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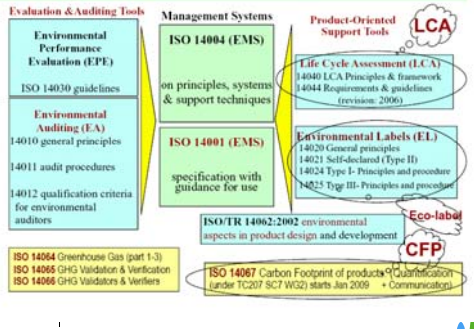
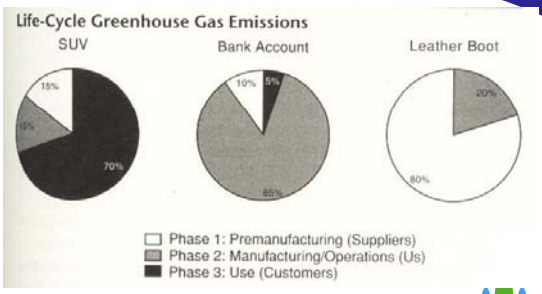
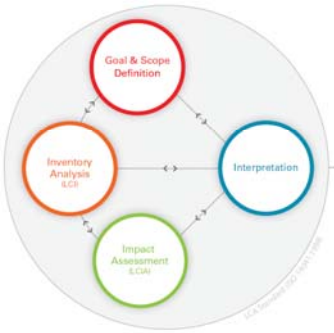


Difference LifeCycle



ขั้นตอนการประเมินวัฏจักรชีวิตผลิตภัณฑ์

ISO 14040 Life Cycle Assessment: Principles and framework



Direction Application
- Product development & Improvement
- Strategic planning
- Public policy making
- Marketing
- Benchmarking
- Ecolabels & product declaration

ที่มา: ISO LCA Framework 1998(Baumann & Tillman, 2004)

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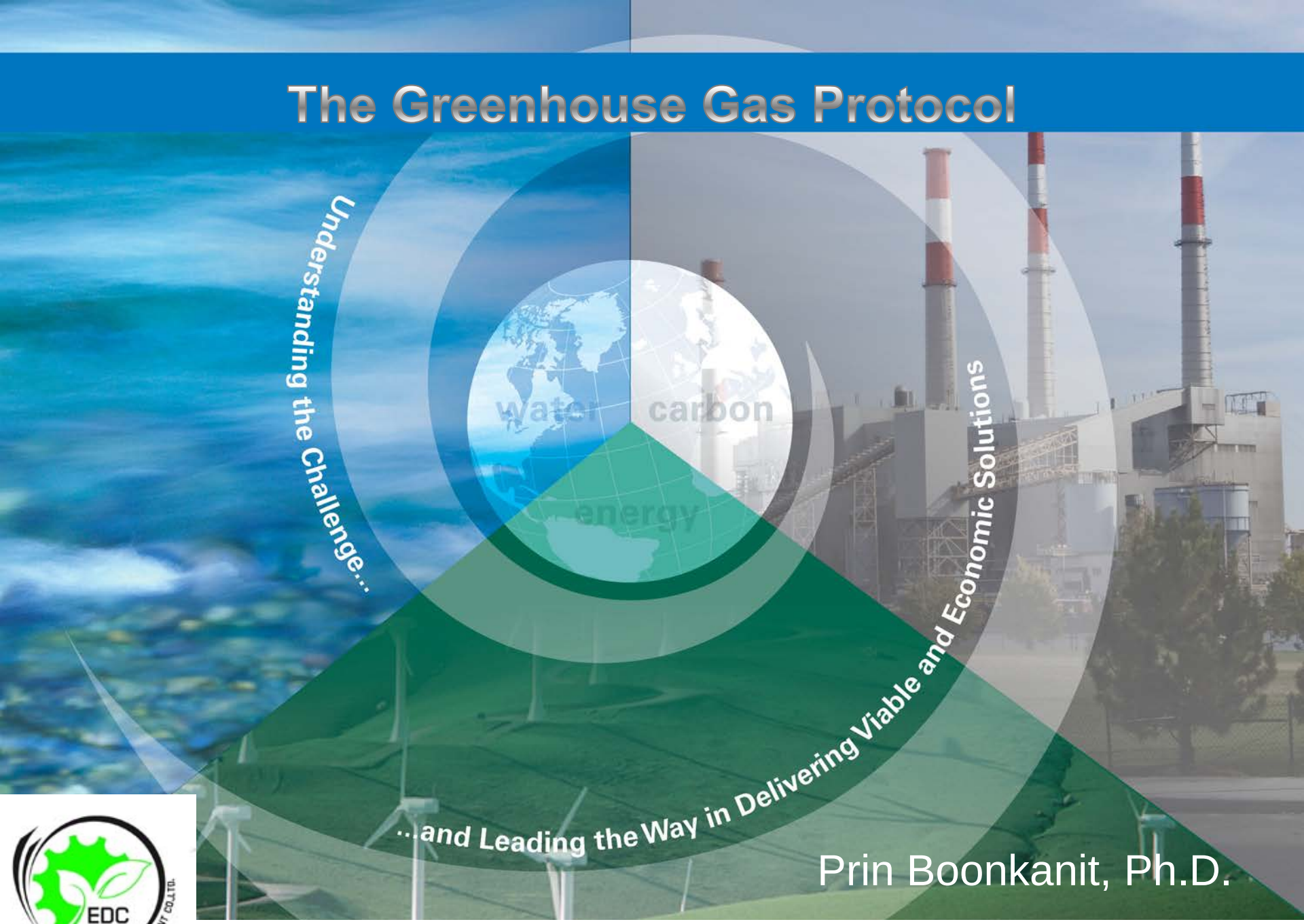
The Greenhouse Gas Protocol



Prin Boonkanit, Ph.D.

Eco Design Consultant Co., Ltd.

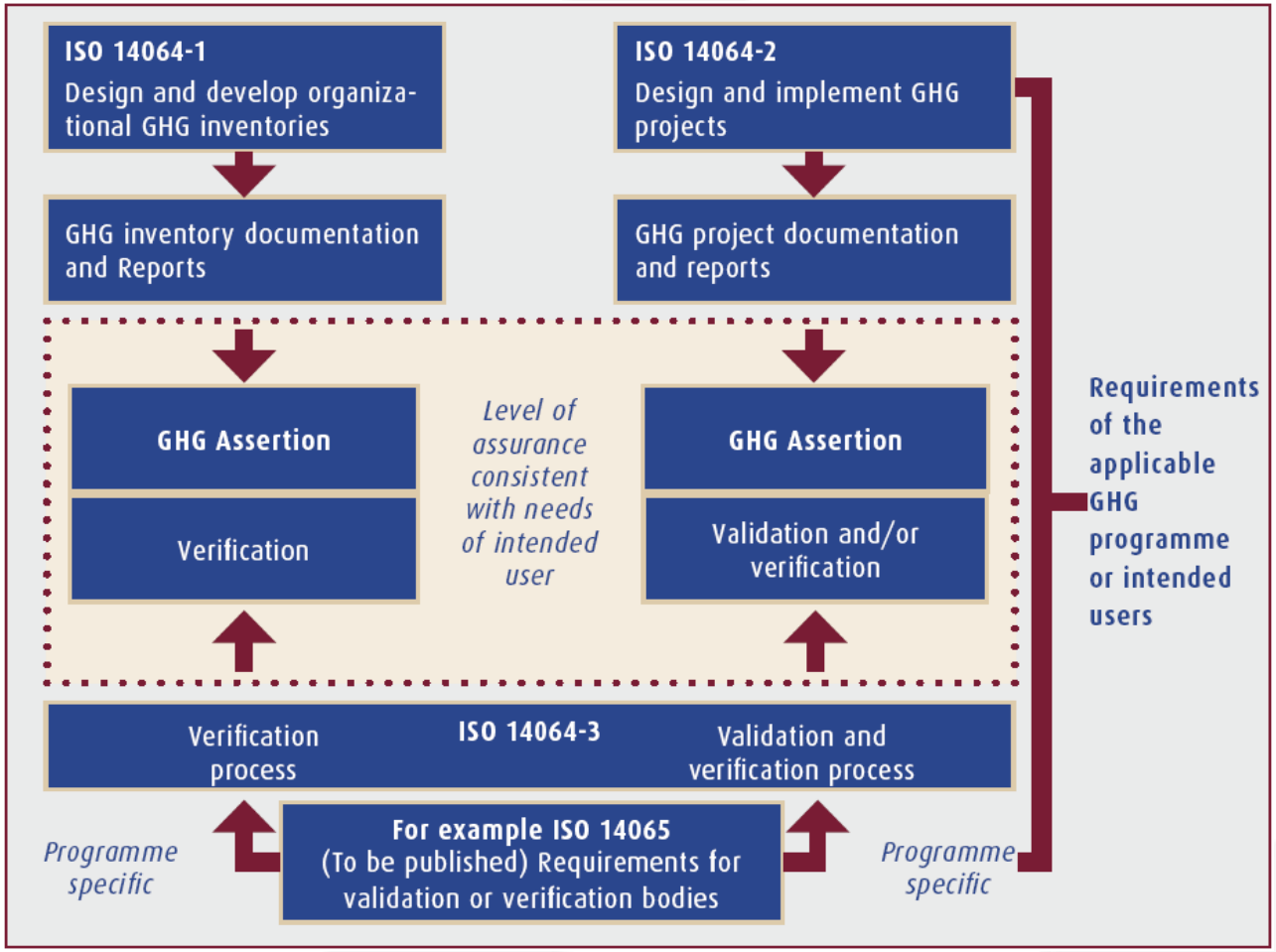
ISO 14064 GHG for Organization

- **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)**

- **ISO 14064-2: 2006 (Greenhouse Gases-Part 2: Specification with Guidance at the Project Level for Quantification, Monitoring and Reporting of Greenhouse Gas Emission Reductions or Removal Enhancements**

- **ISO 14064-3: 2006 (Greenhouse Gases-Part 3: Specification with Guidance for the Validation and Verification of Greenhouse Gas Assertions)**

Relationship between the part of ISO 14064



ISO 14064 incorporates many key concepts and requirements stated by World Business Council for Sustainable Development/ World Resources Institute in Reference [4]

Source: ISO 14064-1:2006

Presentation Overview

- Background and Greenhouse Gases
- Framework of GHG Inventory and Reduction Plans
- Inventory Concepts
  - Emission Source Categories
  - Boundaries
  - Absolute vs. Intensity-Based
- Existing Protocols

std positioning

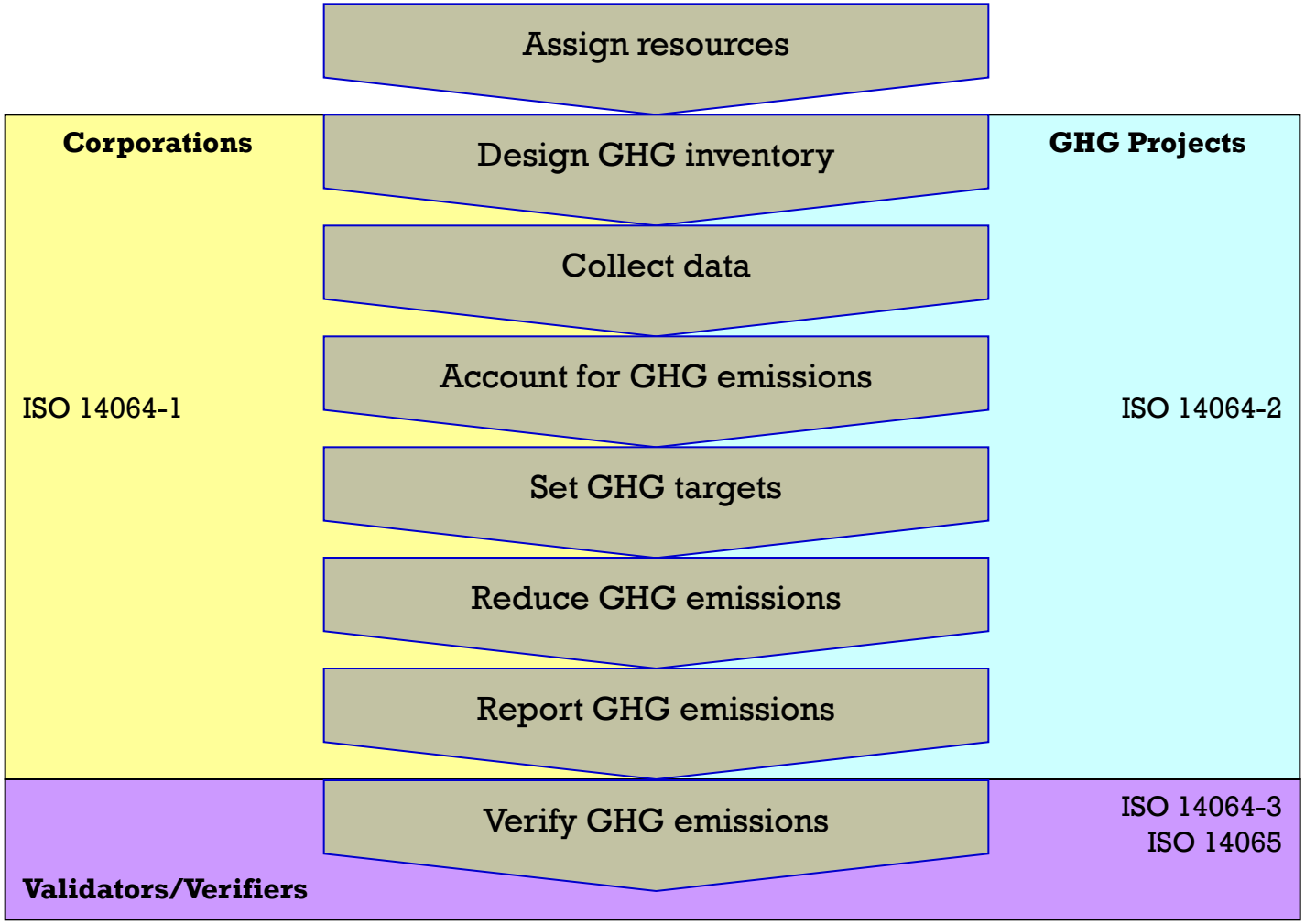
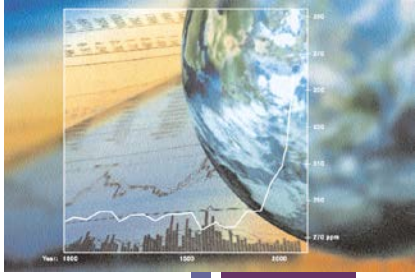
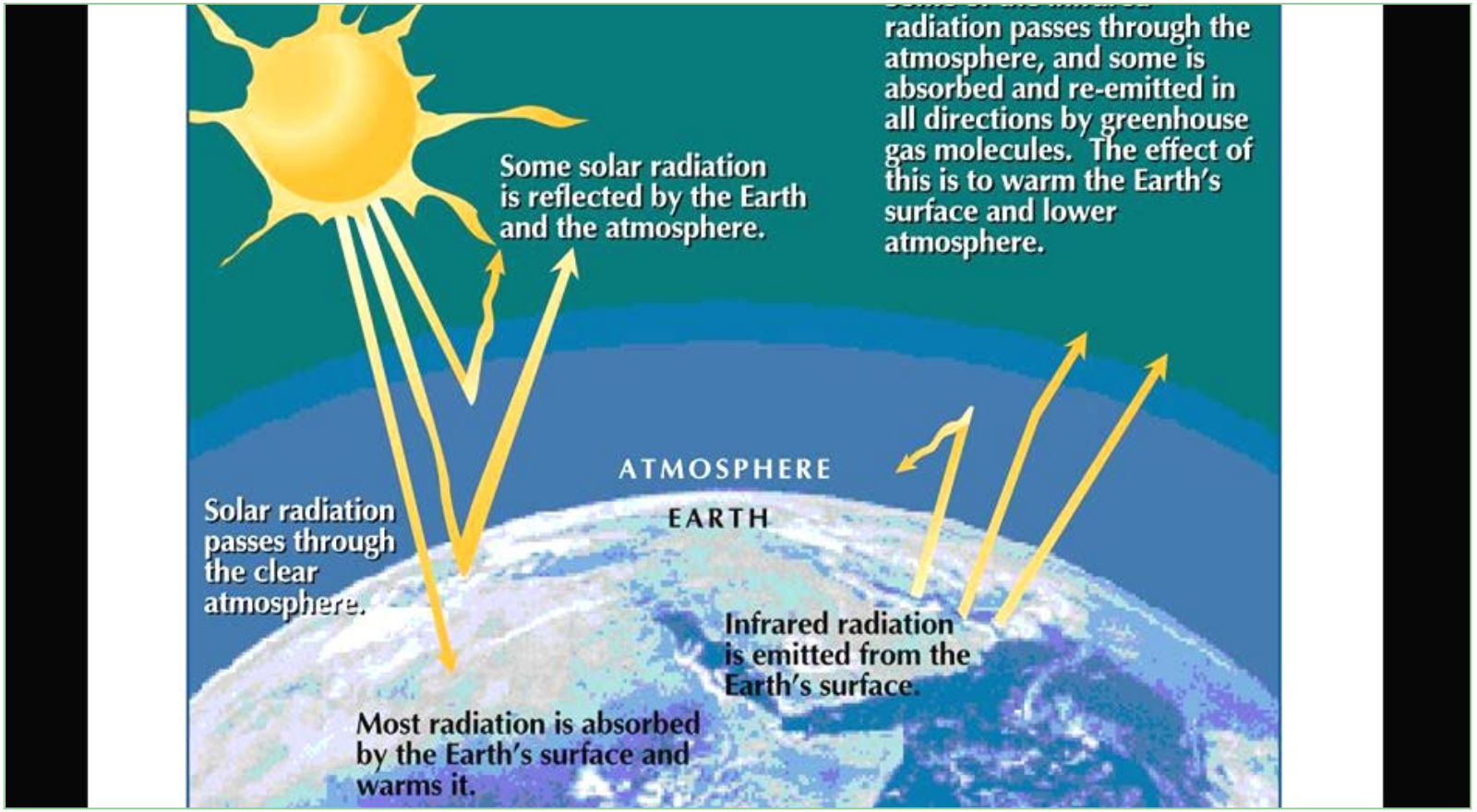


