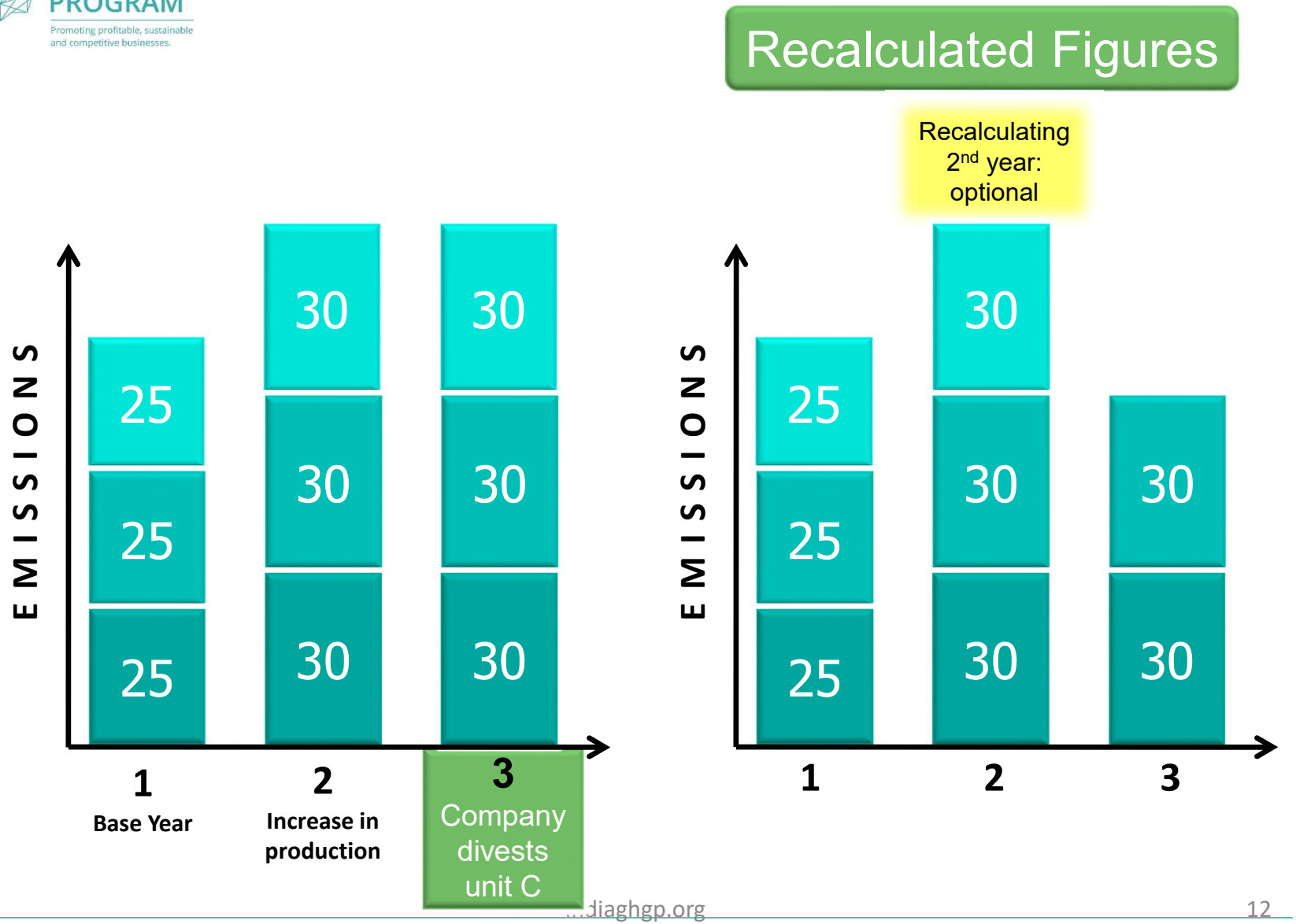
Changes not requiring Recalculation

- Changes involving facilities that did not exist in the base year;
- Out-sourcing/in-sourcing of activities previously reported under a different Scope;
- Organic growth or decline

