ADB Climate Finance Program and Methodology for Tracking Carbon Emission Reduction

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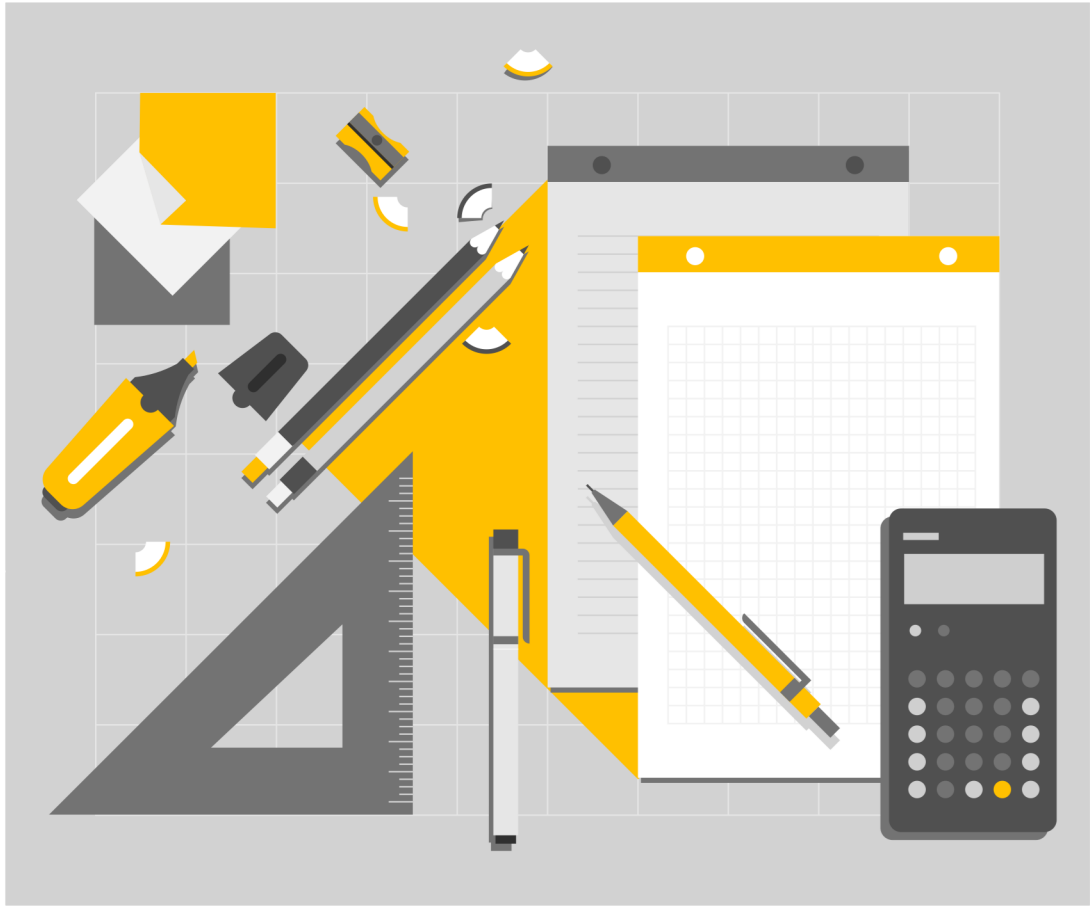