TABLE OF CONTENT ghg protocol (wbcsd)

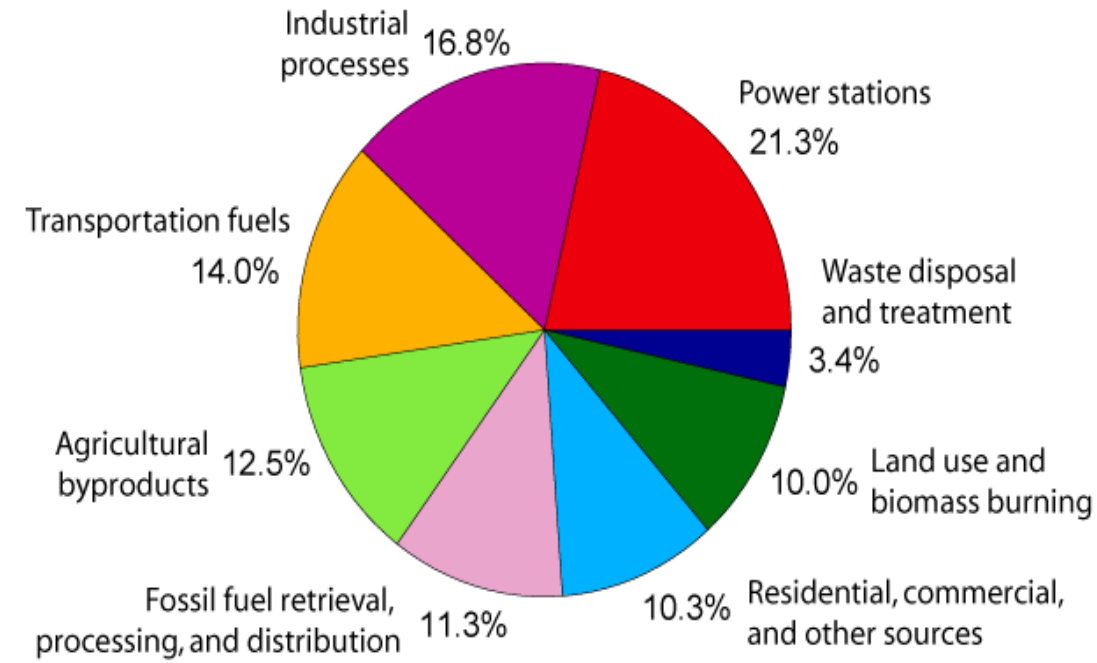


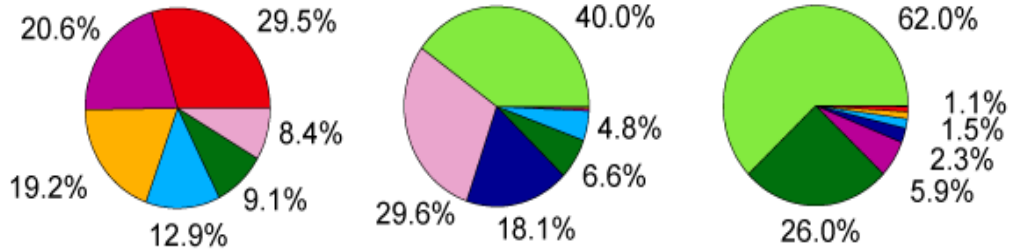
Introduction

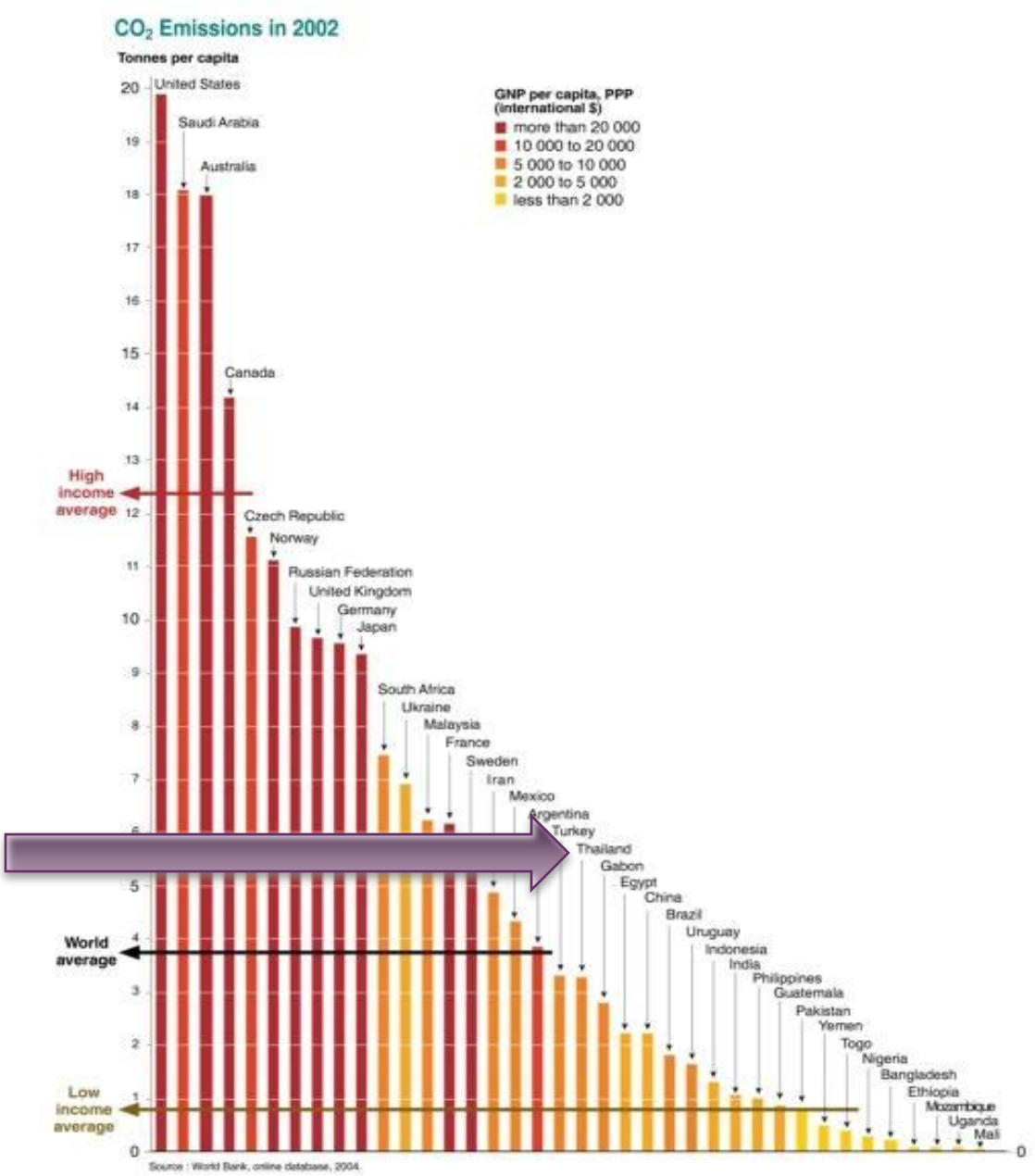
Background: The Greenhouse Gas Effect



Annual Greenhouse Gas Emissions by Sector






CO_2 Emissions in 2002
Tonnes per capita
GNP per capita, PPP (international $)
more than 20 000
10 000 to 20 000
5 000 to 10 000
2 000 to 5 000
less than 2 000
United States
Saudi Arabia
Australia
Canada
Czech Republic
Norway
Russian Federation
United Kingdom
Germany
Japan
South Africa
Ukraine
Malaysia
France
Sweden
Iran
Mexico
Argentina
Turkey
Thailand
Gabon
Egypt
China
Brazil
Uruguay
Indonesia
India
Philippines
Guatemala
Pakistan
Yemen
Togo
Nigeria
Bangladesh
Ethiopia
Mozambique
Uganda
Mali
High income average
World average
Low income average
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Source : World Bank, online database, 2004

Background: The Science

From the Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report:

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level"

"Global atmospheric concentrations of CO2, methane (CH4) and nitrous oxide (N2O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years."

"Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations. It is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)"

Whether one agrees or disagrees with the findings of the IPCC is in some ways irrelevant. This is the issue that has captured the attention of national and local government leaders, regulators, the public, shareholders, insurance companies, and lenders and other financial institutions. Response is becoming less and less voluntary.

Background: Greenhouse Gases

6 GHGs Typically Covered by Existing Regulations / Protocols:

- Carbon Dioxide – CO2
- Methane – CH4
- Nitrous Oxide - N2O
- Sulfur Hexafluoride – SF6
- Hydrofluorocarbons – HFC
- Perfluorocarbons – PFC

Additional GHGs / Factors Impacting Climate:

Other "F-gases"

- CFCs / HCFCs, typically not counted because regulated by Montreal Protocol mechanisms
- NF3 included in proposed Federal cap & trade legislation
- Other fluorinated gases such as HFEs included in recent EPA mandatory reporting rule

Water Vapor

Ground Level Ozone

Carbon Black

Aviation Contrails

Ongoing debate regarding whether high-altitude emissions (aircraft) have greater impact than ground-level emissions

Background: Global Warming Potential

Global Warming Potential (GWP) Definition:

"The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one unit of a given GHG compared to one unit of carbon dioxide (CO_2). " [1]

i.e., a measure of the climate impact of a given mass of one GHG relative to an equal mass of release of CO_2, based on a defined time horizon

[1] Source: The Climate Registry General Reporting Protocol, Version 1.1

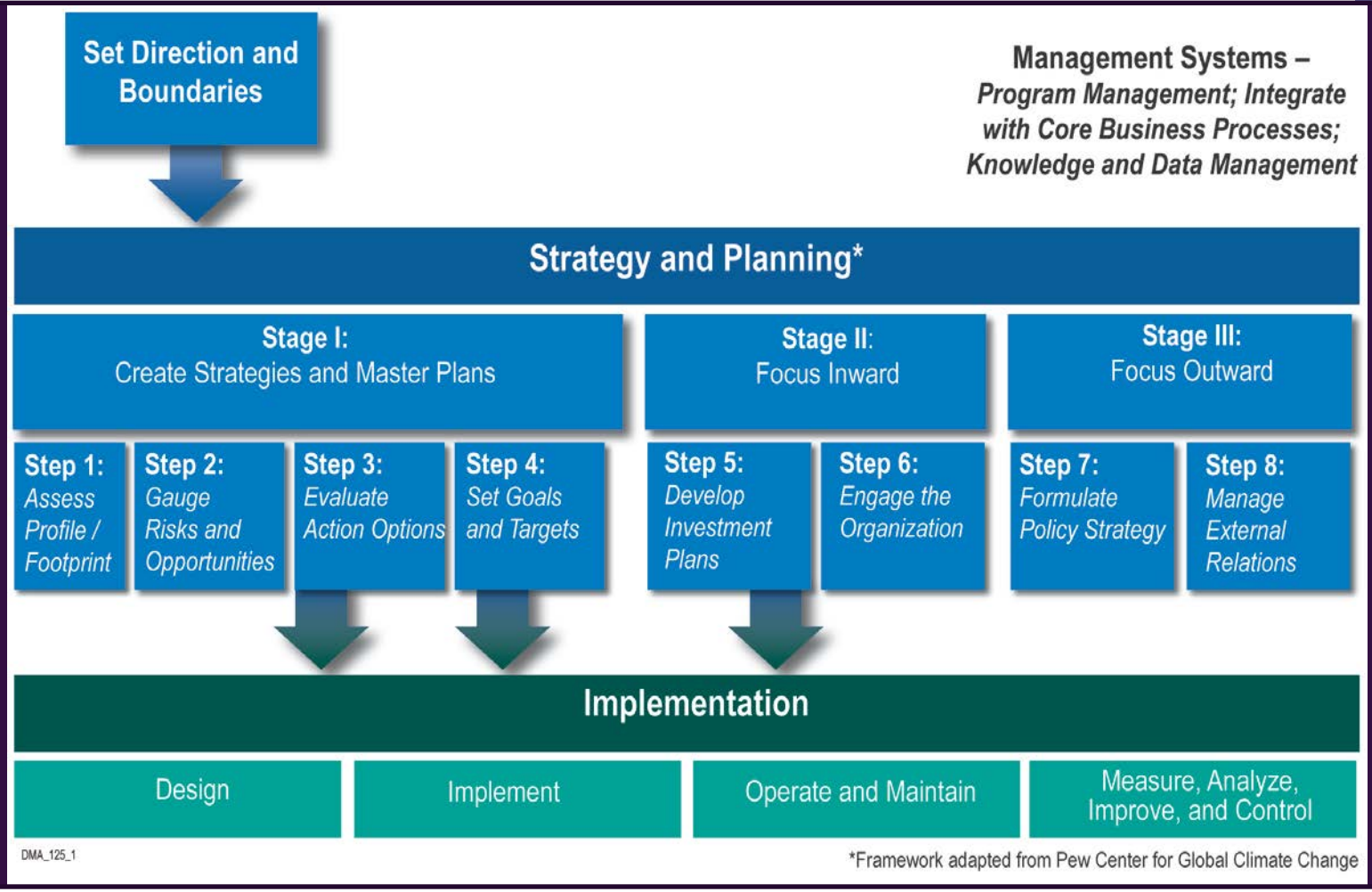
Global Warming Potential Estimates

Global Warming Potential Estimates			
	GWP (100-year)		
	SAR	TAR	AR4
CO2	1	1	1
CH4	21	23	25
N2O	310	296	298
SF6	23,900	22,200	22,800
HFCs	140 – 14,800		
PFCs	6,500 – 12,200		

Source: Intergovernmental Panel on Climate Change, Second Assessment Report (1995), Third Assessment Report (2001), and Fourth Assessment Report (2007)

Setting the Framework for a GHG Reduction Program

The Pathway to GHG Reduction



GHG ACCOUNTING AND Reporting Principles

Benefits of ISO 14064

- Ensures the credibility, consistency, and transparency of GHG accounting and reporting;
- Increases investor confidence;
- Facilitates the certification and trade of GHG emission reductions or removal enhancements;
- Facilitates the development and implementation of organization GHG management strategies and plans;
- Allows entities to track performance and progress in the reduction of GHG emissions and/or increase in GHG removals;
- Assists in the identification of GHG risks or liabilities; and
- Facilitates the development and implementation of GHG projects

GHG ACCOUNTING AND Reporting Principles

RELEVANCE	Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.
COMPLETENESS	Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.
CONSISTENCY	Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
TRANSPARENCY	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
ACCURACY	Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

Setting Organizational Boundaries

Setting Organizational Boundaries

- Control approach
- Control can be defined in either financial or operational terms.

- The company has financial control over the operation if the former has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from its activities.
- A company has operational control over an operation Under the operational control approach, a company accounts for 100% of emissions from operations over which it or one of its subsidiaries has operational control.

- Equity share approach
- Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation.
- company's percentage ownership of that operation, and equity share will normally be the same as the ownership percentage

Double counting

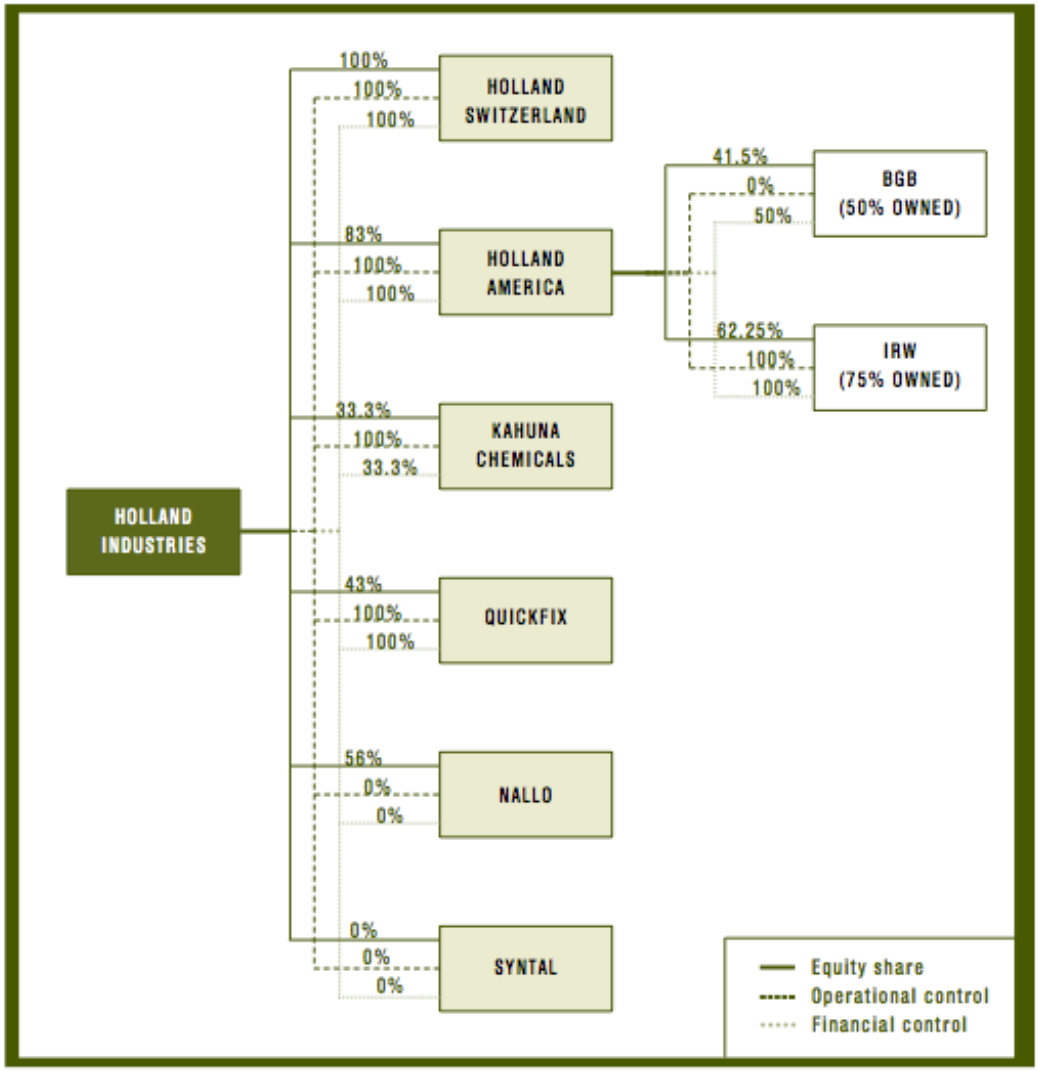
- When two or more companies hold interests in the same joint operation and use different consolidation approaches (e.g., Company A follows the equity share approach while Company B uses the financial control approach), emissions from that joint operation could be double counted.
- This may not matter for voluntary corporate public reporting as long as there is adequate disclosure from the company on its consolidation approach.
- However, double counting of emissions needs to be avoided in trading schemes and certain mandatory government reporting programs

Using the equity share or control approach

- The GHG Protocol Corporate Standard encourages companies to account for their emissions applying the equity share and a control approach separately.