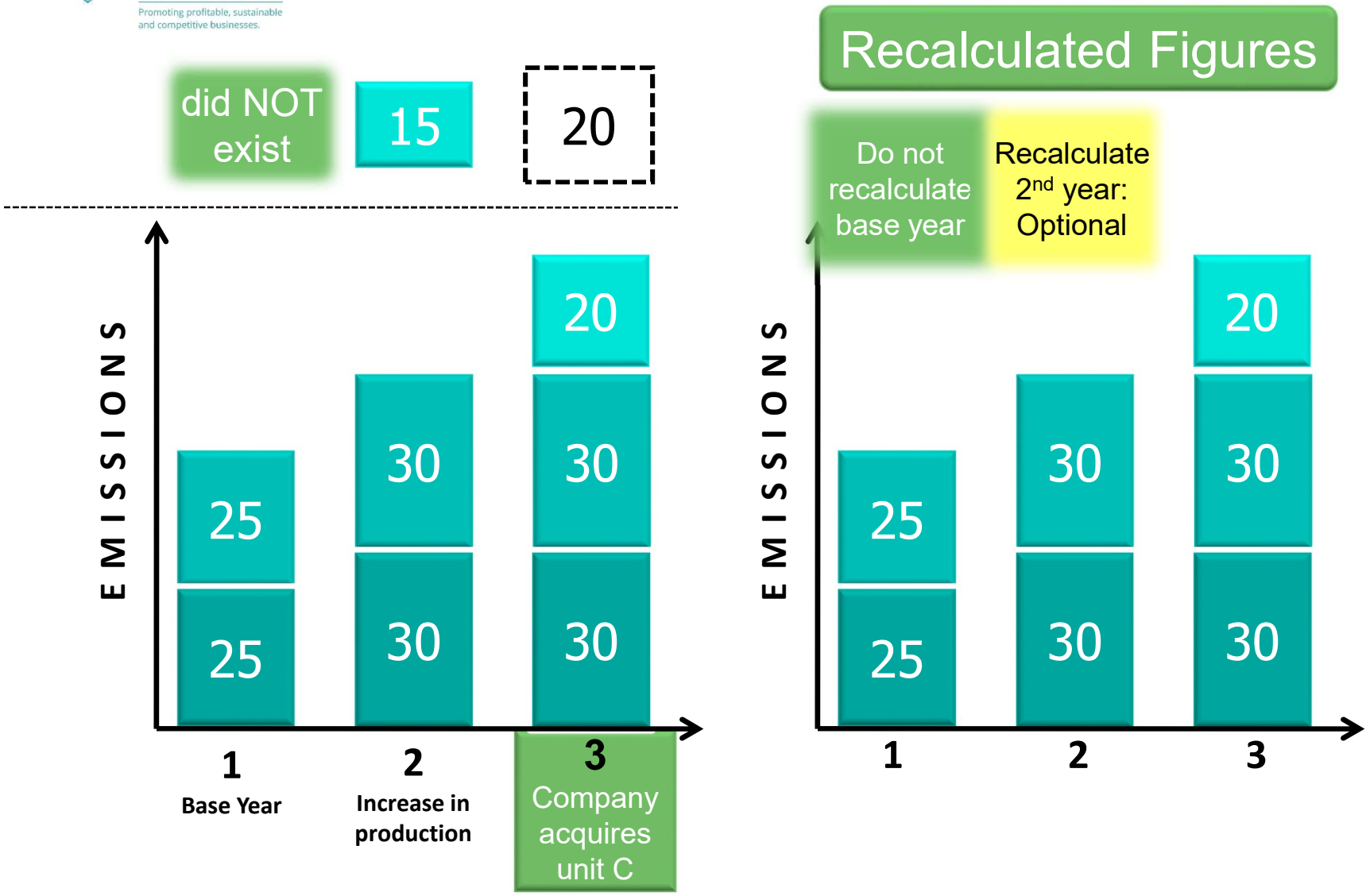
Recalculation: Acquisition



Recalculation: Divestment



Recalculation: Acquisition of facility not in Base Year



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Timing of Recalculation

- If structural changes occur in the middle of the year, recalculate for the entire year;