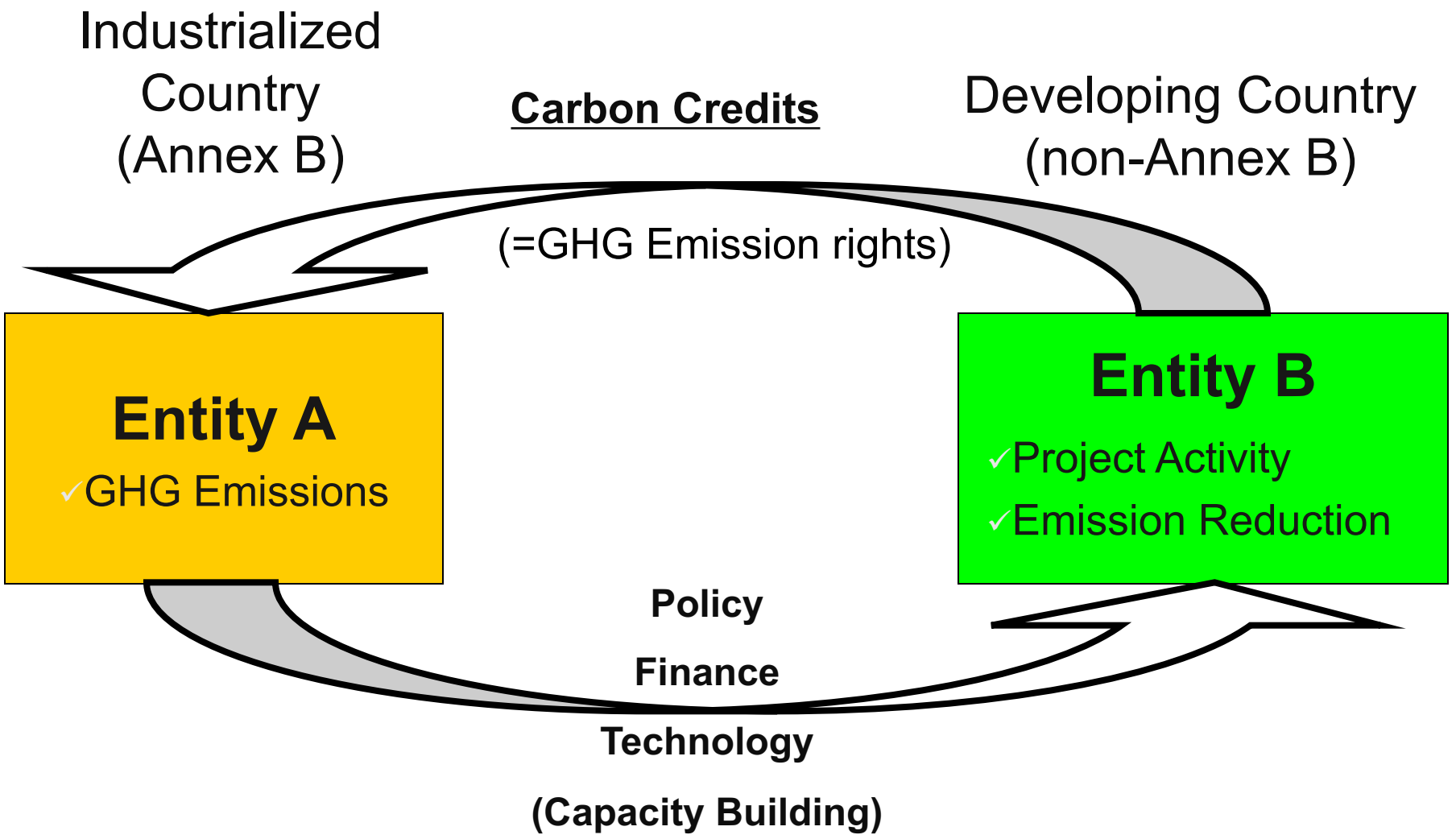
Deep Dive Workshop
On the Path to Carbon Neutrality by Mid-century:
Sharing Korea's Experience
Asia Clean Energy Forum