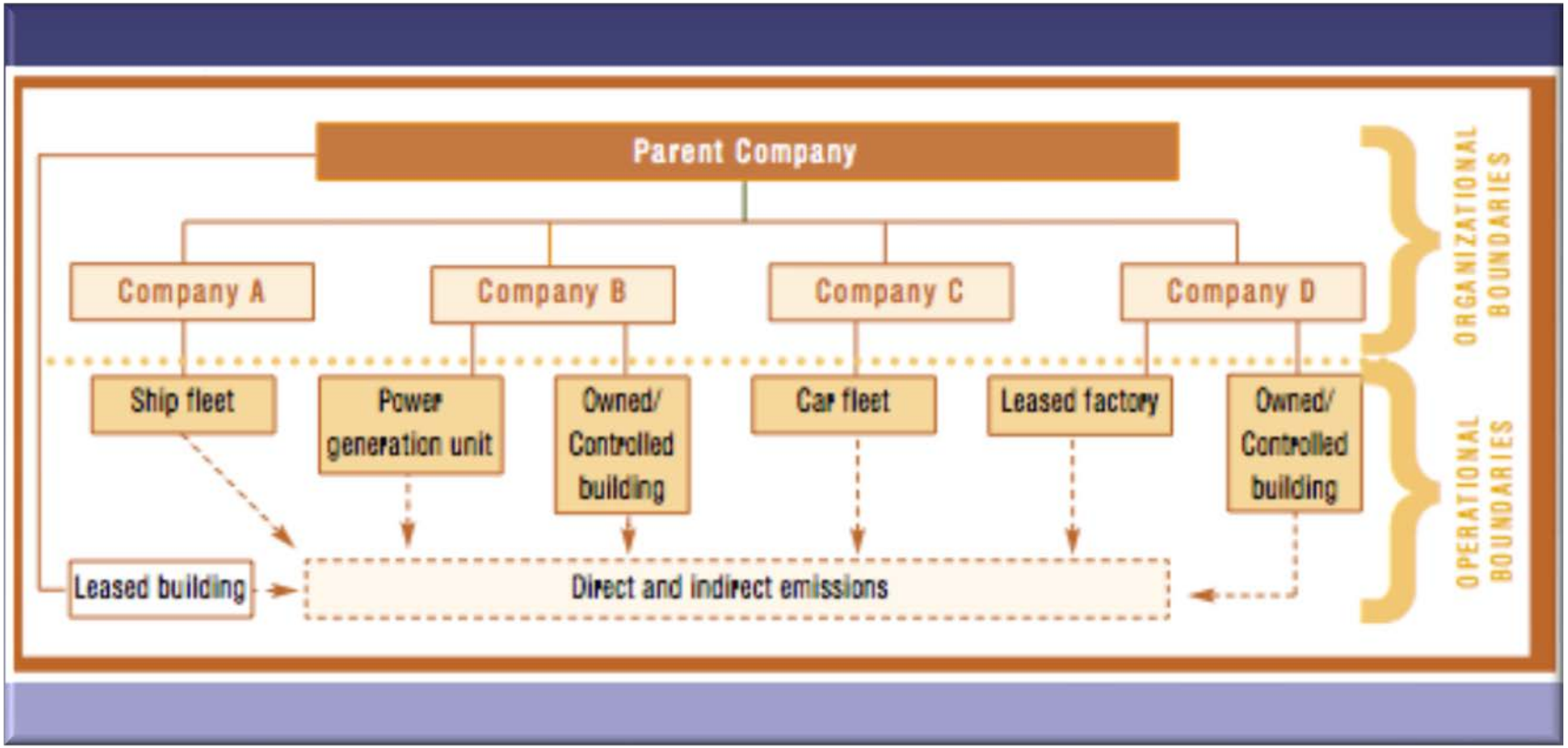
- Companies need to decide on the approach best suited to their business activities and GHG accounting and reporting requirements.
  - Reflection of commercial reality.
  - Government reporting and emissions trading programs.
  - Alignment with financial accounting
  - Management information and performance tracking.
  - Cost of administration and data access.
  - Completeness of reporting.

AN ILLUSTRATION: THE EQUITY SHARE AND CONTROL APPROACHES



Setting Operational Boundaries

Setting Operational Boundaries



Scope 1: Direct GHG emissions

Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Direct CO2 emissions from the combustion of biomass shall not be included in scope 1 but reported separately

GHG emissions not covered by the Kyoto Protocol, e.g. CFCs, NOx, etc. shall not be included in scope 1 but may be reported separately

Scope 2: Electricity indirect GHG emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company.

Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company.

Scope 2 emissions physically occur at the facility where electricity is generated.

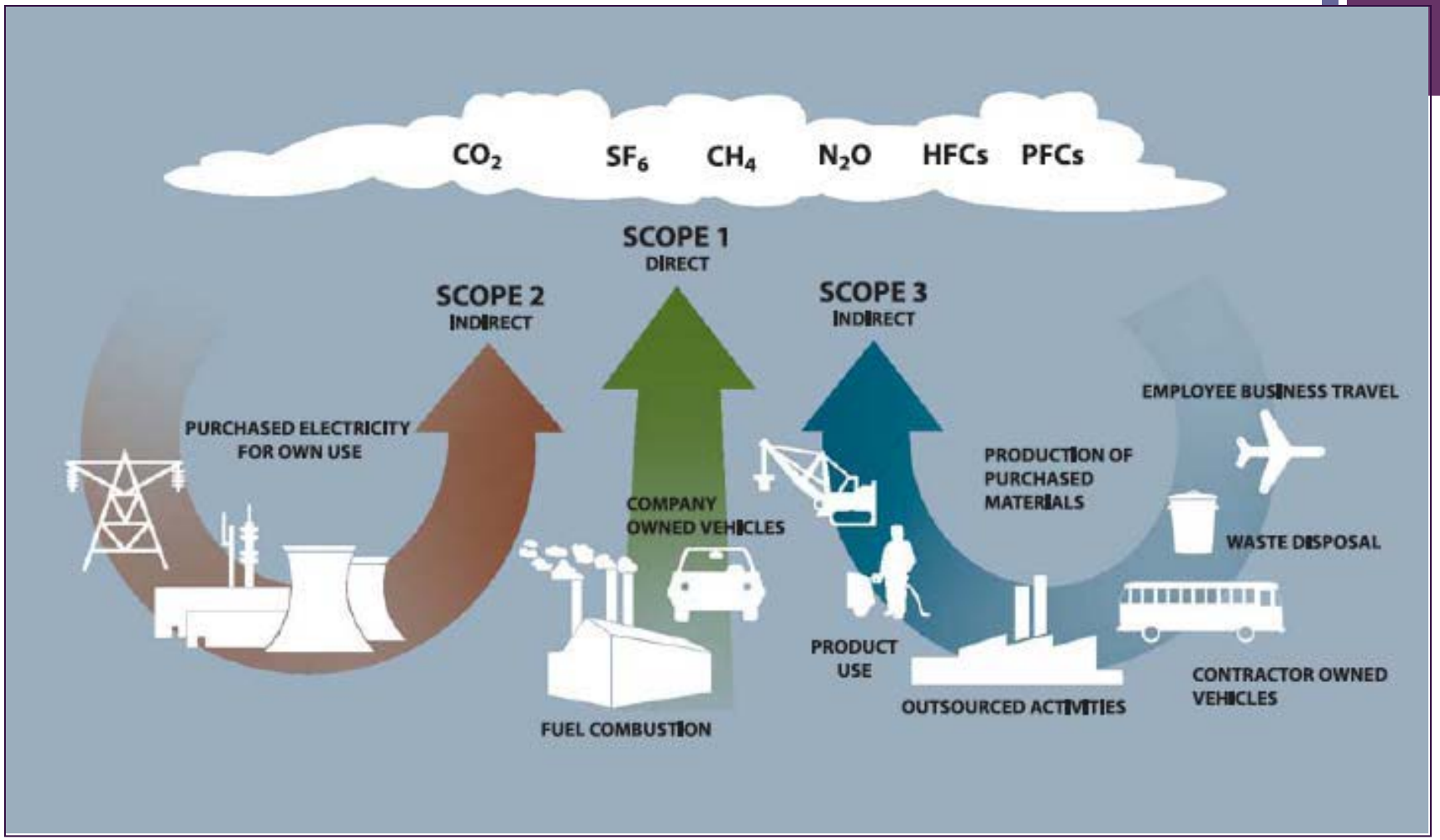
Scope 3: Other indirect GHG emissions

Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions.

Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

Emission Scopes



Setting Operational Boundaries

1. Describe the value chain.

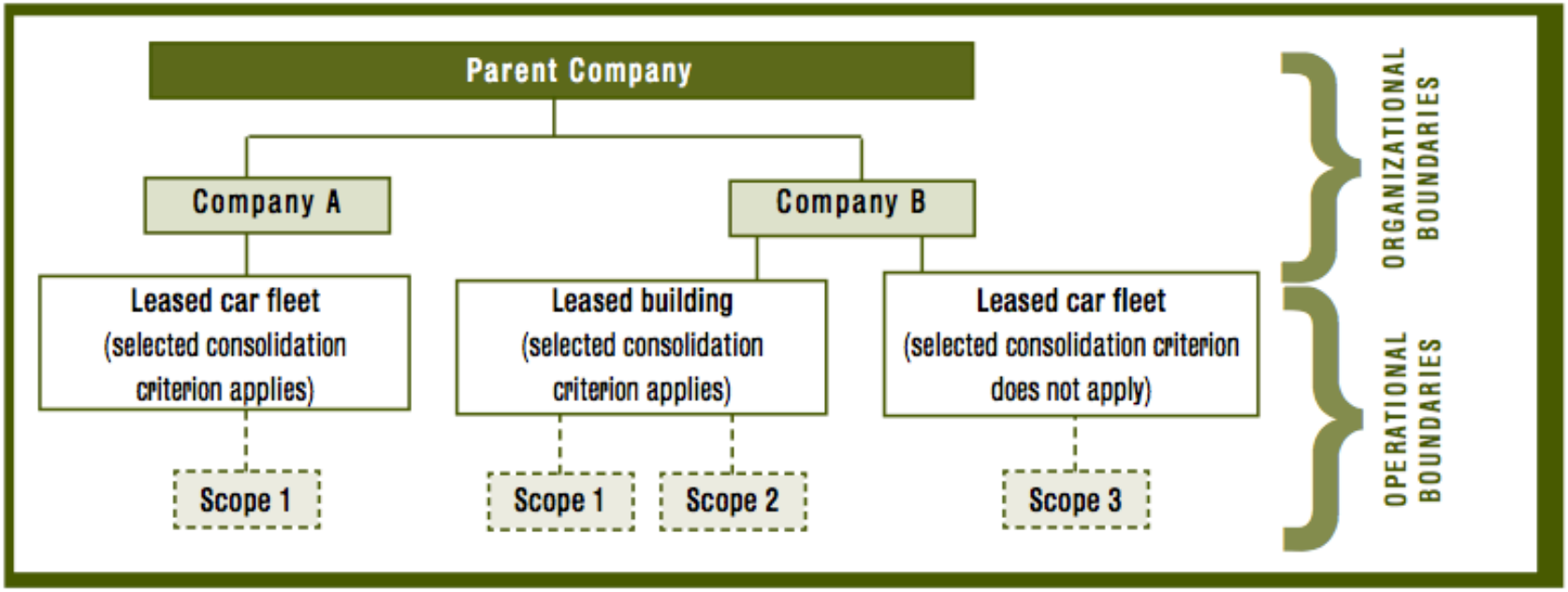
Because the assessment of scope 3 emissions does not require a full life cycle assessment, it is important, for the sake of transparency, to provide a general description of the value chain and the associated GHG sources.

For this step, the scope 3 categories listed can be used as a checklist. Companies usually face choices on how many levels up- and down-stream to include in scope 3.

Consideration of the company's inventory or business goals and relevance of the various scope 3 categories will guide these choices.

Setting Operational Boundaries

- 2. Determine which scope 3 categories are relevant.
- Only some types of upstream or downstream emissions categories might be relevant to the company.



Setting Operational Boundaries

Outsourced activities are often candidates for scope 3 emissions assessments.

It may be particularly important to include these when a previously outsourced activity contributed significantly to a company's scope 1 or scope 2 emissions.

3. Identify partners along the value chain.

4. Quantify scope 3 emissions.

Tracking Emissions Over Time

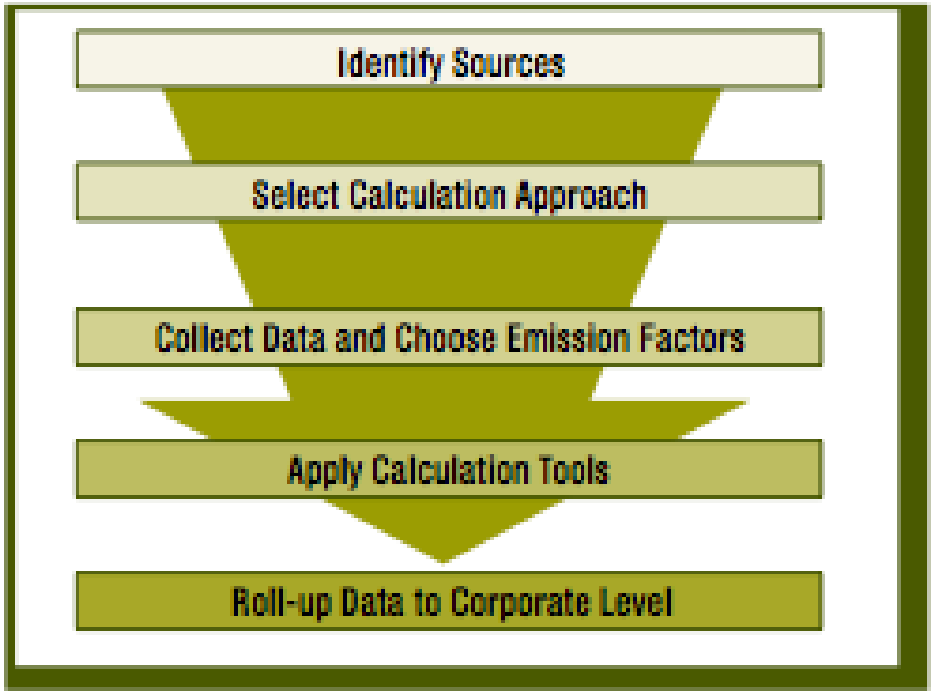
Tracking Emissions Over Time

Choosing a base year

- A base year the earliest relevant point in time for which they have reliable data.
- Some organizations have adopted 1990 as a base year in order to be consistent with the Kyoto Protocol.
- Most companies select a single year as their base year.
- However, it is also possible to choose an average of annual emissions over several consecutive years.
- When significant structural changes occur during the middle of the year, the base year emissions should be recalculated for the entire year,

Identifying and calculating GHG emissions

Steps in identifying and calculating GHG emissions



Identifying and Calculating GHG Emissions

- IDENTIFY SCOPE 1 EMISSIONS
- GHG emissions typically occur from the following source categories:
- Stationary combustion: combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, flares, etc.
- Mobile combustion: combustion of fuels in transportation devices such as automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels, etc.
- Process emissions: emissions from physical or chemical processes such as CO2 from the calcination step in cement manufacturing, CO2 from catalytic cracking in petrochemical processing, PFC emissions from aluminum smelting, etc.
- Fugitive emissions: intentional and unintentional releases such as equipment leaks from joints, seals, packing, gaskets, as well as fugitive emissions from coal piles, wastewater treatment, pits, cooling towers, gas processing facilities, etc.