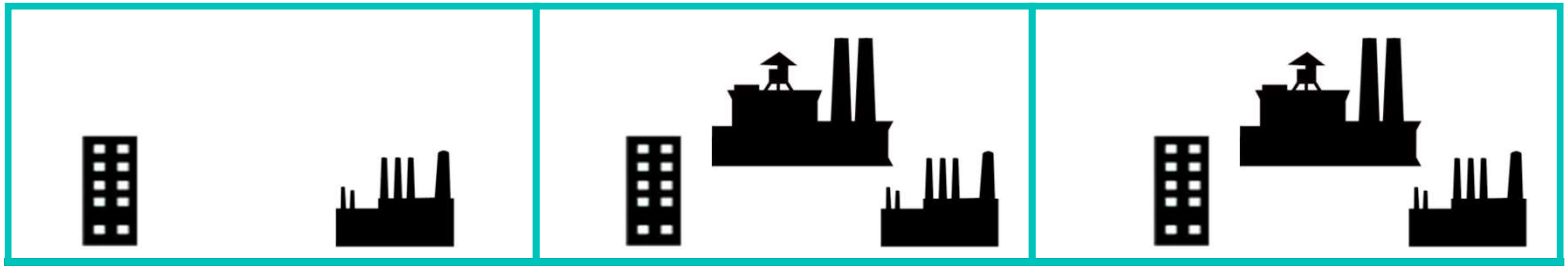
- This “all-year” option:
  - is less complicated;
  - gives the same result as calculating for the remainder of the year and making adjustments;
  - avoids recalculations for subsequent years.

Exempli Gratia

- The demand for Company A's products increases.
- It opens a new factory in year 2 to meet this demand.

No

(don't recalculate for organic growth)

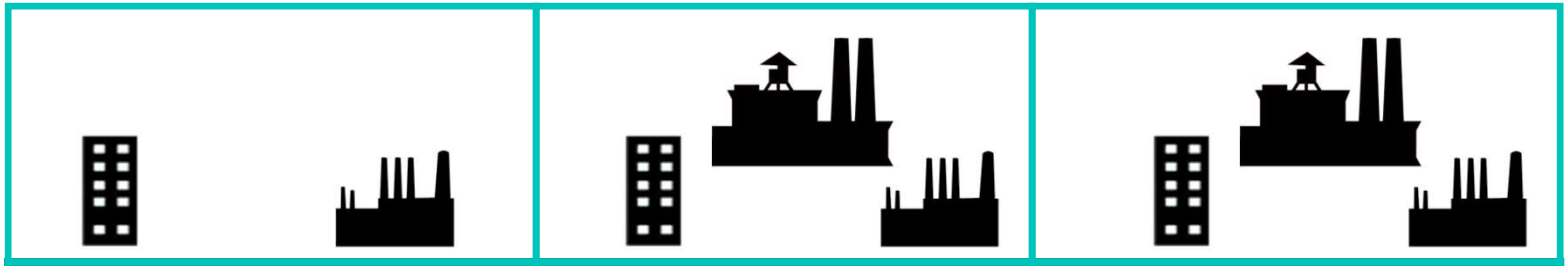


Base year	Year 2	Year 3
50,000	80,000	83,000

- It acquires an older factory from Company E in year 2 to meet this demand.

Should the base year emissions be recalculated?

Yes
(recalculate for acquisitions)



Base year	Year 2	Year 3
50,000	80,000	83,000

- Company sets a 5% significance threshold for errors
- Original emissions calculations:

Base year	Year 2	Year 3
325,000	300,000	330,000

- Later, an error was detected.
- Emissions were then correctly calculated:

Base year	Year 2	Year 3
90,000	80,000	85,000

Should the base year emissions be recalculated?