Climate Finance Program of ADB

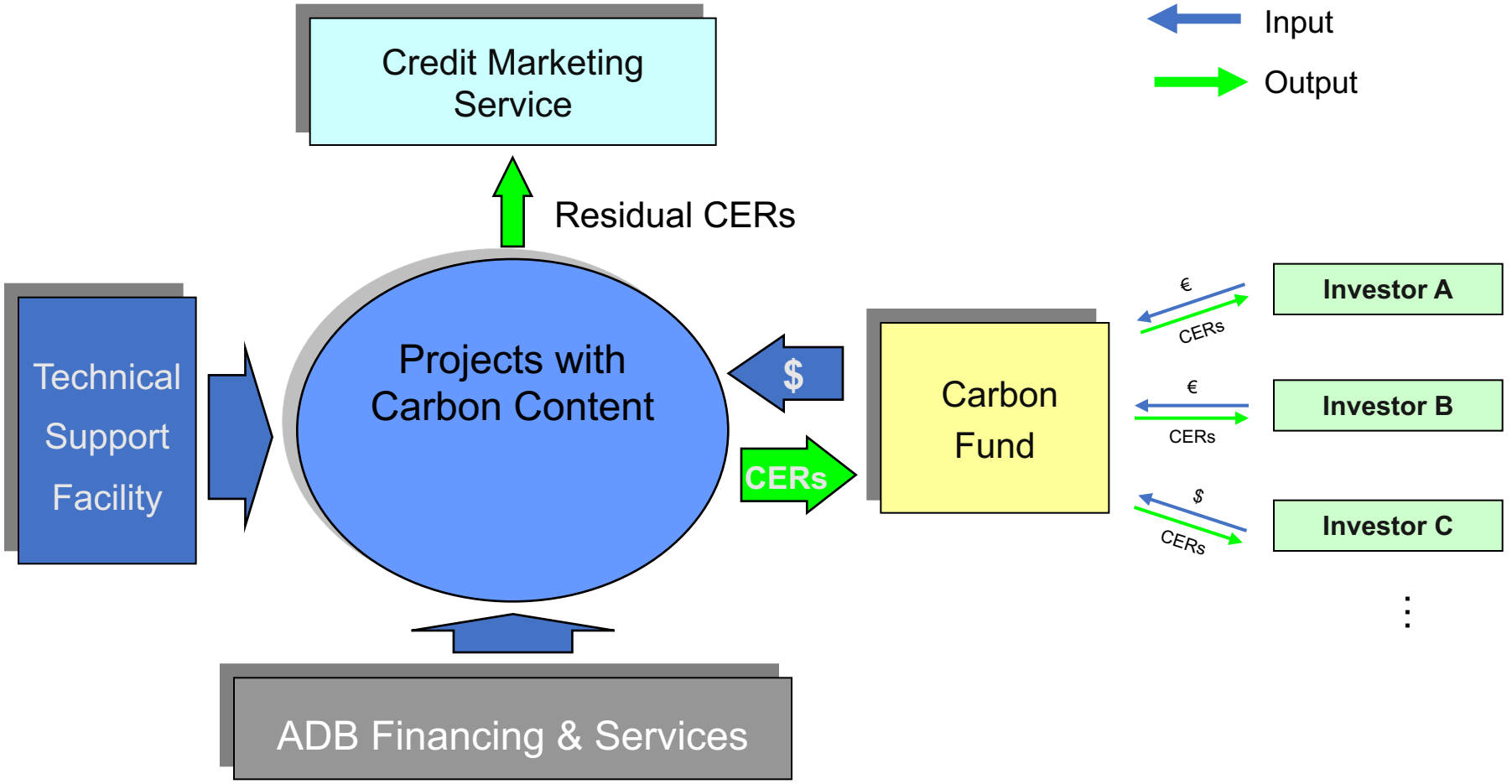
- Carbon Market Program (upto 2015)
  - Asia Pacific Carbon Fund
  - Future Carbon Fund
  - Technical Support Facility