IDENTIFY SCOPE 2 EMISSIONS

- The next step is to identify indirect emission sources from the consumption of purchased electricity, heat, or steam.
- Almost all businesses generate indirect emissions due to the purchase of electricity for use in their processes or services

DENTIFY SCOPE 3 EMISSIONS

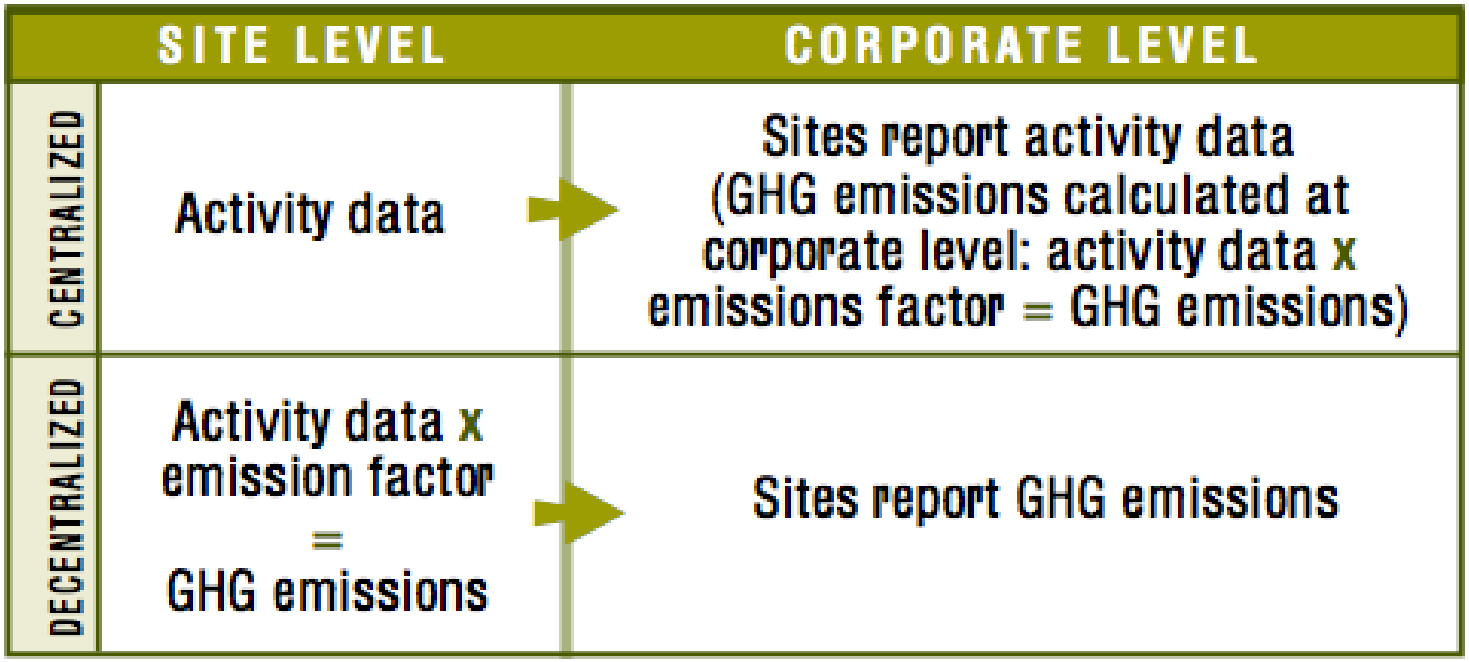
- This optional step involves identification of other indirect emissions from a company's upstream and downstream activities as well as emissions associated with outsourced/contract manufacturing, leases, or franchises not included in scope 1 or scope 2.

- The inclusion of scope 3 emissions allows businesses to expand their inventory boundary along their value chain and to identify all relevant GHG emissions.

Approaches for rolling up GHG emissions data to corporate level

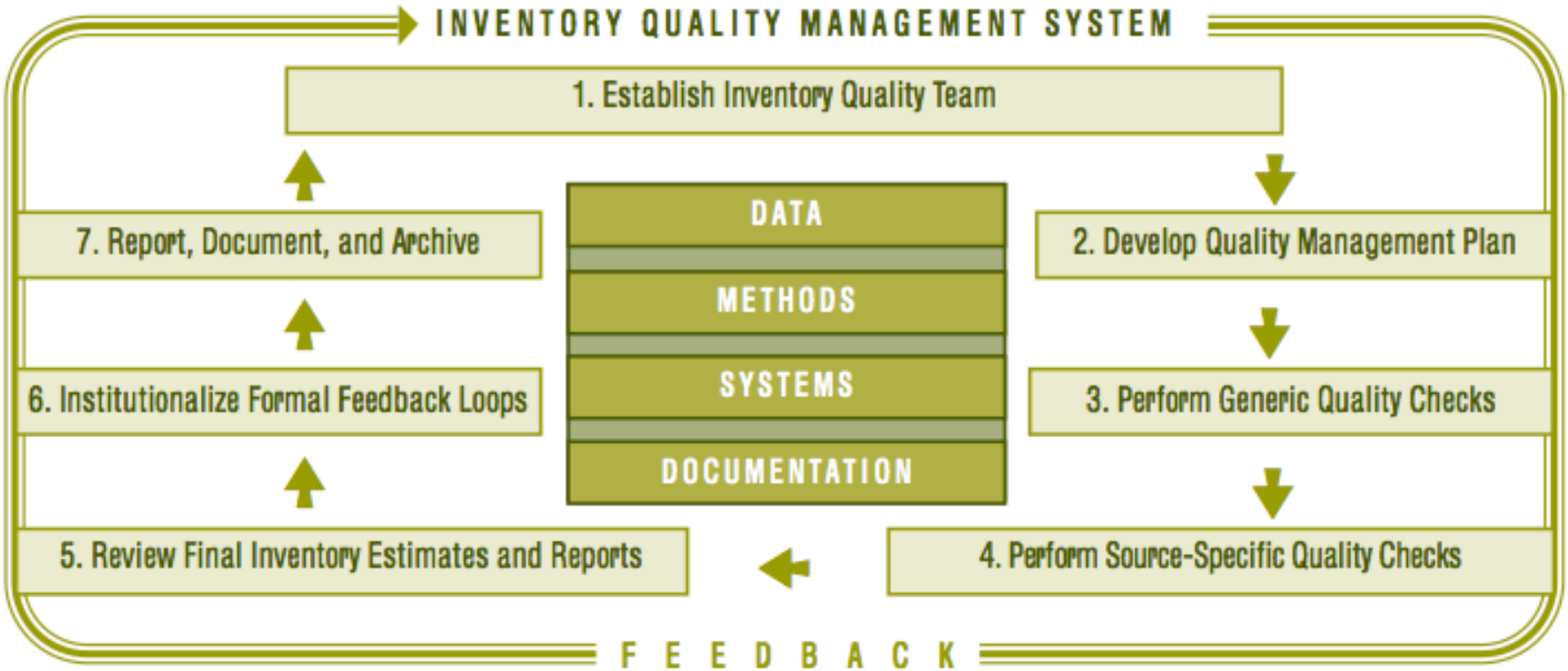
- There are two basic approaches for gathering data on GHG emissions from a corporation's facilities
- Centralized: individual facilities report activity/fuel use data (such as quantity of fuel used) to the corporate level, where GHG emissions are calculated.
- Decentralized: individual facilities collect activity/fuel use data, directly calculate their GHG emissions using approved methods, and report this data to the corporate level.

Approaches to gathering data



Managing Inventory Quality

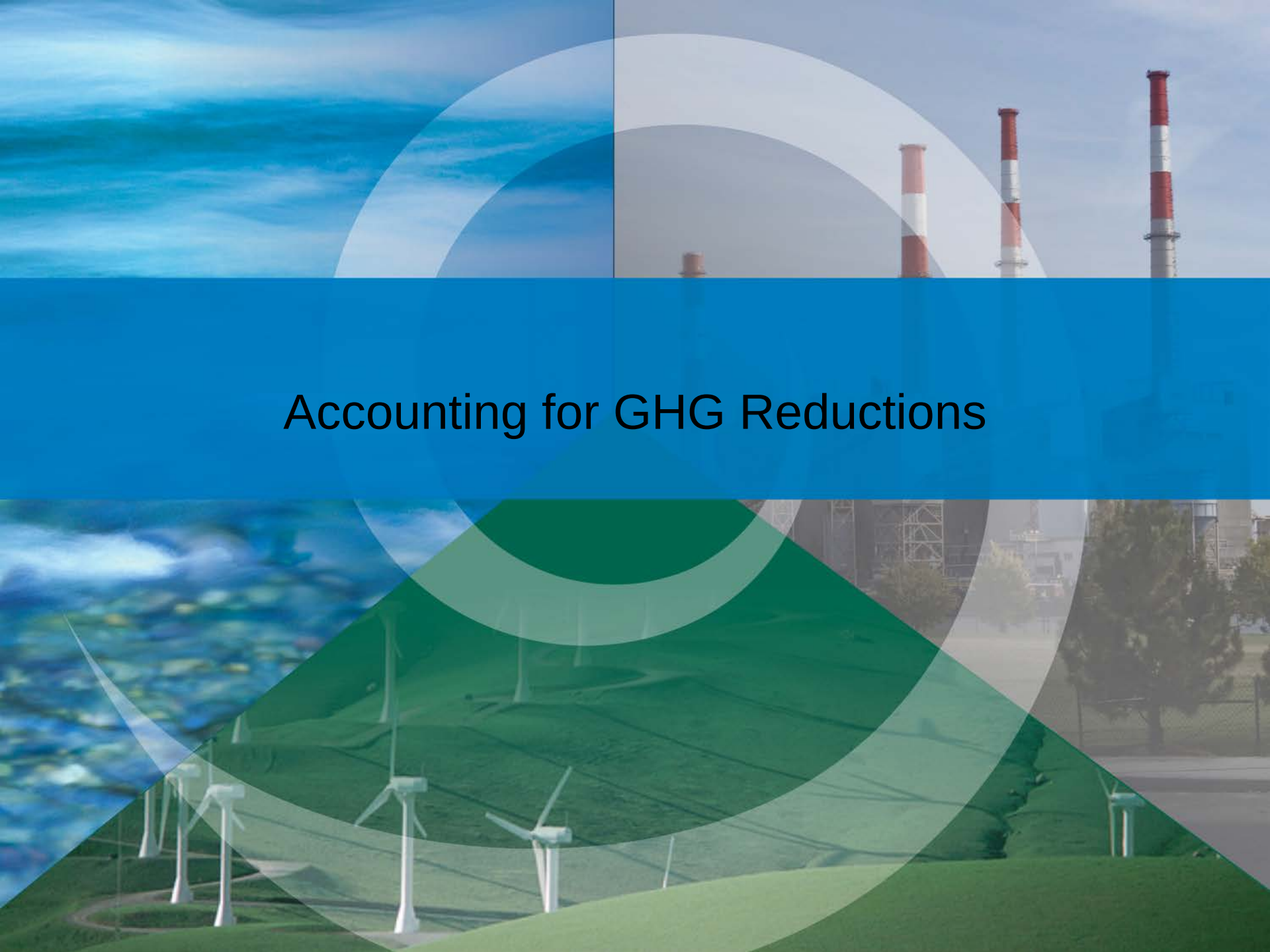
Managing Inventory Quality



DATA GATHERING, INPUT, AND HANDLING ACTIVITIES
• Check a sample of input data for transcription errors
• Identify spreadsheet modifications that could provide additional controls or checks on quality
• Ensure that adequate version control procedures for electronic files have been implemented
• Others
DATA DOCUMENTATION
• Confirm that bibliographical data references are included in spreadsheets for all primary data
• Check that copies of cited references have been archived
• Check that assumptions and criteria for selection of boundaries, base years, methods, activity data, emission factors, and other parameters are documented
• Check that changes in data or methodology are documented
• Others
CALCULATING EMISSIONS AND CHECKING CALCULATIONS
• Check whether emission units, parameters, and conversion factors are appropriately labeled
• Check if units are properly labeled and correctly carried through from beginning to end of calculations
• Check that conversion factors are correct
• Check the data processing steps (e.g., equations) in the spreadsheets
• Check that spreadsheet input data and calculated data are clearly differentiated
• Check a representative sample of calculations, by hand or electronically
• Check some calculations with abbreviated calculations (i.e., back of the envelope calculations)
• Check the aggregation of data across source categories, business units, etc.
• Check consistency of time series inputs and calculations
• Others

ACTIVITY DATA

- The following are useful measures for ensuring the quality of activity data:
- • Develop data collection procedures that allow the same data to be efficiently collected in future years.
- • Compare current year data with historical trends.
- • Compare activity data from multiple reference sources (e.g., government survey data or data compiled by trade associations) with corporate data when possible.



Accounting for GHG Reductions

Accounting for GHG Reductions

- Project based reductions and offsets/credits
- Project reductions that are to be used as offsets should be quantified using a project quantification method, such as the forthcoming GHG Protocol Project Quantification Standard
- For example:
  - Substituting fossil fuel with waste-derived fuel
  - Installing an on-site power generation plant (e.g., a combined heat and power.

Reporting GHG Emissions

Reporting GHG Emissions

- Reported information shall be "relevant, complete, consistent, transparent and accurate."
- The GHG Protocol Corporate Standard requires reporting a minimum of scope 1 and scope 2 emissions.
- A public GHG emissions report that is in accordance with the GHG Protocol Corporate Standard shall include the following information:

DESCRIPTION OF THE COMPANY AND INVENTORY BOUNDARY

- An outline of the organizational boundaries chosen, including the chosen consolidation approach.
- An outline of the operational boundaries chosen, and if scope 3 is included, a list specifying which types of activities are covered.
- The reporting period covered.

INFORMATION ON EMISSIONS

- Emissions data separately for each scope.
- Emissions data for all six GHGs separately (CO2, CH4, N2O, HFCs, PFCs, SF6) in metric tonnes and in tonnes of CO2 equivalent.
- Year chosen as base year, and an emissions profile over time that is consistent with and clarifies the chosen policy for making base year emissions recalculations.
- Appropriate context for any significant emissions changes that trigger base year emissions recalculation (acquisitions/divestitures, outsourcing/insourcing, changes in reporting boundaries or calculation methodologies, etc.)
- Emissions data for direct CO2 emissions from biologically sequestered carbon (e.g., CO2 from burning biomass/biofuels), reported separately from the scopes.
- Methodologies used to calculate or measure emissions, providing a reference or link to any calculation tools used.
- Any specific exclusions of sources, facilities, and /or operations.

Verification of GHG Emissions

Verification of GHG Emissions

- Goals
- Before commissioning an independent verification, a company should clearly define its goals and decide whether they are best met by an external verification.
- Common reasons for undertaking a verification include:
  - Increased credibility of publicly reported emissions information and progress towards GHG targets, leading to enhanced stakeholder trust
  - Increased senior management confidence in reported information on which to base investment and target- setting decisions
  - Improvement of internal accounting and reporting practices (e.g., calculation, recording and internal reporting systems, and the application of GHG accounting and reporting principles), and facilitating learning and knowledge transfer within the company
  - Preparation for mandatory verification requirements of GHG programs.

Internal assurance

- Many companies interested in improving their GHG inventories may subject their information to internal verification by personnel who are independent of the GHG accounting and reporting process.

- Both internal and external verification should follow similar procedures and processes.

Site visits

- The sites visited should be representative of the organization as a whole.
- The selection of sites to be visited will be based on consideration of a number of factors, including:
  - Nature of the operations and GHG sources at each site
  - Complexity of the emissions data collection and calculation process
  - Percentage contribution to total GHG emissions from each site
  - The risk that the data from sites will be materially misstated
  - Competencies and training of key personnel
  - Results of previous reviews, verifications, and uncertainty analyses.

Timing of the verification

- The engagement of a verifier can occur at various points during the GHG preparation and reporting process.

- Some companies may establish a semi-permanent internal verification team to ensure that GHG data standards are being met and improved on an on-going basis.

Selecting a verifier

- Some factors to consider when selecting a verifier include their:
- • previous experience and competence in undertaking GHG verifications
- • understanding of GHG issues including calculation methodologies
- • understanding of the company's operations and industry
- • objectivity, credibility, and independence.

Preparing for a GHG verification

- Information required by an external verifier is likely to include the following:
- • Information about the company's main activities and GHG emissions (types of GHG produced, description of activity that causes GHG emissions)
- • Information about the company/groups/organization (list of subsidiaries and their geographic location, ownership structure, financial entities within the organization)
- • Details of any changes to the company's organizational boundaries or processes during the period, including justification for the effects of these changes on emissions data

Preparing for a GHG verification

- Details of joint venture agreements, outsourcing and contractor agreements, production sharing agreements, emissions rights and other legal or contractual documents that determine the organizational and operational boundaries
- Documented procedures for identifying sources of emissions within the organizational and operational boundaries
- Information on other assurance processes to which the systems and data are subjected (e.g. internal audit, external reviews and certifications)

Data used for calculating GHG emissions. This might, for example, include:

- Energy consumption data (invoices, delivery notes, weigh-bridge tickets, meter readings: electricity, gas pipes, steam, and hot water, etc.)
- Production data (tonnes of material produced, kWh of electricity produced, etc.)
- Raw material consumption data for mass balance calculations (invoices, delivery notes, weighbridge tickets, etc.)
- Emission factors (laboratory analysis etc.).

Description of how GHG emissions data have been calculated:

- Emission factors and other parameters used and their justification
- Assumptions on which estimations are based
- Information on the measurement accuracy of meters and weigh-bridges (e.g., calibration records), and other measurement techniques
- Equity share allocations and their alignment with financial reporting
- Documentation on what, if any, GHG sources or activities are excluded due to, for example, technical or cost reasons.

Setting a GHG Target

Why Set a GHG Target?

- MINIMIZING AND MANAGING GHG RISKS

- While developing a GHG inventory is an important step towards identifying GHG risks and opportunities, a GHG target is a planning tool that can actually drive GHG reductions.

- • ACHIEVING COST SAVINGS AND STIMULATING INNOVATION Implementing a GHG target can result in cost savings by driving improvements in process innovation and resource efficiency

- PREPARING FOR FUTURE REGULATIONS

- Internal accountability and incentive mechanisms that are established to

- support a target's implementation can also equip companies to respond

- more effectively to future GHG regulations.