Yes

(errors met 5% significance threshold, triggering recalculation)

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Review

SITUATION	BASE YEAR RECALCULATION?
Company acquires another company	Yes if acquired company existed in base year of reporting company
Production of steam is out-sourced	No emissions move from Scope 1 to Scope 2
Company produces more and emissions increase	No
Company installs continuous emissions monitoring systems and collects more accurate data	Yes if more accurate data show changes that meet significance threshold

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Summary

- Base year: the year in history against which an organization's emissions are tracked over time
- Define your organization's recalculation policy
  - ✓Define significance threshold to trigger base year recalculation
- Recalculate for
  - ✓structural changes
  - ✓changes in calculation methodology
  - ✓discovery of significant errors
- Don't recalculate for
  - ✓organic growth or decline
  - ✓Changes involving facilities that didn't exist in base year
  - ✓Out-/in-sourcing of activities previously accounted for in different Scope

Identifying & Calculating Emissions

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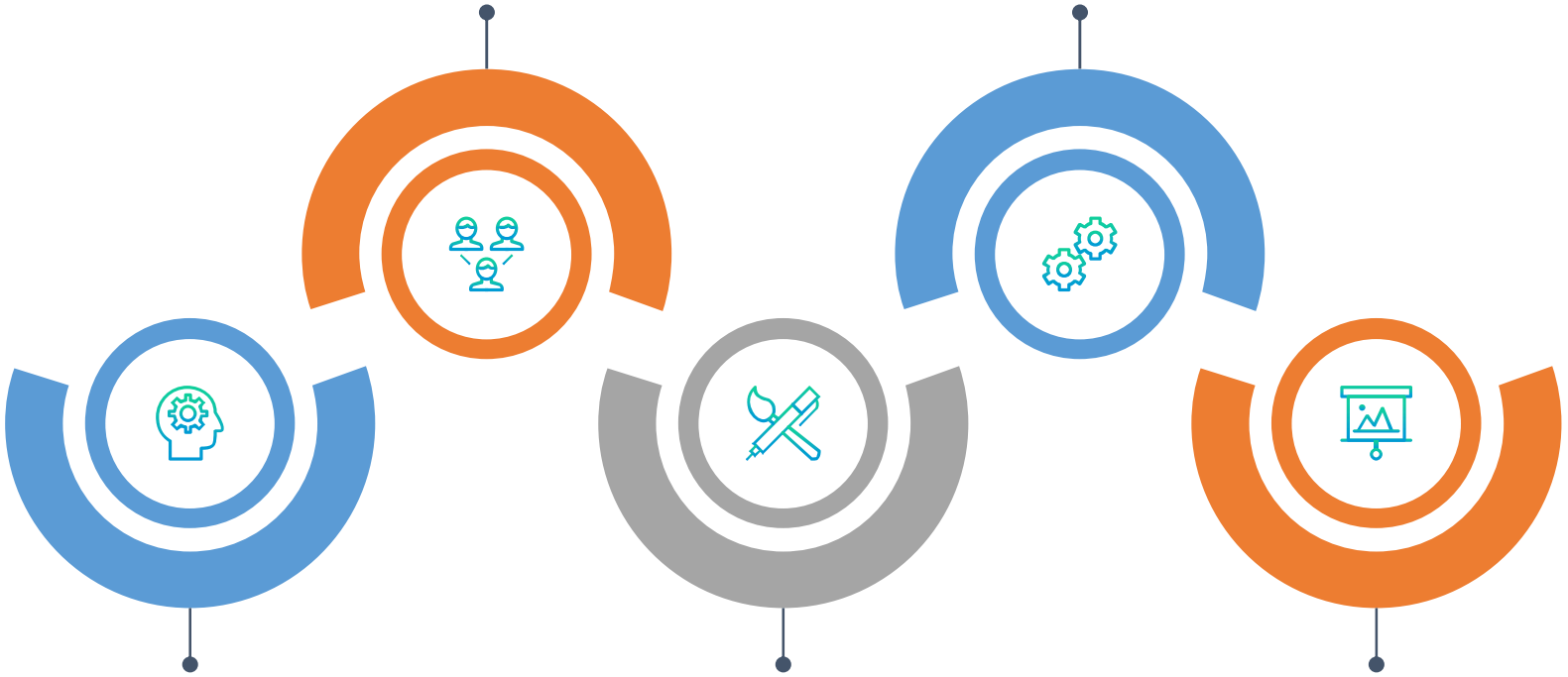
Key Steps