CDM Concept

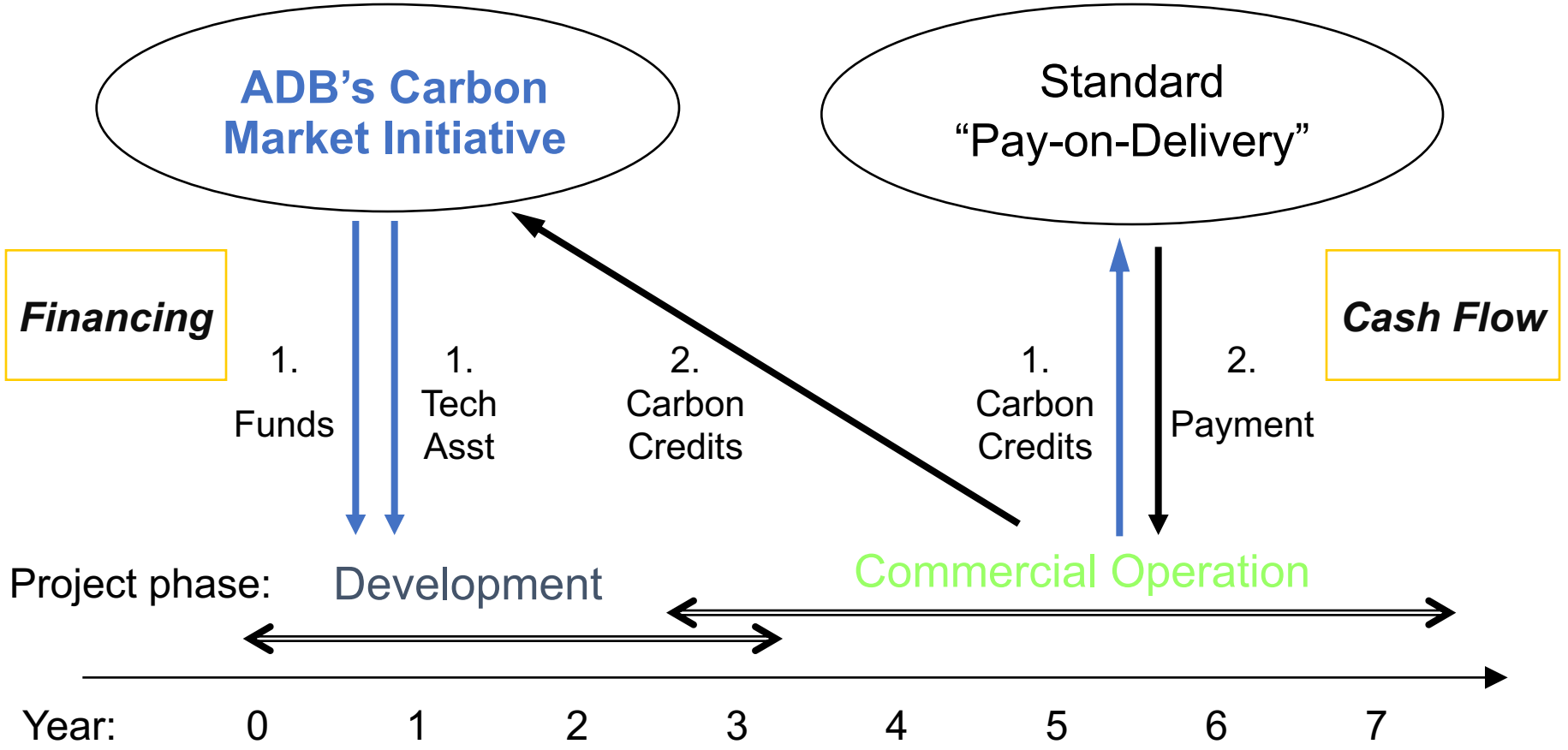

Industrialized Country (Annex B)
Carbon Credits
Developing Country (non-Annex B)
(=GHG Emission rights)
Entity A
✓GHG Emissions
Entity B
✓Project Activity
✓Emission Reduction
Policy
Finance
Technology
(Capacity Building)

Carbon Market Initiative: 3 Components



* CERs = Certified Emission Reductions

Carbon Market Initiative
Turning Cash Flow into Financing



Changing Energy Profile of Asia and Energy Lending of ADB

(1960s, 70s, 80s and 90s)
Energy Security, Energy Access, Energy Infrastructure

Energy Security, Energy Access Energy Generation (Mostly through Fossil Fuels) Energy Transmission

(2000 and 2010s)
Energy Efficiency and Some energy Access

Energy Efficiency Generation energy Efficient Transmission, DSM, Initial projects in Wind / Solar

(2020s 2030)
Low carbon Development, Paris Alignment

Renewable energy, Hydrogen, New Energy, Energy Storage, New generation biomass

Beyond 2030
Reaching 1.5 degree C, Glasgow Climate Pact

Renewable Electricity Generation, Energy Storage, Grid modernisation Next generation biomass

Emerging Scenario of Project Financing

- Fossil fuel-based projects financing will be almost exceptional
- Climate friendly projects financing would have been mainstreamed
- As the grid becomes cleaner, the CO2 saving will be increasingly low
- New energy technologies will be introduced at more rapid pace. Hydrogen, CCUS, Biofuels, offshore wind etc will be norm
- Cost of carbon is likely to be much more and hence, precise quantification will be more important
- As the economies develop, the lending will be more to private sector