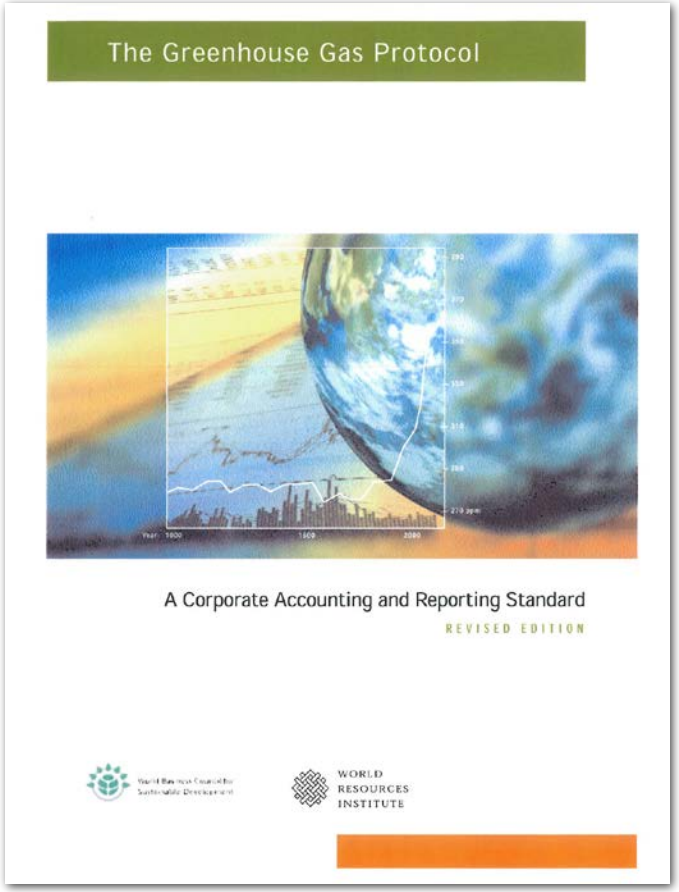
ISO/WD 14069

GHG -- Quantification and reporting of GHG emissions for organizations (Carbon footprint of organization) -- Guidance for the application of ISO 14064-1

WRI/ WBCSD GHG Protocol

- Starting point for virtually every protocol that is available today

- Consists of 2 separate but interrelated modules:
  - GHG Protocol—Corporate Accounting and Reporting Standard
  - GHG Protocol—Project Accounting



WRI/ WBCSD GHG Protocol

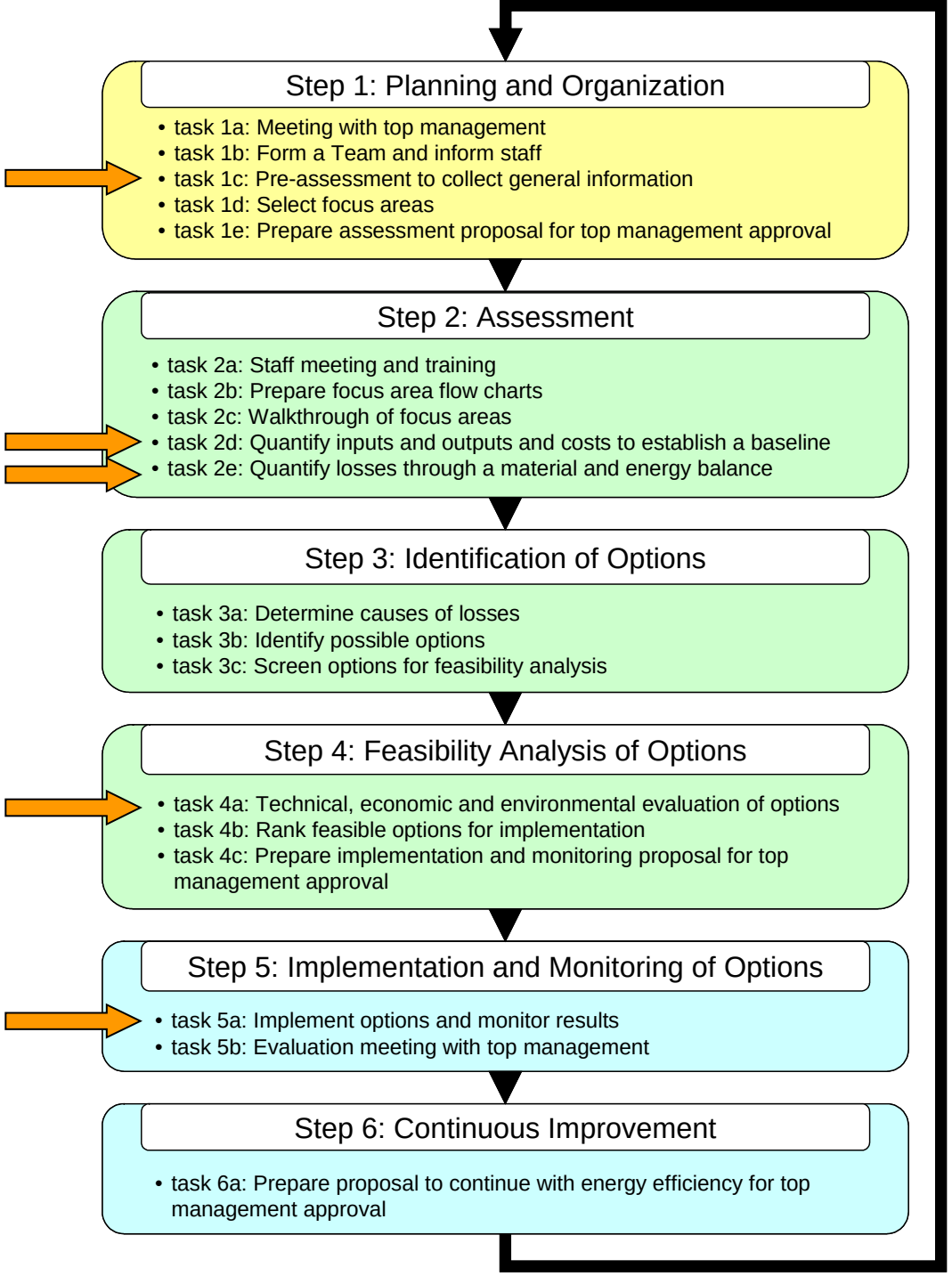
- GHGs addressed include the 6 Kyoto Gases- CO2, CH4, N2O, HFC, PFC, and SF6
- Sources of GHGs - Scope 1 (direct), Scope 2 (indirect), Scope 3 (optional indirect) emissions
- Materiality Threshold (uncertainty error range potentially causing material misstatement) is defined
- Emission factors based on IPCC and international energy data sources (except US energy is based on e-GRID)
- Includes guidance and calculation tools for:
  - Stationary Combustion, Indirect Emissions, Mobile Combustion, HFC usage, and Sector specific modules for the Cement Industry, Aluminum Production, Iron & Steel, Pulp & Paper, Ammonia Production, etc.
- Does not include a registry

ISO 14064

- The ISO 14064 comprises three standards:
  - ISO 14064-1, *Greenhouse gases* – Part 1: *Specification with guidance at the organization level for the quantification and reporting of greenhouse gas emissions and removals*.
  - ISO 14064-2, *Greenhouse gases* – Part 2: *Specification with guidance at the project level for the quantification, monitoring and reporting of greenhouse gas emission reductions and removal enhancements.*
  - ISO 14064-3, *Greenhouse gases* – Part 3: *Specification with guidance for the validation and verification of greenhouse gas assertions.*
- Closely follows WRI GHG Protocol
- GHGs addressed include the 6 Kyoto Gases- CO2, CH4, N2O, HFC, PFC, and SF6
- Sources- Direct, Energy Indirect, Other indirect
- Specific emission factors or quantification methodologies are not provided

But first…

In what step(s) of the methodology is GHG measurement relevant?



Example GHG Report

GLOBAL
Change Location

- Environment & Society
- Performance data
- **Environmental data**
- Interactive environmental data charts
- **Greenhouse gas emissions**
- Flaring
- Energy intensity
- Acid gases and volatile organic compounds
- Ozone depleting emissions
- Spills
- Discharges
- Fresh water use
- Waste disposal
- External perception of environmental performance
- Innovation

You are here: Home > Environment & Society > Performance data > Environmental data > **Greenhouse gas emissions**

Greenhouse gas emissions

In early 2010 we obtained limited assurance of our 2009 direct and indirect greenhouse gas emissions data from facilities we operate. Our 2009 direct greenhouse gas emissions show we are on track to meet our voluntary target for 2010: to reduce GHG emissions from our operations by at least 5% compared to 1990 levels.

Greenhouse gas emissions (GHGs) | **GHG breakdown** | **Carbon dioxide (CO2) & Methane** | **Nitrous oxide and hydrofluorocarbons** | **About our GHG data**

The direct greenhouse gas (GHG) emissions from facilities we operate were 67 million tonnes on a CO2-equivalent basis in 2009, 11% lower than in 2008. A combination of factors was behind the drop including improved operational performance, lower demand for our products due to the economic downturn, some shut-in production in Nigeria and the sale of some of our facilities. Since 1990, our GHG emissions have fallen by around 35% on a comparable basis.

However, in the coming years our direct GHG emissions may rise as a result of new projects coming on-stream.

This data is based on direct emissions and includes all companies and joint ventures where we are the operator. For information on the limitations of our GHG data see the About our GHG data tab.

We have achieved external verification of our 2009 direct and indirect GHG data from facilities we operate as well as confirmation that direct GHG emissions for the 1990 Base Year for our major facilities have been adjusted in accordance with the requirements of ISO 14064-1.

See About our GHG data tab for more details.

Visit our climate change section

Download the Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions - opens in new window
Footnote: Petroleum Industry Guidelines for Greenhouse Gas Estimate, December 2003, (API, IPIECA, OGP) indicate that uncertainty in greenhouse gas measurements can be significant depending on the methods used.

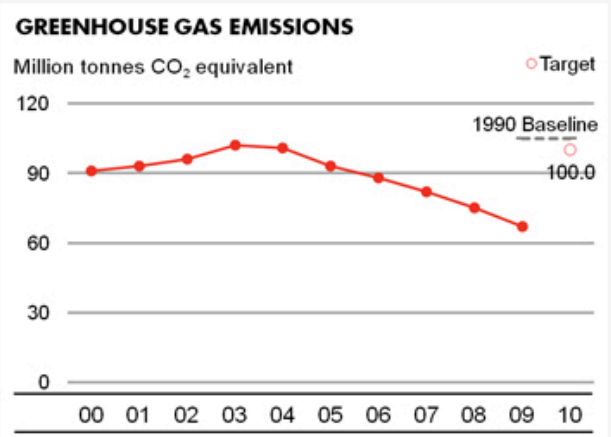


Chart 1: Greenhouse gas emissions

GHG management

Corporate profile
Investor relations
Sustainability
- Sustainable Management
- Integrity Management
- Environment
  - Climate Strategy
    - Policy and goals
    - GHG management
    - Energy management
  - Eco-Products
  - Chemical Management
  - Take Back & Recycling
  - Sustainable Operations
  - Communications
- Social Contribution
- Product & Services
- Partner Collaboration
- Sustainability Reports

Citizenship
Our businesses
Global Procurement
Management
Careers

Eco Vision & Plans
Planet First
more »

GHG Management for Scope 1 and 2

Samsung Electronics' total emissions of greenhouse gases are shown in Figure 1. The majority of GHGs come from our semiconductor and LCD panel businesses.

Though the absolute amount of GHG has not decreased significantly due to the growth of our businesses, the company has committed to reducing greenhouse gas emission intensity resulting from manufacturing processes and improving energy efficiency in operations. Figure 2 demonstrates the decrease in emissions normalized by sales as a result of the company's GHG reduction initiatives.

Figure 1. Total Greenhouse Gas Emissions

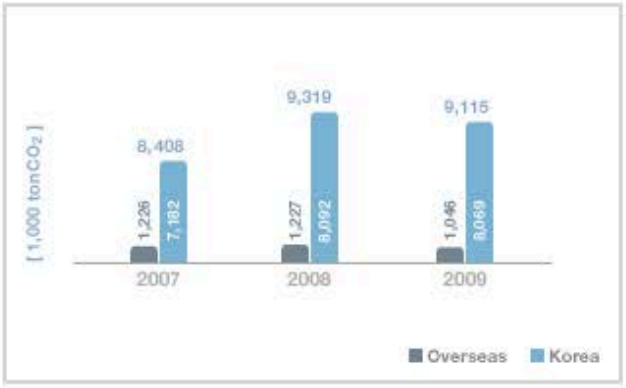
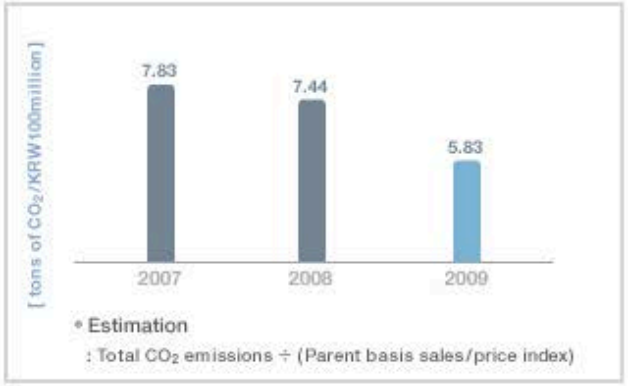


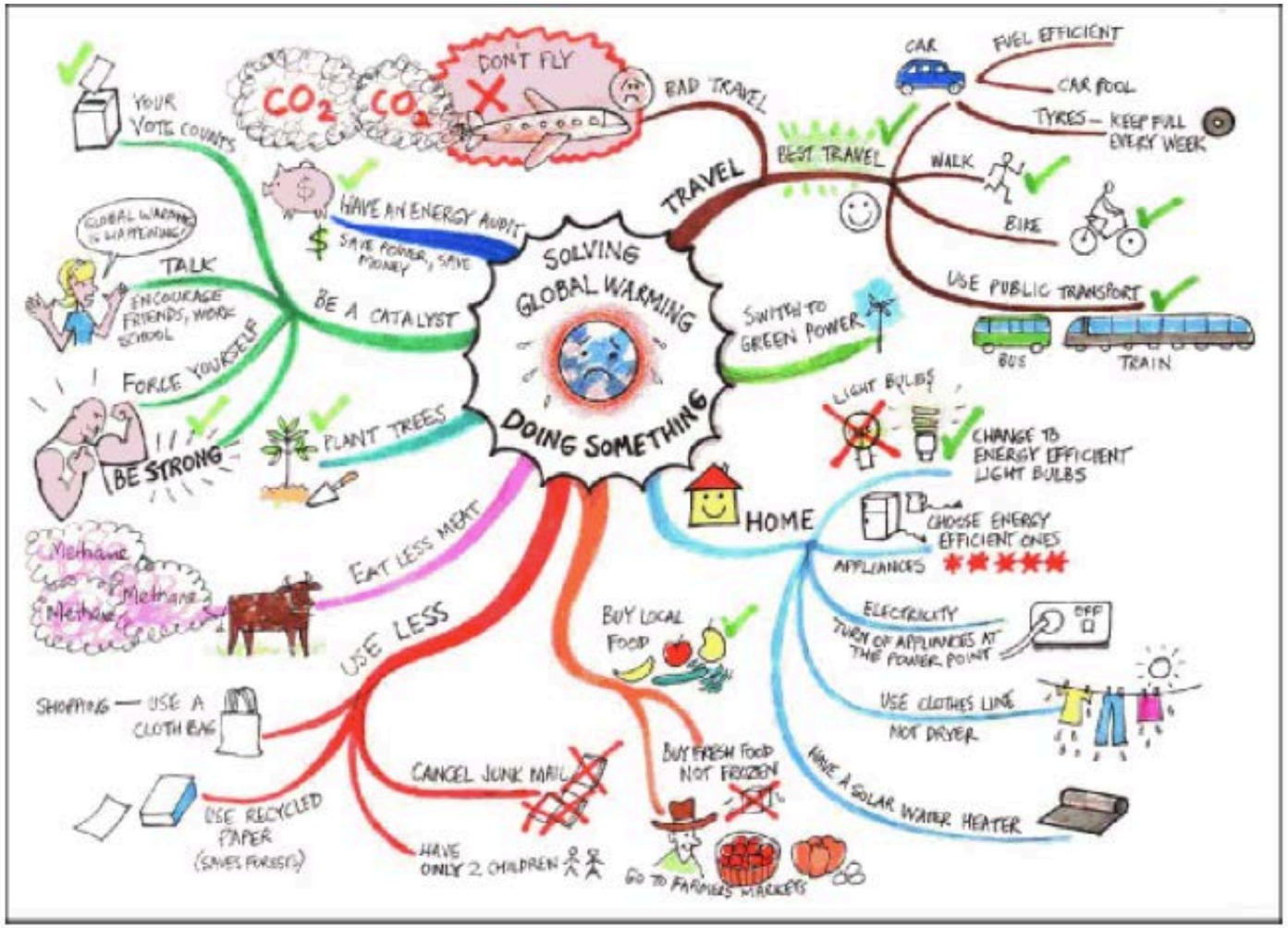
Figure 2. Greenhouse Gas Emissions normalized by sales (Korea)



GHG

Delta, Apple, Toyota etc.

+ Solving Global Warming



Eco Design Consultant Co., Ltd.