Identifying Emission Source Categories

- Stationary combustion: fuel burned in stationary sources
  - ✓ Ex: boilers and heaters
- Mobile combustion: fuel burned during transportation
  - ✓ Ex: cars, airplanes, ships
- Process emissions: from physical or chemical processes
  - ✓ Ex: cement calcination, aluminum smelting
- Fugitive emissions: intentional and unintentional releases
  - ✓ Ex: equipment leaks, cooling towers, CH_4 from natural gas pipelines, HFCs from air conditioning and refrigeration
- Consult Appendix D: Emissions by Industry Sector and Scope

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Identifying Emissions

Scope 1

- Process emissions usually in certain industry sectors
- Identify direct emission sources in 4 categories

Scope 2

- Almost all companies Purchased electricity

Scope 3

- Emissions along value chain;
- Upstream of downstream of owned operations

Calculation Approaches

- Direct Measurement: monitor GHG concentration and flow rate, such as with a filter on an exhaust pipe
  - ✓ E.g. Continuous Emissions Monitoring Systems (CEMS)
- Stoichiometric Calculation: measures which elements enters and leaves the system
  - ✓ E.g. Mass balance approach
- Estimate emissions: multiply activity data (e.g. fuel use records) by appropriate emission factors
  - ✓ Most common approach

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Estimating Emissions

- **Basic Equation**: AD × EF × GWP = Emissions (tCO_2e)
- Examples of activity data:
  - ✓ Electricity used (kWh);
  - ✓ Distance travelled (kms);
  - ✓ Diesel or Petrol used (Litres)

- Finding Activity Data: Most companies should consult these records:
  - ✓ Scope 1: Purchased records for fuel;
  - ✓ Scope 2: Metered electricity consumption records;
  - ✓ Scope 3: Activity data such as fuel use, passenger miles, etc.

Emission Factors

- Emission factors convert activity data to emission values;
- Published by National (Govt.) Agencies and Intergovernmental organizations;
- Use most recent value while maintain consistency;
- How is it actually derived?

Fuel	Carbon Content	Oxidation Factor	Net Calorific Value	Carbon Molecule Mass Ration	Fuel Density	= Emission Factor
L (or kg)	Kg/GJ	-	TJ/Gg	-	Kg/L	tCO_2/L
Diesel	20.2	1	43	44/12	0.845	2.691

- Make sure units match!!!

Global Warming Potential

- Higher GWP = more warming capacity
- Use to calculate carbon dioxide equivalent (CO2e)
- Source: IPCC Assessment Reports
  - ✓ Choose 2nd or 5th Assessment Report values;
  - ✓ Use of latest values is recommended.