New Generation (Post Kyoto) Tools of ADB

- Green Bonds (GB)
- Energy Transition Mechanism (ETM)
- Just Transition Support Program (JT)
- Innovative Finance Facility for Climate in Asia and Pacific (IF CAP)
- Climate adaptation financing….
- ……

Major Check Points for ADB Projects on Climate Change

Amount of Emission Reduction

(Whether it follows a reliable emission reduction calculation methodology – IFI TWG - List of methodologies | UNFCCC / Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects: Additional Guidance for Energy Projects

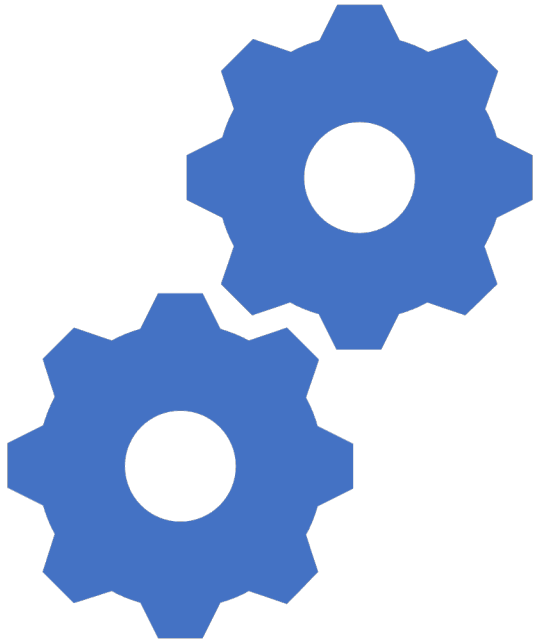
Allocation of climate Mitigation / Adaptation Finance (mdb_idfc_mitigation_common_principles_en.pdf)

Paris Agreement Alignment

cop26-mdb-paris-alignment-note-en.pdf (eib.org)

Data, knowledge, and Skills Needed to Compute Emissions

- Output and input
- Efficiency and losses
- Emission factor
- Processes (good to know the overview, knowing details is good but not necessary)

