Introduction to U.S. EPA's Integrated Environmental Strategies (IES) Co-Benefits Training Modules

16th AP Seminar on Climate Change
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U.S. Environmental Protection Agency (EPA)

Overview

- Overview
- Hands-On Exercise: *Thinking About Co-Benefits*
- IES, EPA's Approach to Co-Benefits
- IES Tools and Resources
- IES Handbook & Training Modules
- IES Training Module Excerpt
- Hands-On Exercise: *Thinking About Stakeholders*

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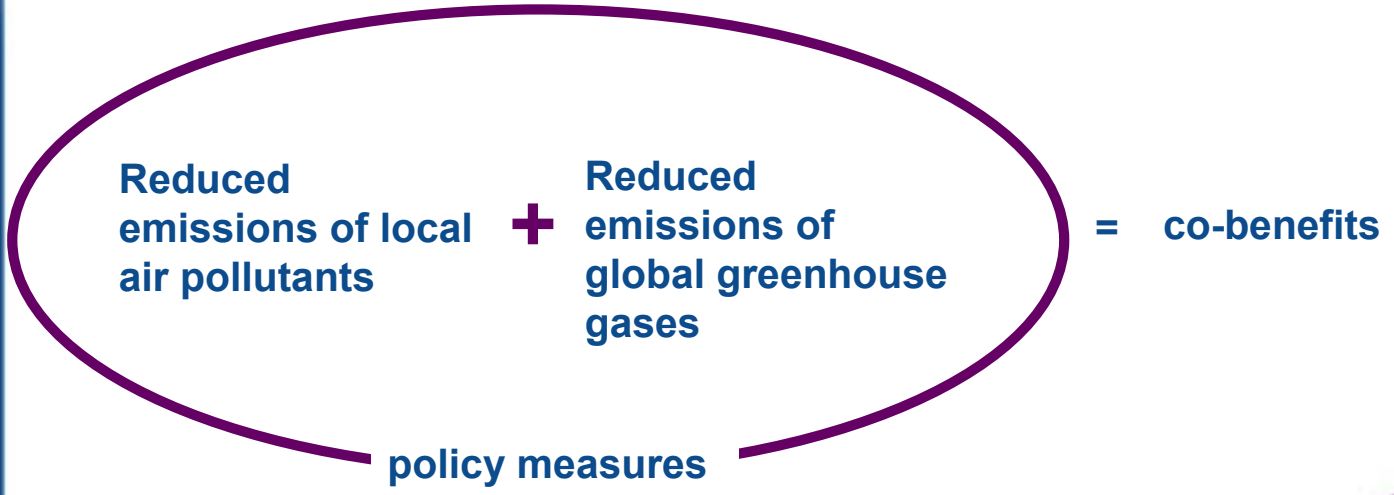
Hands-On Exercise # 1
Thinking About Co-Benefits

Key IES Term

- ***Co-benefits:*** Multiple (two or more) benefits that result from the same environmental measure or set of measures.



GHG Measure	LOCAL Benefits	GLOBAL Benefits
Landfill methane gas recovery and reuse for energy	Y reduces nuisance emissions and displaces fossil fuel emissions	Y removes a potent GHG, converting CH4 into H20 + CO2
Wind power		
Installing a smokestack scrubber at a coal-Burning facility		
Energy Efficiency		
Particulate traps on diesel buses		
Manage forests for increased carbon conservation		
Reducing / eliminating the use of SF6 (high global warming potential gas, 22,000 X		
Setting stringent PM_{10} (particulate matter) targets.		