GHG	GWP
CO_2	1
CH_4	21
N_2O	310
HFCs	140 - 11,700
PFCs	6,500 - 9,200
SF_6	23,900

Source: IPCC, 2006

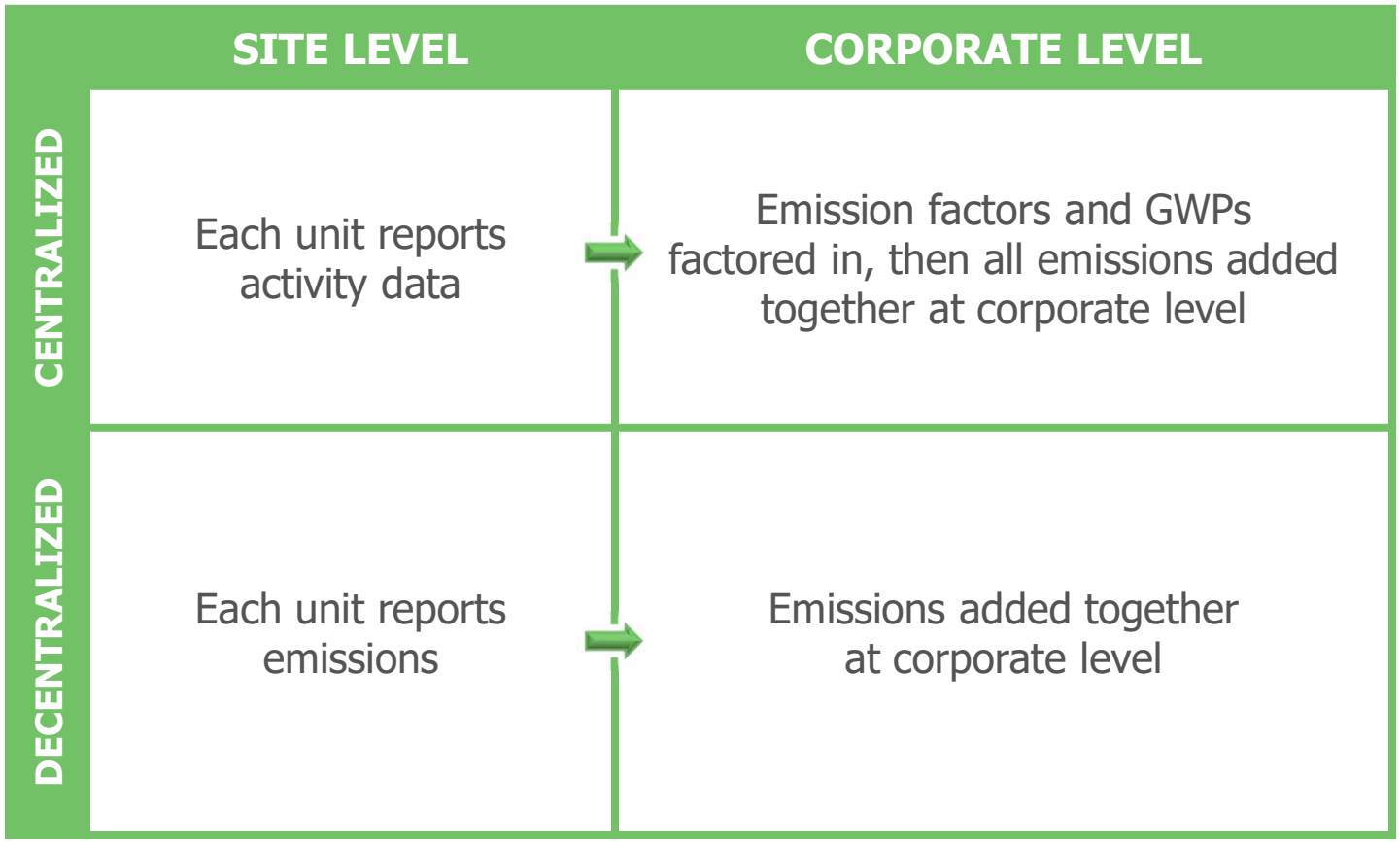
Apply Calculation Tools

- **Cross Sector Tools**: Can be applied to different sectors.
  - ✓ Stationary Combustion;
  - ✓ Mobile Combustion;
  - ✓ HFC use in refrigeration and Air Conditioning;
  - ✓ Measures and estimates uncertainty.
- **Sector specific Tools**: designed to calculate emissions in specific sectors such as aluminum, iron and steel, cement, oil and gas, pulp and paper, office based organizations.
- **India GHG Program**: provides India-specific tools with India specific emission factors for Transport, Power sector and Do-it-yourself GHG Accounting tool

Visit: http://indiaghgp.org/india-specific-tools

Roll-up data to Corporate level

2 APPROACHES



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Thank You

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