• การพัฒนาฉลาก **Carbon Footprint** และ **Carbon Reduction Label**

การพัฒนาฉลาก Carbon Footprint และ Carbon Reduction Label

ดร. อรรคเจตต์ อภิชจรศิลป์
บริษัท อีโค ดีซายน์ คอนซัลแตนท์ จำกัด

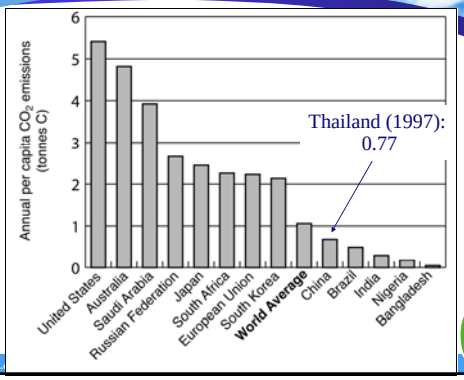
คำกล่าวโดย นายกรัฐมนตรี อภิสิทธิ์ เวชชาชีวะ

- ปัญหาการเปลี่ยนแปลงสภาพภูมิอากาศ ไม่ควรถูกมองว่าเป็นปัญหาที่ขัดกับกระบวนการพัฒนา แต่การส่งเสริมการลงทุนที่เป็นมิตรกับสิ่งแวดล้อม กลับสร้างโอกาสทางการค้าและการลงทุนได้อย่างมาก

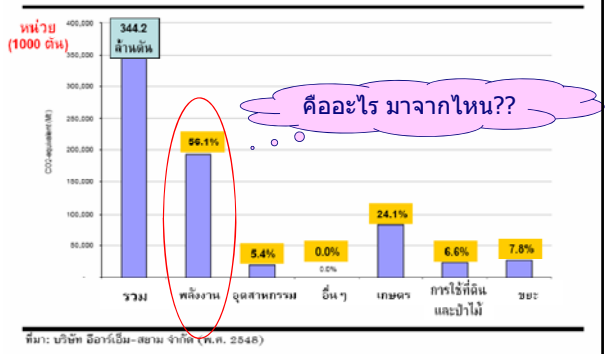
ฉลากรอยเท้าคาร์บอน CFP (Carbon Footprint)

Dr. Akajate Apikajornsin
Eco Design Consultant Co.,Ltd

Per Capita CO_2 emissions from fossil fuels and industry, 1996



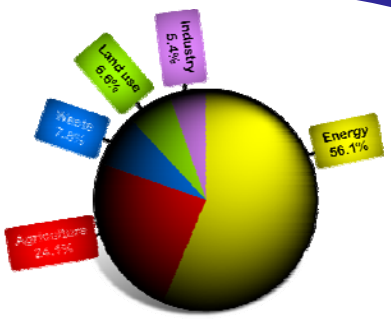
ปริมาณการปล่อยก๊าซเรือนกระจกของไทย 2546



ที่มา: บริษัท อีอาร์เอ็ม-สยาม จำกัด (พ.ศ. 2548)

ที่มา สพ. http://www.eppo.go.th/encon/report/ENCONFundSeminar/Seminar%2050-ENCON%20P-5-CDM-1-ONEP.pdf

GHGs emission in Thailand



What is Carbon Footprint?

- Amount of life cycle greenhouse gas emissions, expressed in terms of kg CO_2 equivalent (kg CO_2-eq)


What is Carbon Footprint (CFP)?

(1) Target greenhouse gases

- 6 types: CO_2, CH_4, N_2O, HFCs, PFCs and SF_6
- Target sources of release include nature (such as livestock and other agricultural processes)
- GWP: 100-year values of IPCC secondary report (calculation standard of emission by country in the Kyoto Protocol)

(2) Calculation range

Calculation is based on the entire lifecycle of:

- Raw-material procurement stage
- Production stage
- Distribution/sales stage
- Usage/maintenance management stage
- Disposal/recycling stage
  - → Suggests flexible handling (Ex: primary products, intermediate materials, etc.)

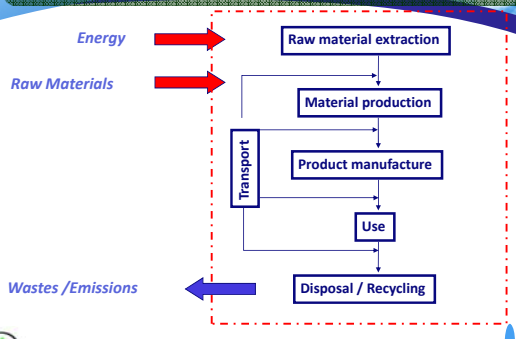
Why calculate CF?

- Measuring GHG emissions (carbon footprint)
- Setting target and reducing carbon emissions
- Communicating carbon footprint to businesses (B2B) or end consumers (B2C)

How to calculate CF?

- Life Cycle Assessment (ISO 14040 and 14044) with the particular focus on Global Warming Potential

CF scope of analysis

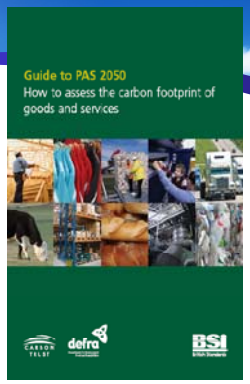


C Reduction label

ฉลากสิ่งแวดล้อมประเภท 2 และฉลากเฉพาะกลุ่มโรงแรม

Standard methods on CFP

- PAS 2050:2008
  Specification for the assessment of the life cycle greenhouse gas emissions of goods and services by BSI, Defra and Carbon Trust (launched on 29 October, 2008)
- Japanese guidelines
  being developed (to be launched in April 2009)
- ISO standard (ISO/WD 14067)
  on CF discussed at the Malaysia meeting (Jan 2009)



Defining Standards Internationally

CARBON TRUST

PAS 2050 has been downloaded over 12,000 times in over 90 countries.
(Direct downloads only; does not include informal distribution: eight months to May 2009)

Source : Robin Dickinson

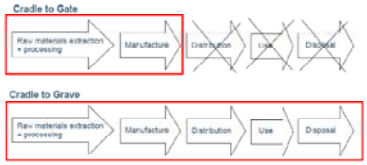
Global carbon labels

Carbon labelling

- **Result of CF:**
  - Overall result
  - Individual phase
- **Reporting of CF:**
  - B2B
  - B2C

Scope of CF

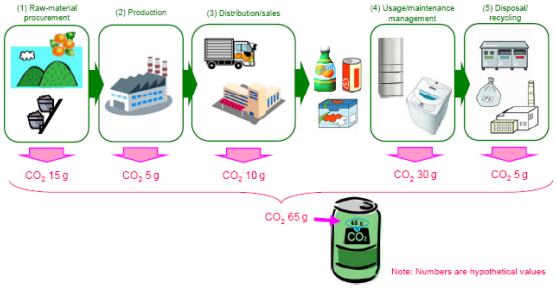
Business to Business (B2B): Provision of inputs, including product, to another party that is not the end user



Business to Consumer (B2C): provision of inputs, including products, to the end user

tructural Elements of Carbon Footprint (CFP)

- Carbon Footprint (CFP) is structured from 5 lifecycle stages of:



Claims of carbon label: Where?

- On-pack label
- Point-of-sale information
- CSR, Annual report
- Brochure (or supporting leaflet)
- Catalogue
- Website information

Many ways to communicate to consumers

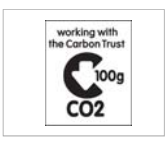
The label appeared first on three products

Who?	What?	Where?
WALKERS	Cheese & Onion Crisps	On pack
Boots	Botanics & Ingredients Shampoo	Point-of-sale
innocent little tasty drinks	Mango & Passion-fruit Smoothie	Website

Types of carbon labels

Low-carbon seal

Carbon rating



Carbon score

ประเทศที่ให้ความสนใจ

- สหราชอาณาจักร
- สาธารณรัฐฝรั่งเศส
- สวิสเซอร์แลนด์
- เยอรมันนี
- สหรัฐอเมริกา
- แคนาดา
- ญี่ปุ่น
- เกาหลีใต้
- จีน
- ไทย

การแสดงค่าคาร์บอนฟุตพริ้นท์ของประเทศไทย

- ติดบนผลิตภัณฑ์หรือภาชนะบรรจุ
- แสดงข้อมูล ณ จุดขาย ในรายงานประจำปี แผ่นพับ บัญชีรายชื่อสินค้า หรือบนเว็บไซต์
- แสดงค่าด้วยตัวเลข 3 ตัว เช่น 3.15 kg, 152 g

แนวทางการประเมิน CF ของผลิตภัณฑ์

เกณฑ์การใช้เครื่องหมายคาร์บอนฟุตปริ้นท์

- มีผลต่อผลิตภัณฑ์ 1 ชนิดที่ขอใช้เท่านั้น ระยะเวลาการใช้งานได้ 2 ปีต่อการขออนุญาตใช้ 1 ครั้ง
- เจ้าหน้าที่จะตรวจสอบกระบวนการผลิตผลิตภัณฑ์ที่ได้รับการอนุญาตใช้ทุก 6 เดือน
- ใช้ถูกต้องตามประเภทผลิตภัณฑ์
- ไม่ใช้เป็นส่วนหนึ่งของเครื่องหมายทางการค้า ชื่อทางการค้า เครื่องหมายบริการ เครื่องหมายรับรอง เครื่องหมายร่วมสัญลักษณ์ ลวดลาย งานลิขสิทธิ์บนผลิตภัณฑ์
- หยุดใช้เครื่องหมายหลังหมดสัญญา แต่ยังสามารถจำหน่ายผลิตภัณฑ์ที่มีเครื่องหมายได้อีกไม่เกิน 3 เดือนหลังหมดสัญญา

Carbon Footprint Projects in Thailand:

1. Research Project (TRF)
2. EU Funded Project (EU)
3. Thailand Carbon Footprint Pilot Project (MTEC & TGO)

Carbon Footprint Pilot Projects

123g CO2 working with the Carbon Trust

~25 pilot products (Apr.-Dec. 2009)

Pilot products: T-shirt (100% cotton), Nylon yarn, Carpet, Cake can, TULC can, Ceramic tiles, Paper, Rice flour, Jusmine rice, Chicken meat, Meat stick, Instant noodle, Canned tuna, Pineapple juice, Copying machine, Air conditioner, Tyre, PP cup, etc.

Source : Dr. Thamrongrut Mungcharoen

ผลิตภัณฑ์ที่ได้รับ CF ของประเทศไทย-1

ผลิตภัณฑ์ที่ได้รับ CF ของประเทศไทย-2

โค้กกระป๋อง 325 CC
CFP = 258 g CO_2-eq

เส้นหมี่กึ่งสำเร็จรูปน้ำใส 55 g
CFP = 375 g CO_2-eq

เนื้อไก่สด ซีพี ขนาด 1 kg
CFP = 2.9 kg CO_2-eq

ไก่ย่างเทอริยากิ ซีพี ขนาด 110 g
CFP = 302 g CO_2-eq

ข้าวหอมมะลิ 100 % หงษ์ทอง 5 kg
CFP = 22.9 kg CO_2-eq

แกงเขียวหวานหุบ่า ซีเล็ค 185 g
CFP = 521 g CO_2-eq

ผลิตภัณฑ์ที่ได้รับ CF ของประเทศไทย-3

กล่องอาหาร-ฝา Ezy go ขนาด 34 g
CFP = 392 g CO_2-eq

เส้นด้ายยืดไนล่อน 6 1 kg
CFP = 3.89 kg CO_2-eq

พรมปูพื้น ขนาด 1 m^2
CFP = 82.7 kg CO_2-eq

กระเบื้องเซรามิคปูผนัง คอตโต ขนาด 1 m^2
CFP = 5.32 kg CO_2-eq

อาหารไก่เนื้อ เบอร์ 203, 304 และ 205
CFP = 9.97, 10.8 และ 10.4 kg CO_2-eq ตามลำดับ

ผลิตภัณฑ์ที่ได้รับ CF ของประเทศไทย-4

บริษัท	ผลิตภัณฑ์	คาร์บอนฟุตพริ้นท์
1.บางกอกแคน แมนนูแฟคเจอริ่ง จำกัด	กระป๋องเครื่องดื่ม TULC ขนาด 330 มิลลิลิตร	131 kg CO_2-eq
2.ทิปโก้ฟูดส์ (ประเทศไทย) จำกัด มหาชน	น้ำสับปะรดเข้มข้น 65 Brix ทิปโก้ ขนาด 200 ลิตร	583 kg CO_2-eq
3.ยางโอตานิ จำกัด	ยางรถแทรกเตอร์ รุ่น F-17 12.4-24 (R1) ขนาด 40.66 กิโลกรัม	163 kg CO_2-eq
4.การบินไทย จำกัด (มหาชน)	Chicken Curry "Kiew-wan", Steamed Thai Hom Mali Rice และ Chicken Curry "Mussaman", Steamed Thai Hom Mali Rice	1.39 และ 1.36 kg CO_2-eq ตามลำดับ

สรุป : คาร์บอนฟุตพริ้นท์สำหรับผู้ผลิต

- ทราบปริมาณการปลดปล่อยก๊าซเรือนกระจกในแต่ละขั้นตอน
- สามารถจำแนกประเด็นปัญหาหลัก และลำดับความสำคัญสิ่งที่ต้องแก้ไข ปรับปรุงรวมทั้งการออกแบบผลิตภัณฑ์ที่คำนึงถึงสิ่งแวดล้อมโดยตลอดวัฏจักรชีวิตของผลิตภัณฑ์
- การแสดงข้อมูลคาร์บอนฟุตพริ้นท์ เป็นการแสดงความตั้งใจในความรับผิดชอบต่อสิ่งแวดล้อม และสังคม
- มีส่วนร่วมในการช่วยลดปัญหาภาวะโลกร้อนและการเปลี่ยนแปลงสภาพภูมิอากาศ

สรุป : คาร์บอนฟุตพริ้นท์สำหรับผู้บริโภค

- ทราบข้อมูลปริมาณการปลดปล่อยก๊าซเรือนกระจก เพื่อเกิดความตระหนักถึงการปลดปล่อยก๊าซเรือนกระจก อันเนื่องมาจากรูปแบบและวิธีการบริโภคของตน
- ทราบแนวทางการปรับเปลี่ยนวิธีการใช้ผลิตภัณฑ์ เพื่อช่วยลดการปลดปล่อยก๊าซเรือนกระจก
- เลือกซื้อผลิตภัณฑ์ที่มีฉลากคาร์บอน เพื่อแสดงความร่วมมือในการช่วยลดปัญหาภาวะโลกร้อน

Budgeting

- Demo Project

  50,500

  App 500 + processing 10,000 + used of logo 4,000 + verification 36,000 (12,000 x 3)
- Non demo (before 30/6/10)

  Consult Fee +50,500
- Non demo (after 30/6/10)

  Consult Fee + Verification Fee + 14,500

Grouping of Similar Product

- **Similar product : Variation of size/color (and minor material for food industries)**
- **Fee for the used of logo will be reduced 50% when submit 10 products (group) at the same time.**

Example

- **Carbon footprint for product of Glass**
  - B2B or B2C (in this example select B2B)
  - Material production
    - Washing
    - Melting
    - Forming
    - Finishing
    - Packing
  - Production
  - Including Transportation / warehouse / maintenance

Example

- **Carbon footprint for product of Glass**
  - Production process
    - Washing
    - Melting
    - Forming
    - Finishing
    - Packing

Example

- **Carbon footprint for Organization**

Process Flow

- Incoming
- Storage
- Production
- Quality control
- Packing
- Warehousing
- Shipping

Example

- **Carbon footprint for Organization (2)**

Organization department

- HR
- purchasing
- Maintenance
- R&D

Example

- **Carbon footprint for Organization (3)**

Scope 1

- Stationary Combustion
- Mobile Combustion
- Process Emission
- Fugitive emission

Scope 2

- Indirect Emission from purchased electrical and other power form

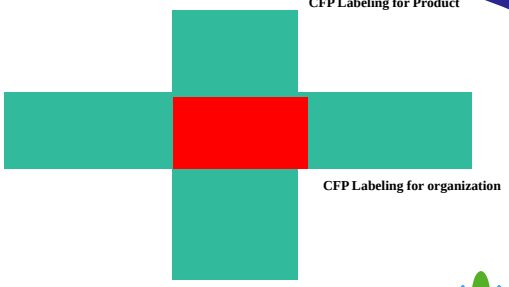
Scope 3

- Other indirect emission own or control by other organization

Carbon Issue

- **Carbon Credit (CDM)** **(may claim 14064-2)**
- **Carbon Footprint**
  - CFP Inventory Report (14064)
  - CFP labeling for product (14067) (TGO)
  - CFP labeling for Organization (14069) (TGO)
- **Carbon Offset**

CFP Labeling



Conclusion

- **Why**
  - Regulation, standard, or trade barrier
  - Customer requirement
  - Global or Head Quarter policy
  - CSR improvement
  - Want reduce cost as well as become sustain
- **When**
  - The earliest the best
- **With Whom**
  - Eco Design Consultant Co., Ltd.

Thank you

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Tel : +66(0) 2945 9775
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237/1 Ramintra 61 Road Tareang Bangkhen Bangkok 10230

• การจัดการเหมืองแร่ด้วยการผลิตที่สะอาด (Cleaner Technology)

Clean Technology for Mining & Primary Industry

รศ. ดร. ดาวัลย์ วิวรรธนะเดช
และ
ผศ. สมศักดิ์ สายสินธ์ชัย
ภาควิชาวิศวกรรมเหมืองแร่และปิโตรเลียม
คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

What's Mining & Primary Industry?

Mining is **the drawing out** of ***valuable minerals*** or other forms of geological matters from the earth, commonly (but not always) from an ore body, vein or (coal) stratum. http://www.greatmining.com/mining.phphttp://www.greatmining.com/mining.php

Primary industry involves *the turning of* ***natural resources*** *into* ***primary products***, most of which are **raw materials** for other industries.

Note:

Primary Industries is the term used to describe organizations that are involved in the development and production of raw materials.

Secondary Industries are involved in the manufacture of goods.

Tertiary Industries is the field of industries that provide transportation or finance rather than manufacturing or extracting raw materials.

http://wiki.answers.com/Q/What_are_primary_secondary_and_tertiary_industries

Mining Industry

Mining

Remove **Geological Matters** (inc. **Minerals**) from the Earth

Mineral Processing and/or **Metallurgy**

Raw Materials
for
Energy, Industry, Consumer Products

Ex: - Coal	⇒ Energy
- Limestone, Marble, Granite	⇒ Construction Materials
- Kaolin, Feldspar, Silica Sand	⇒ Glass, Ceramics
- Rock Salt	⇒ NaCl salt
- Gemstones, Precious Metals, Base Metals, etc.	

Therefore, "Mining" is an essential industry.