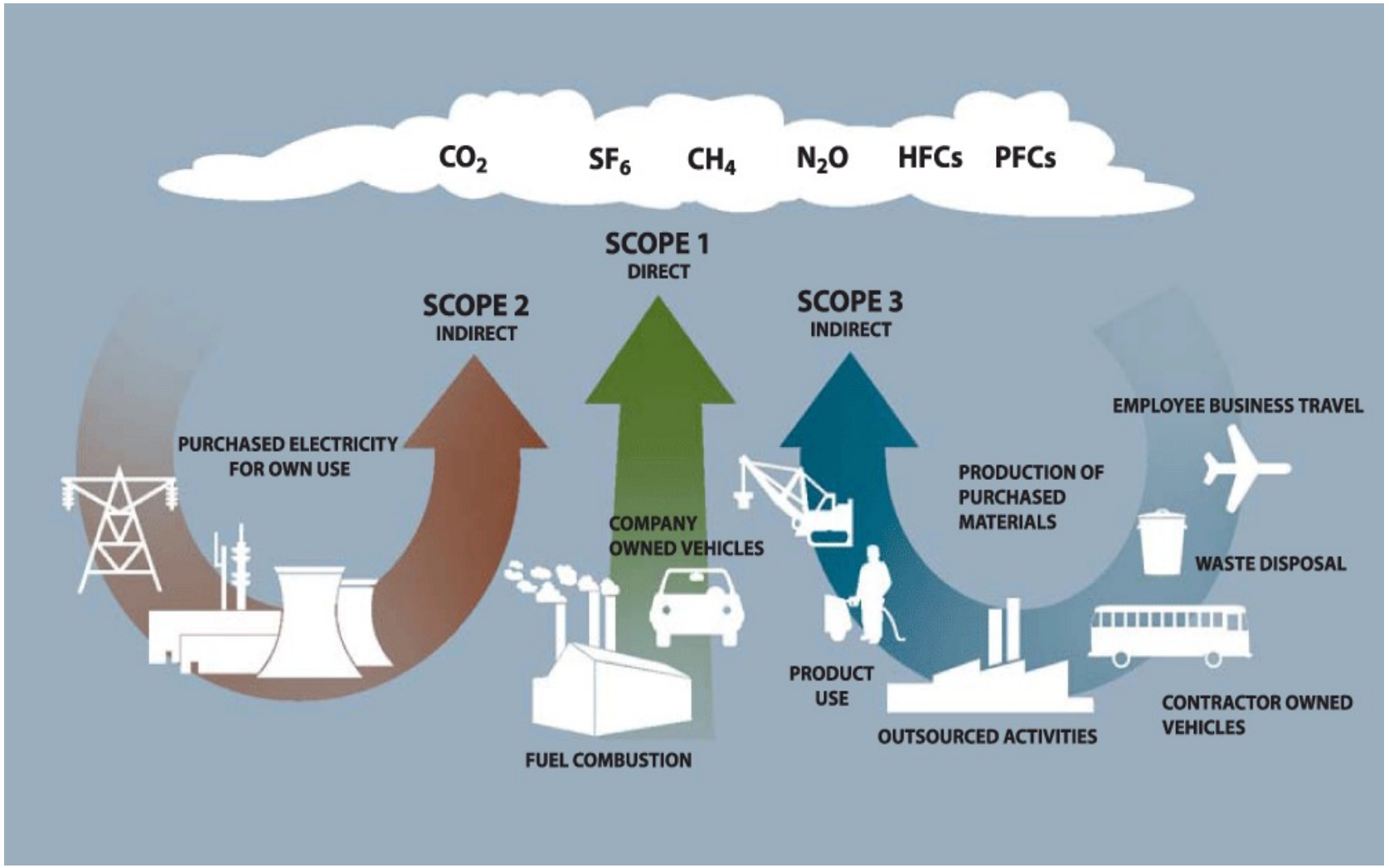


Global Warming Potential and Atmospheric Lifetime for Major Greenhouse Gases

Greenhouse gas	Chemical formula	Global Warming Potential, 100-year time horizon	Atmospheric Lifetime (years)
Carbon Dioxide	CO2	1	100*
Methane	CH4	25	12
Nitrous Oxide	N2O	265	121
Chlorofluorocarbon-12 (CFC-12)	CCl2F2	10,200	100
Hydrofluorocarbon-23 (HFC-23)	CHF3	12,400	222
Sulfur Hexafluoride	SF6	23,500	3,200
Nitrogen Trifluoride	NF3	16,100	500

IPCC Fifth Assessment Report https://www.ipcc.ch/report/ar5/syr/

Emission Categories- Examples



Opportunities of Emission Reduction in Electricity Generation

a. Reducing energy usage/wastages (energy efficiency and conservation)
b. Displacing GHG-intensive energy, processes or system with less intensive ones (RE-based electricity displacing fossil fuel-based electricity, biofuel displacing diesel, etc)
c. Combination of (a) and (b) (fuel switching from diesel to gas with efficiency improvement)
d. (d) End-of-pipe alternative (carbon capture & storage)
e. Avoiding high GWP gases like SF6, Chlorofluorocarbon….

First Equation of Emission Reduction Calculation

Emission Reduction = Baseline Emission – Project Emission - Leakage

<u>Approaches in Defining Baseline</u>

a. Performance based approach
b. Business As Usual approach
c. Best Available Technology

MDB List of harmonized GHG accounting standards

References	Title	Sector	Date of adoption
AHSA-001	IFI Approach to GHG Accounting for Renewable Energy Projects Reference to AHG-001	Renewable Energy and Energy Efficiency	July 2019
AHSA-002	IFI Approach to GHG Accounting for Energy Efficiency Projects Reference to AHG-001	Supply/Demand Side Energy Efficiency	January 2023
AHSA-003	IFI Joint approach to GHG assessment in the Transport Sector	Transport	November 2015
AHSA-004	Default Energy Intensity Factors for Water Supply Systems	Energy Efficiency in Water Supply	October 2020
AHG-001	Methodological Approach for the Common Default Grid Emission Factor Dataset Harmonized IFI Default Grid Factors 2021 v3.2	Cross-cutting	April 2022
AHG-002	Methodology/approach to account project emissions associated with grid electricity consumption	Cross-cutting	December 2020
AHG-003	Guideline for a Harmonised Approach to GHG Accounting	Cross-cutting	June 2021