Mining Technology

Surface Mining (Open-Pit)

http://pubs.usgs.gov/fs/2005/3023/

การทำเหมืองเทคนิคนี้จะต้องมีการระเบิดหน้าเหมือง หากขาดข้อมูลเชิงวิชาการ เลือกวิธีการระเบิดไม่เหมาะสม อาจส่งผลกระทบด้านสิ่งแวดล้อมและความปลอดภัย

นอกจากผลกระทบด้านความปลอดภัยแล้ว ยังอาจส่งผลกระทบด้าน เสียง แรงสั่นสะเทือน ปัญหาฝุ่นละออง และ ทัศนียภาพ

- ควรออกแบบเหมืองและการเจาะระเบิด ให้ส่งผลกระทบน้อยที่สุด
- ควรควบคุมฝุ่นละอองจาก **การระเบิดและขนส่ง** ด้วยการรดน้ำ และ/หรือ ปลูกต้นไม้เป็น Buffer Zone
- ควรวางแผนฟื้นฟู หลังสิ้นสุดกิจกรรม

Underground Mining

http://www.maxfielddrilling.com.au/underground.html

การทำเหมืองเทคนิคนี้ต้องใช้เทคโนโลยีขั้นสูง หากขาดข้อมูลเชิงวิชาการ อาจส่งผลกระทบทั้งด้านสิ่งแวดล้อม และความปลอดภัย เช่น เหมืองถล่ม เป็นต้น

Mining Activity

- **มลทินในแร่** โดยเฉพาะโลหะหนัก
- **สารปนเปื้อน** จากกระบวนการแยกสกัดแร่
- **ฝุ่นละออง** จากกิจกรรมเหมืองและการขนส่งแร่
- **เสียงและแรงสั่นสะเทือน** จากการระเบิดหน้าเหมือง
- **ทัศนียภาพ**

ส่งผลกระทบ ต่อ
สิ่งแวดล้อม สุขภาพ และ **ความปลอดภัย**

ภาพลักษณ์เชิงลบ

กระแสต่อต้าน

สาเหตุของปัญหา

ผู้ประกอบการ (บางราย)	ประชาชน	ภาครัฐ
ขาดจิตสำนึกความรับผิดชอบ	ได้รับผลกระทบจริง	กฎหมาย/มาตรการ ไม่เอื้อ / ไม่สอดคล้องข้อเท็จจริง ⇒ ปฏิบัติไม่ได้
ขาดข้อมูลทางวิชาการ	ตามกระแส	การกำกับไม่เข้มงวด ไม่จริงจัง
	ได้รับข้อมูลคลาดเคลื่อน/แอบแฝง	ขาดการบูรณาการระหว่างหน่วยงาน
	ไม่ไว้ใจ/ไม่เชื่อมั่น	

แนวทางแก้ปัญหา

จิตสำนึก และ ความจริงใจ ของผู้ประกอบการ + มวลชนสัมพันธ์

กำจัดภาพลบเดิมๆ สร้างภาพบวกให้มากขึ้น

เสริมสร้างความเข้าใจ หาคำตอบที่เป็นปัญหาแท้จริง แก้ไขให้ตรงประเด็น

Clean Technology

Low Carbon Growth

What's Clean Technology?

เทคโนโลยีสะอาด (Clean Technology: CT) หมายถึง การพัฒนา ปรับปรุง หรือเปลี่ยนแปลง กระบวนการผลิต และ/หรือ ผลิตภัณฑ์อย่างต่อเนื่อง เพื่อให้ ...
การใช้วัตถุดิบ พลังงาน และทรัพยากรธรรมชาติ เป็นไปอย่างมีประสิทธิภาพ ก่อให้เกิดผลกระทบ ความเสี่ยงต่อมนุษย์และสิ่งแวดล้อม น้อยที่สุดเท่าที่จะเป็นไปได้ ด้วยการ ลดมลพิษที่แหล่งกำเนิด (Reduce at Source or Pollution Prevention) และมีของเสียเกิดขึ้นน้อยที่สุด (Waste Minimization) หรือ ไม่มีเลย (Zero Waste) ด้วยการ ...

- ลดหรือปรับเปลี่ยนวัตถุดิบ
- การใช้ซ้ำและการนำกลับมาใช้ใหม่

เป็นการอนุรักษ์ *ทรัพยากรธรรมชาติ พลังงาน และ สิ่งแวดล้อม*
รวมถึงลดต้นทุนการผลิต ควบคู่กันไป

http://eco-town.dpim.go.th/webdatas/articles/ArticleFile57.pdf

วิวัฒนาการของ Clean Technology?

End-of-Pipe Treatment

Pollution Prevention (Reduce @ Source)

Cradle-to-Grave

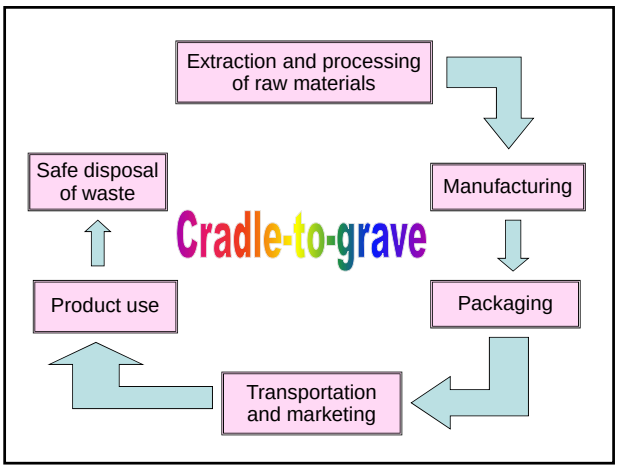
Cradle-to-Cradle (Zero Waste Approach)

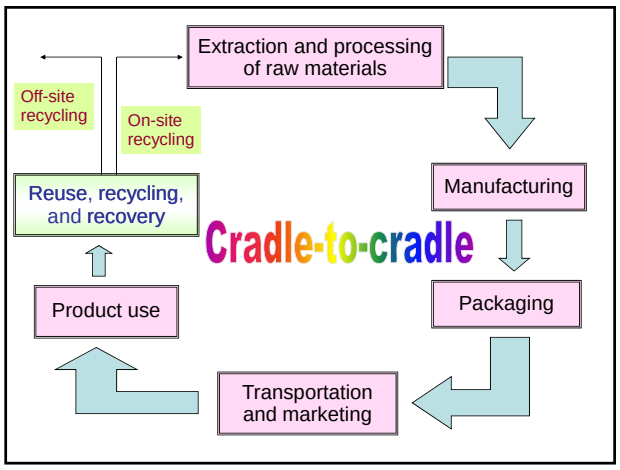
Zero Waste Approch

Zero waste approach involves not only waste reduction but also waste utilization (*recovery & recycling, WtE*).

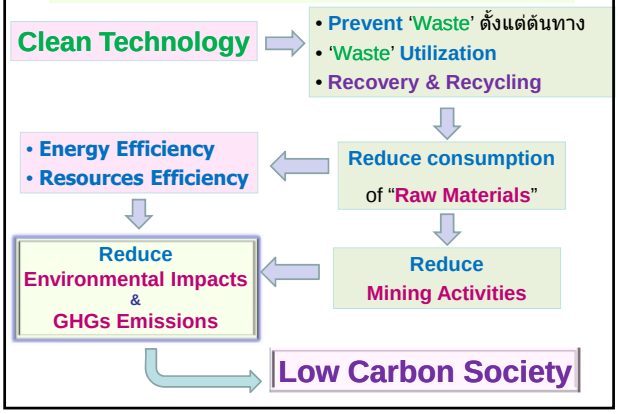
Zero waste approach ≡ Life cycle waste management
or Cradle-to-cradle philosophy
Objective: not only to conserve the environment, but also to conserve natural resources.

Cleaner production ≡ Waste reduction or control throughout the whole process
or Cradle-to-grave philosophy
Note: This is to control or reduce waste since **the raw materials extraction** till **the disposal or landfill**.





The Way Towards Low Carbon Society



มาตรการลดก๊าซเรือนกระจก

มาตรการภาคบังคับ (Regulated Measures)

- Kyoto Protocol (บังคับสำหรับ Developed Countries)
- EU-ETS (บังคับภายในกลุ่ม EU)
- Post Kyoto …. Under Negotiation

มาตรการภาคสมัครใจ (Voluntary Measures)

- National policy on EE & RE
- Carbon footprint & Carbon Labeling
- Carbon offset / Carbon Neutral

Carbon Market

- Regulated Carbon Market (RCM)
  - ⇒ Kyoto Mechanisms
  - ⇒ EU-ETS (Cap-and-Trade system)
- Voluntary Carbon Market (VCM)
  - ⇒ Free market
    - อาจซื้อเพื่อ CSR หรือเก็บไว้ขายในอนาคต
  - ⇒ Cap-and-Trade system
    - เช่น Chicago Climate Exchange (CCX)

Carbon Offset / Carbon Neutral

กรณีกิจกรรมของตนปล่อย GHG มาก
จึงแสดงความรับผิดชอบต่อสังคม (CSR)
โดยไปลงทุนโครงการลดก๊าซฯที่อื่น (ง่ายหรือถูกกว่า)
แล้วนำมาหักล้างกับปริมาณที่ปล่อยจริง
หาก**หักล้างได้หมด** ⇒ **Carbon Neutral**

2 Types of Carbon Offset

- Technology-based offset
- Land use-based offset

⇒ **ปลูกป่า** หรือ **อนุรักษ์พื้นที่ป่า**

Note: Carbon offset
ต้องไม่นำไปสู่ "An excuse for No action"

Carbon Footprint

- **บังคับ** หรือ **สมัครใจ**?
- เกี่ยวข้องกับ **CSR** อย่างไร?

เราจะ**ลดรอยเท้า**คาร์บอนของตนเองได้หรือไม่? อย่างไร?

Carbon Footprint คือ อะไร?

ใช้บ่งบอก **ปริมาณการปล่อย CO_2 ต่อหน่วยสินค้า**

อาจเป็น

- ปริมาณการปล่อย CO_2 จากกระบวนการผลิตสินค้านั้น

หรือ

- ปริมาณการปล่อย CO_2 ตลอดวงจรชีวิตของสินค้านั้น

Carbon Footprint Label

การนำเสนอรอยเท้าคาร์บอน มีหลายรูปแบบ

- Carbon Footprint Label บ่งบอกปริมาณการปล่อยก๊าซฯ
- Low Carbon Certificate
- Carbon Reduction Label
  ที่มีการจัดลำดับแสดงระดับการลด CO_2
  (คล้ายฉลากประหยัดไฟเบอร์ 5)

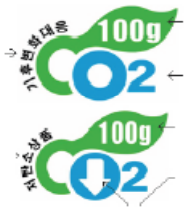
ตัวอย่างฉลากคาร์บอน

UK

Canada

ตัวอย่างฉลากคาร์บอน

Japan



Korea
1. Show amount of GHG emission
2. Show the emission is lower than allowance value.

ฉลากคาร์บอนของไทย

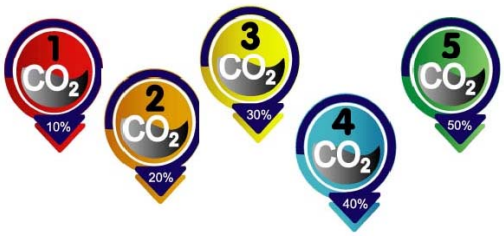
Representing the GHG in term of CO_2 equivalent

Arrow points down symbolizing the GHG emission reduction.

Objective: To represent simple and easy-understanding information for consumers in making choices.

ฉลากการลดคาร์บอนของไทย

Thailand Carbon Reduction Label



ข้อดีของการมีฉลากคาร์บอน

ผู้บริโภคได้อะไร?
- ทางเลือกในการซื้อสินค้าและบริการ
- กระตุ้นให้ผู้ผลิตปรับปรุงกระบวนการผลิตให้ปล่อย GHG น้อยลง
- มีส่วนร่วมในการลดโลกร้อน

ผู้ผลิตได้อะไร?
- ลดต้นทุนการผลิตจากการเพิ่มประสิทธิภาพการผลิต
- แสดงเจตนารมณ์ในการรับผิดชอบต่อสังคม (CSR)
- สร้างภาพลักษณ์ที่ดีให้แก่บริษัท

ตัวอย่างการลด Resources Consumption ด้วย CT

- Clean Coal Technologies (CCTs)
  Ex. ปรับปรุงคุณภาพถ่านหิน ก่อนใช้งาน
- Resources Efficiency via 3Rs'
- Recycling for Resources Efficiency
- Waste Utilization / Waste-to-Energy
  Ex. ใช้ Fly Ash เป็นส่วนผสมในซีเมนต์ หรือใช้ Waste เป็นเชื้อเพลิง
- Efficiency Improvement in Quarry Industry
  Ex. - ใช้ Feeder ที่ออกแบบแยกเศษดินออกจากหินก่อนป้อนเข้าปากโม่
  - ใช้สายพานลำเลียงหินลงสู่ Bin หรือลำเลียงจากอุโมงค์ลงสู่รถบรรทุกโดยตรง แทนการใช้รถตักจากกองหิน

Clean Coal Technologies

1. Pre-Combustion Technology → 2. Combustion Technology → 3. Post-Combustion Technology

เทคโนโลยีก่อนการเผาไหม้ | เทคโนโลยีระหว่างการเผาไหม้ | เทคโนโลยีหลังการเผาไหม้

- Coal Preparation - Coal Briquetting - Coal Upgrading Technology - Coal Liquid Mixture (CWM / COM) - Coal Liquefaction - Coal Gasification - etc.	- Advanced Pulverized Coal Combustion (APCC) - Low NO_x Burner - Fluidized Bed Combustion (FBC) - Integrated Gasification Combined Cycle (IGCC) - etc.	- Fabric Filter - Electrostatic Precipitator (ESP) - Flue Gas Desulfurizer (FGD) - Selective Catalytic Reduction (SCR) - Solid Waste Utilization - etc.

Clean Coal Technologies

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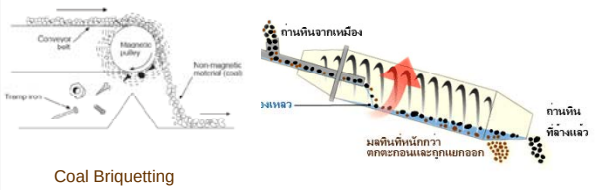
Coal Preparation / Coal Upgrading

ปรับปรุงคุณภาพถ่านหินที่ได้จากเหมือง ก่อนนำไปใช้งาน เพื่อเพิ่มค่าความร้อนและลดสารก่อมลพิษ (กำจัด ความชื้น ซัลเฟอร์ และมลทินต่างๆ) ⇒ **เพิ่มประสิทธิภาพพลังงาน**



Coal Briquetting

หลังการปรับปรุงคุณภาพถ่านหิน สามารถอัดก้อนถ่านหิน หรือบดแล้วทำเป็น Coal Liquid Mixture

1. Pre-Combustion Technology → 2. Combustion Technology → 3. Post-Combustion Technology

เทคโนโลยีก่อนการเผาไหม้ | เทคโนโลยีระหว่างการเผาไหม้ | เทคโนโลยีหลังการเผาไหม้

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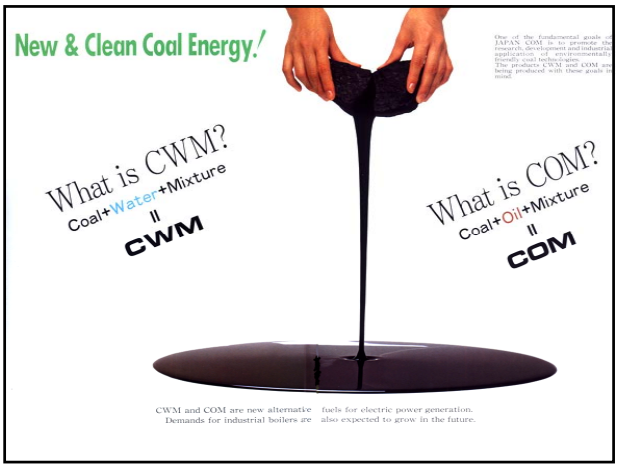

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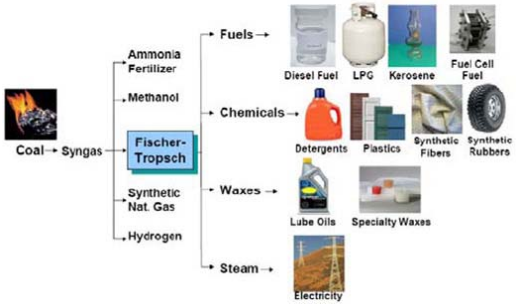
- etc.

- Fabric Filter
- Electrostatic Precipitator (ESP)
- Flue Gas Desulfurizer (FGD)
- Selective Catalytic Reduction (SCR)
- Solid Waste Utilization
- etc.

Coal Liquefaction - (Coal-To-Liquids)

ถ่านหิน สามารถนำมาแปรสภาพเป็นผลิตภัณฑ์เหลวได้ ด้วยกระบวนการทางเคมี (Direct Liquefaction) หรือ ผ่านการแปลงเป็นก๊าซก่อน (Indirect Liquefaction) เพื่อผลิตผลิตภัณฑ์ทดแทนผลิตภัณฑ์จากปิโตรเลียม



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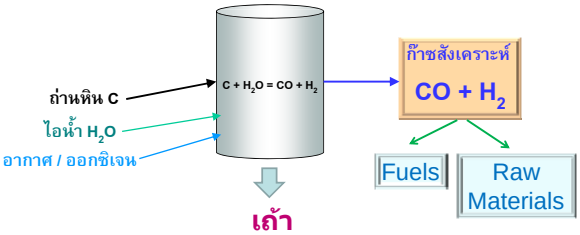
- Solid Waste Utilization
- etc.

GASIFICATION TECHNOLOGY

ถ่านหิน สามารถนำมาแปลงเป็นก๊าซสังเคราะห์ หรือ Syn Gas ($CO + H_2$) ซึ่งอาจใช้ทดแทนเชื้อเพลิงก๊าซ หรือ ใช้เป็นสารตั้งต้นในอุตสาหกรรมอื่นๆ รวมถึงใช้เป็นแหล่งพลังงานไฮโดรเจน

เครื่องปฏิกรณ์ (Gasifier)



Resource Efficiency via 3Rs

Thinking about Waste: from Loss to Gain

Reduce wastes for final disposal,
while Reuse & Recycle valuable resources

3Rs: Zero Waste Approch

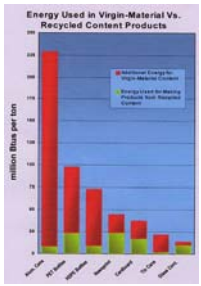
Reduce resources & wastes generated in production
Reuse products and waste materials, in their existing forms (including production of by-products)
Recycling wastes into a form suitable for use as an input to production – lie at the heart of any effort to achieve resource efficiency

Note: "Waste to final disposal" would refer only to those materials that have absolutely no potential to be utilized and, therefore, have no economic value.
Even many hazardous or toxic materials can be recycled or re-refined for reuse.

ตัวอย่าง
Recycling for Resources Efficiency

How Recycle Conserves Energy?

Using secondary materials involves ***substantial energy savings*** when compared with primary production



Recycled **Aluminum**
⇒ 95% Energy Saving

Recycled **Copper**
⇒ 85% Energy Saving

Recycled **Steel**
⇒ 74% Energy Saving

Recycled **Plastics**
⇒ 80% Energy Saving

Recycled **Paper**
⇒ 64% Energy Saving

ตัวอย่าง
Waste Utilization / Co-Processing

What is Co-processing?

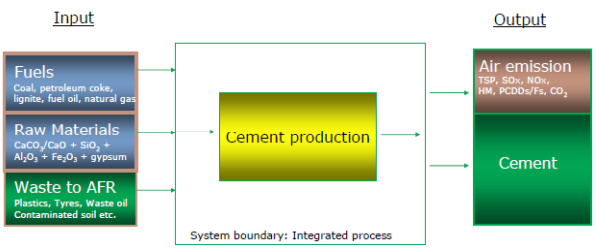
Co-Processing refers to the use of waste materials or by-products from one industrial process to substitute primary fuel and raw material in another process.

These materials are referred to as Alternative Fuels and Raw materials (AFR)

Industries where co-processing is applicable include:
- Cement manufacturing
- Thermal power industry
- Steel industry
- Lime production
- Ceramics, bricks, glass
- Chemical industry
- Petroleum industry

Source: Geocycle, a business unit of Siam City Cement, January 2011.

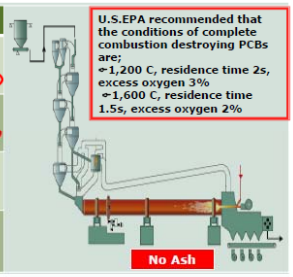
System boundary: Integrated process (Co-processing)



Source: Geocycle, a business unit of Siam City Cement, January 2011.

Co-processing of waste in the cement kiln is an environmental-friendly alternative for responsible industries;

Characteristics	Temperature and time
Temperature at main burner	>1450°C: material >1800°C: flame temperature
Residence time at main burner	>12-15 sec and >1200°C >5-6 sec and >1800°C
Temperature at precalciner	>850°C: material >1000°C: flame temperature
Residence time at precalciner	>2 - 6 sec and >800°C



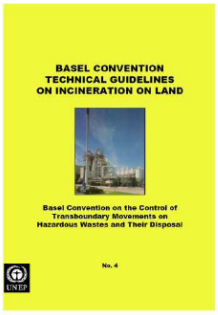
U.S.EPA recommended that the conditions of complete combustion destroying PCBs are;
≈1,200 C, residence time 2s, excess oxygen 3%
≈1,600 C, residence time 1.5s, excess oxygen 2%

Source: Guidelines on co-processing waste material in cement production, 2006

Source: Geocycle, a business unit of Siam City Cement, January 2011.

World views of Co-processing of Hazardous Waste in cement kilns

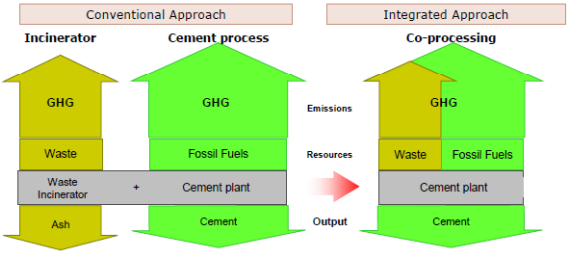
- **..is recognized as an environmentally sound disposal method of hazardous waste in the context of Basel Convention Technical Guidelines.**



Source: Geocycle, a business unit of Siam City Cement, January 2011.

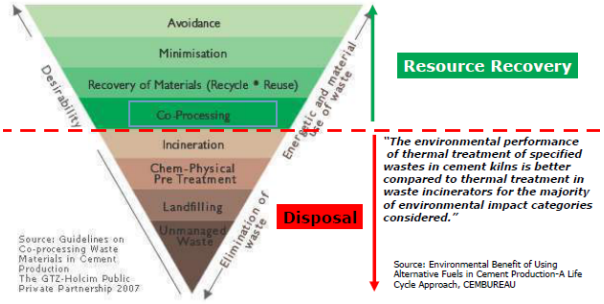
World views of Co-processing of Hazardous Waste in cement kilns (cont'd)

- **Substituting fossil fuel and virgin material by waste (AFR) will <u>further reduce overall CO_2 emissions</u>** (GTZ-Holcim, 2006)



Source: Geocycle, a business unit of Siam City Cement, January 2011.

World views of Co-processing of Hazardous Waste in cement kilns (cont'd)



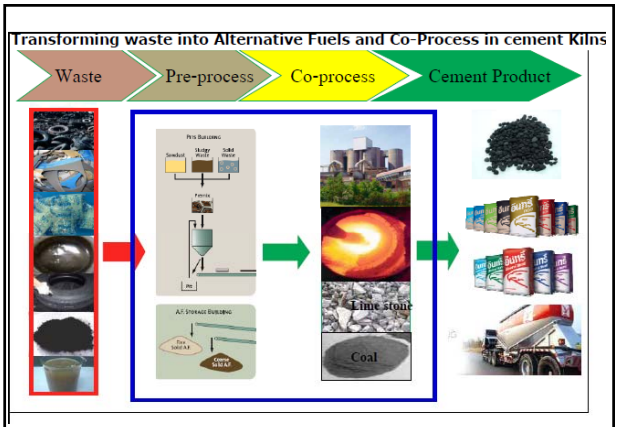
Source: Geocycle, a business unit of Siam City Cement, January 2011.

Destruction of Cadmium contaminated of un-husked rice

Co-Processing Success Story

Co-Processing Contaminated Rice :
Best Environmental Solution for Tak Community

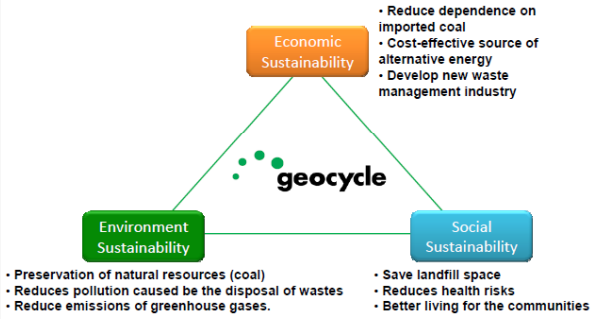
Source: Geocycle, a business unit of Siam City Cement, January 2011.



Source: Geocycle, a business unit of Siam City Cement, January 2011.

Benefit of Co-Processing

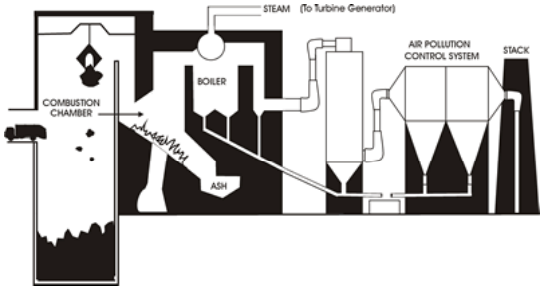
Sustainable Development Strategy



Source: Geocycle, a business unit of Siam City Cement, January 2011.

ตัวอย่าง
Waste-to-Energy

Waste-to-Energy Plants



It works very much like coal-fired power plant.
The only difference is the use of **garbage** instead of **coal**.

ตัวอย่าง
Efficiency Improvement
ในเหมืองหินและโรงโม่หิน

ลดพลังงานและฝุ่นจากการใช้รถตักหิน โดยลำเลียงหินผ่านสายพานจากอุโมงค์ลงสู่รถบรรทุกโดยตรง

พร้อมติดตั้งระบบสเปรย์น้ำที่เหมาะสม

Thank you

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• การลดการระบายก๊าซเรือนกระจกจากการทำเหมืองแร่

(Carbon Reduction)

Mitsubishi UFJ Morgan Stanley

Carbon Reduction in Mining sector of Thailand

CDM Seminar for Mining sector in Thailand

The Twin Towers Hotel

February 25, 2011

Clean Energy Finance Committee

Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

Contents

- MUMSS Profile
- Carbon Reduction in Mining Sector
- Case Study for ACM0008
- Japan’s Bilateral Offset Mechanism

1. MUMSS Profile

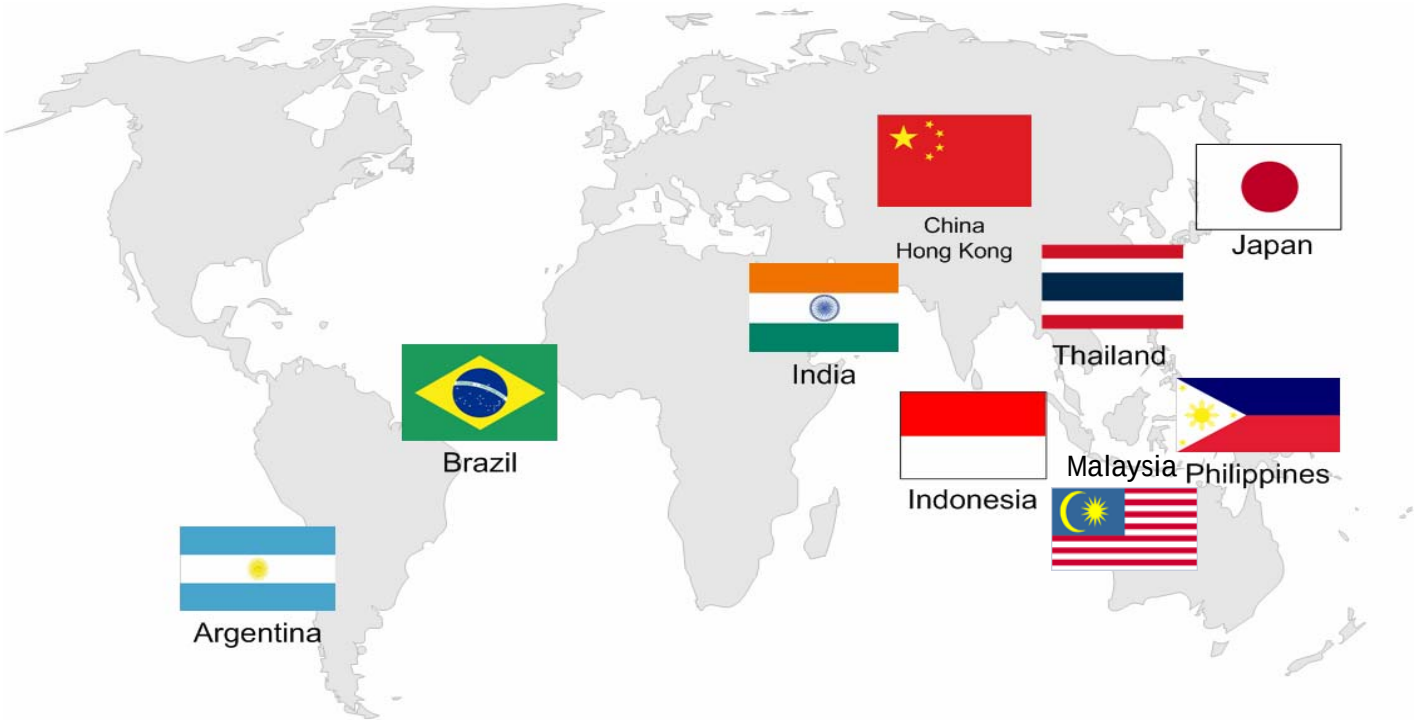
Mitsubishi UFJ Morgan Stanley

- Mitsubishi UFJ Morgan Stanley Securities (MUMSS)
  - ✓ Brokerage and investment banking arm of Mitsubishi UFJ Financial Group
  - ✓ Became an MUFG majority-owned JV with Morgan Stanley Japan in May 2010
- Mitsubishi UFJ Financial Group (MUFG)
  - ✓ Largest banking group in Japan
  - ✓ Total assets: US$ 2.2T; Market Cap: US$ 67.5B
  - ✓ Approx. 1,200 locations in Japan, 460* locations worldwide
  - ✓ Bank of Tokyo-Mitsubishi UFJ, under MUFG

* Includes 341 branches of Union Bank, commercial bank in the US.

Clean Energy Finance Committee

- MUMSS set up Clean Energy Finance Committee (CEF) in 2001
- 35 professionals globally, incl. Thailand
- Global leader in CDM/JI consulting
  - ✓ Registered 43 CDM projects, incl. 10 in Thailand
  - ✓ Authored 7 new methodologies
- CDM/JI credits placement/brokerage service



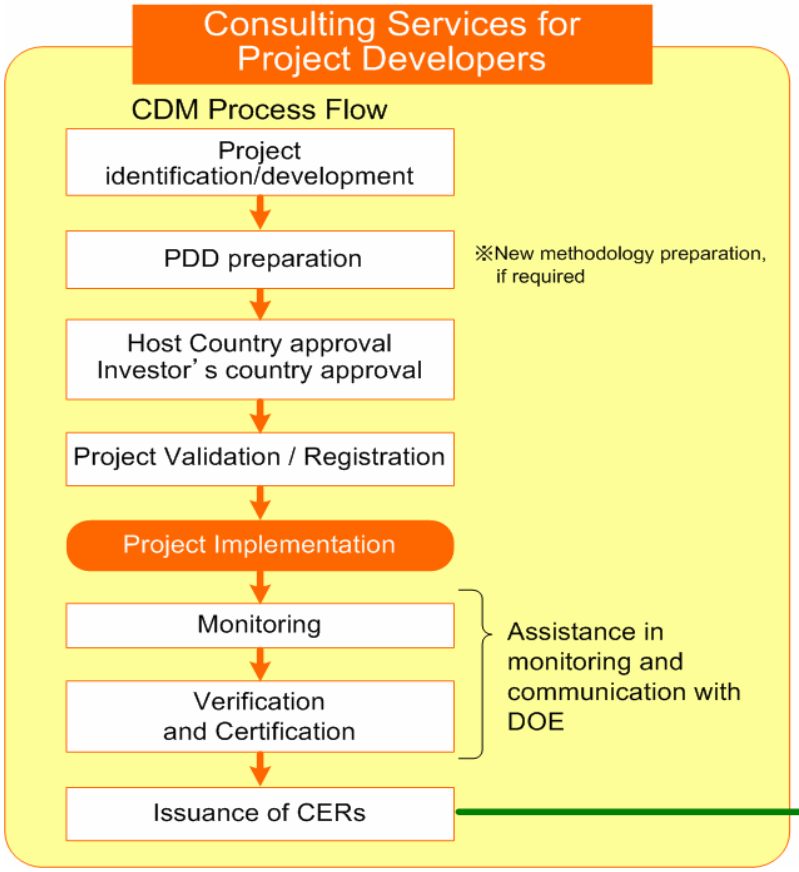
Consulting services available in the following languages:

- ❖Bahasa Indonesia
- ❖Bulgarian
- ❖Chinese (Mandarin and Cantonese)
- ❖English
- ❖French
- ❖German
- ❖Hindi
- ❖Japanese
- ❖Korean
- ❖Portuguese
- ❖Russian
- ❖Spanish
- ❖Thai

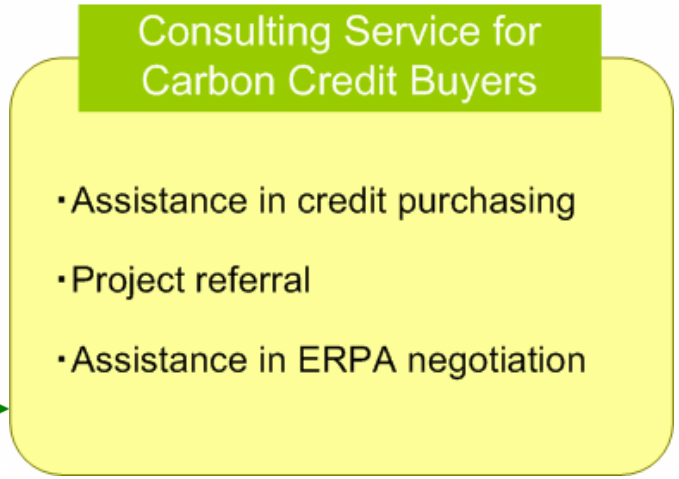
Our Activities

1) MUMSS offers comprehensive consulting services to our clients. To project developers, MUMSS offers an initial evaluation of CDM qualification to their projects, new methodology development, if necessary, preparation of a project design document ("PDD"), and assistance in all phases in the project cycle up to the issuance of CERs.

2) To CER (for CDM) or Emission Reduction Units ("ERU") (for JI) buyers, MUMSS offers services including project referral, project evaluation and assistance in negotiations for an Emission Reduction Purchase Agreement (ERPA) with CER/ERU sellers.



- Advisory service for project developers/owners (Carbon Credits sellers) in host countries
- Advisory for project developers/owners for buyers mainly in Japan
- Advisory service for technology providers



2. Carbon Reduction in Mining sector

Source of GHG emission in mining sector

- CH_4 emission
  - Mine methane, ventilation air methane and non-mine methane and operating mine that can be released due to mining activity
  - Use of chemical and explosive in mining process (if use)
- CO_2 emission
  - Fossil fuel consumption (i.e. diesel oil) of transportation in the mining process
  - Electricity consumption in the mining process from fossil fuel based power generation in Thailand