Harmonized Grid Emission Factor V 3.2

	Combined Margin Grid Emission Factor, gCO2/kWh				Operating Margin Grid Emission Factor, gCO2/kWh (including for use in PCAF GHG accounting)
	Firm Energy (e.g., Hydro, Geothermal)	Intermittent Energy (e.g., Solar, Wind, Tidal)	Energy Efficiency	Electricity Consumption	
Country / Territory / Island					
Afghanistan	193	331	193	193	414
Albania	0	0	0	0	0
Algeria	397	479	397	397	528
American Samoa (U.S.)	516	664	516	516	753
Andorra	70	144	70	70	188
Angola	748	1203	748	748	1476

End-use EE project

Project: Streetlighting retrofit for energy efficiency (India)

New Energy Saving Streetlight Fitting(Project)			
Type	Power (W)	Number of pieces	Operating hours per year
FTL T5 28W	28	6,632	4,015
FTL T5 4x14W	56	3,337	4,015

Consumption = (28*6,632+56*3,337)*4015 /1,000,000= 1,495.86 MWh/yr
Technical losses = 20%
Electricity input to T&D = 1,495.86 /(1-0.2) = 1,869.83 MWh/yr
Grid emission factor = 0.92 tCO2/MWh
Project Emission = 1,869.83 MWh/yr * 0.92 tCO2/GWh = 1,720.24 tCO2/yr

Crypton Series For T5 Street Lights ...

NOTE: the light outputs in the baseline and the project are equal.

Suggested Baseline: Old streetlighting:

Old Streetlight Fitting (Baseline)			
Type	Power(W)	Number of pieces	Operating hours per year
FTL T12 40W	50	6632	4,015
SVL/MVL 150	175	3337	4,015

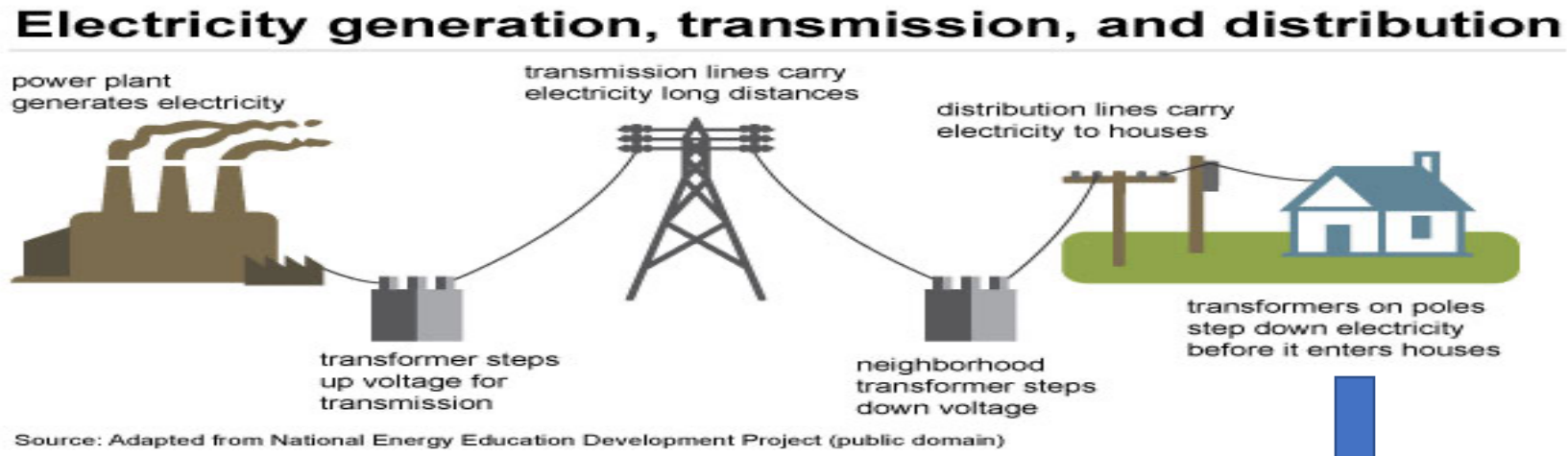
Consumption = (50*6,632+175*3,337)*4015 /1,000,000= 3,676.034 MWh/yr
Technical losses = 20%
Electricity input to T&D = 3,676.034 /(1-0.2) = 4,595.04 MWh/yr
Grid emission factor = 0.92 tCO2/MWh
Project Emission = 4,595.04 MWh/yr * 0.92 tCO2/GWh = 4,227.44 tCO2/yr

ER = energy savings*EF = (4,595.04 - 1,869.83) *0.92 = 2,507.2 tCO2/yr

Mercury-vapor lamp - Wikipedia

Emission Reduction= 4,227.44 tCO2/yr – 1,720.24 tCO2/yr = 2,507.2 tCO2/yr

End-use/T&D “Emissions” Example 2



Electricity sent = ??? MWh/yr
Emission factor at power plant = 0.9885 tCO2/kWh

Electricity used by one household 12,000 kWh/yr = 12 MWh/yr

COMBINED T&D LOSSES = 10%

Determine the CO2 emissions when a T&D system delivers 12,000 kWh/year to one household from a power plant with emission factor of 0.9885 tCO2/MWh. Combined T&D losses is 10%.

Electricity sent = (12 MWh/yr) / (100%-10%) = 13.33 MWh/year (the power plant has to generate 13.33 MWh/year to be able to supply the 12 MWh/yr.)
CO2 EMISSIONS = 13.33 MWh/year * 0.9885 tCO2/kWh = 13.177 tCO2/year

Thank you!

For Further Details please contact

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Relevant Websites

- GHG calculator for solid waste: https://pub.iges.or.jp/pub/ghg-calculator-solid-waste-ver-ii-2013
- PV generation calculator: https://pvwatts.nrel.gov/pvwatts.php
- IPCC Guidelines: https://www.ipcc-nggip.iges.or.jp/public/2006gl/
- Approved large scale CDM methodologies: https://cdm.unfccc.int/methodologies/PAmethodologies/approved
- Approved small scale CDM methodologies https://cdm.unfccc.int/methodologies/SSCmethodologies/approved
- CDM Project Search https://cdm.unfccc.int/Projects/projsearch.html
- Default country grid emission factors:

https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.pdf (Preferred)

OR relevant national emission factor

https://www.iges.or.jp/en/pub/list-grid-emission-factor/en?__cf_chl_jschl_tk__=poMnV59q0jtCOzgO06BrPLFRXR8QE_jjjymjsEzaMek-1636361839-0-gaNycGzNCRE

List of harmonized accounting standards for IFI

https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies

- Energy and fuel data sheet-fuel characteristics: http://www.claverton-energy.com/wordpress/wp-content/uploads/2012/08/the_energy_and_fuel_data_sheet1.pdf

Approaches in defining baselines

(a) "Performance-based" approach- specifies a "reference" emission level against which project emissions are compared. A GHG performance metric is often used – the grid emission factor – for power projects. Reference emission levels can be set in many ways: e.g. "best achieved" level (most conservative), "best available" level (average of top X%), lowest emission factor among grid-connected power plants using the same fuel, average emission factor among grid-connected power plants.

(b) "Best Available Technology (BAT)" approach- specifies a "reference" emission level based on GHG performance of best available technology or process. This can lead to a very variable baselines as best available technology is different in different DMCs or region.

Source: https://www.oecd.org/environment/cc/Designing-the-Article-6.4-mechanism-assessing-selected-baseline-approaches-and-their-implications.pdf

Approaches in defining baselines

(c) "Business-as-usual (BAU)" approach- requires the creation of a forward-looking scenario that describes how GHG emissions would progress in the absence of the mitigation project activity. Defining "BAU" scenario requires a number of assumptions about how conditions are expected to evolve, leading to considerable uncertainty in the baseline emissions levels.

(d) "Historical emission" approach- specifies a "reference" emission level by extrapolating emissions at a constant historical level (such as absolute or per unit output levels relevant to the activity) or following the historical trend (similar to a simplified BAU approach)

Source: https://www.oecd.org/environment/cc/Designing-the-Article-6.4-mechanism-assessing-selected-baseline-approaches-and-their-implications.pdf

Emerging Scenario of Emission Trading

- Multiple National and International emission trading schemes
- Multiple buyers
- Harmonized approach may not yield the same emission reduction