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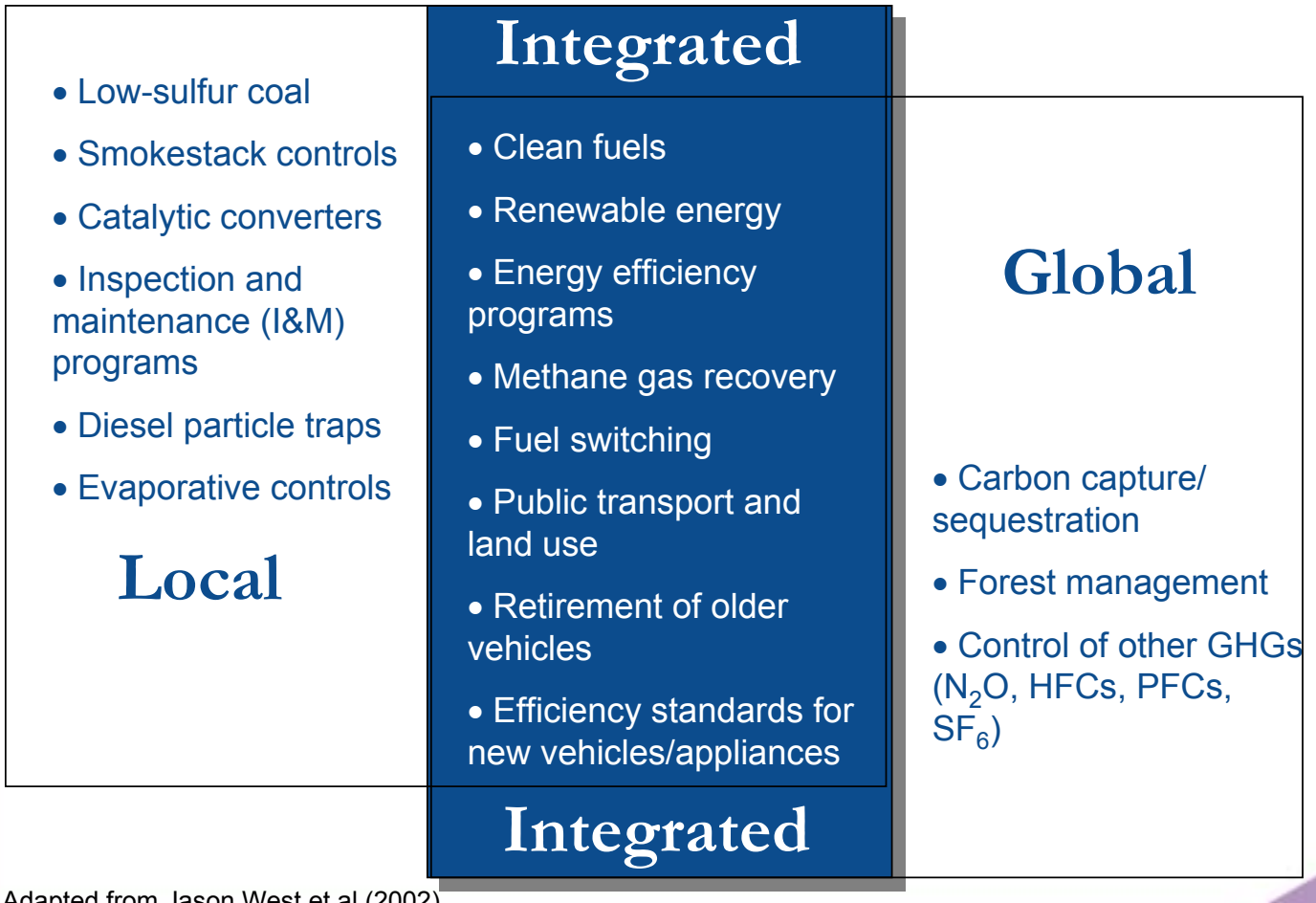
What Are Integrated Measures?



Adapted from Jason West et al (2002)

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What is IES?

Introducing EPA's Co-Benefits Approach

U.S. EPA's Integrated Environmental Strategies (IES) Co-benefits Approach

Evaluates:

- Environmental benefits
- Human health benefits
- Economic benefits

Focuses on measures that simultaneously:

- Improve local air quality
- Reduce global greenhouse gas emissions

Key IES Terms

IES co-benefits approach targets emissions of:

Local air pollutants: These pollutants contribute to **local** and **regional** environmental and health risks.

- Examples: particulate matter (PM), ozone (O_3), nitrogen oxides (NO_x), sulfur dioxide (SO_2), lead (PB)

Greenhouse gases (GHGs): GHG emissions trap the sun's energy as heat in the Earth's atmosphere, with **global** effects on the Earth's climate and resources.

- Examples: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6)

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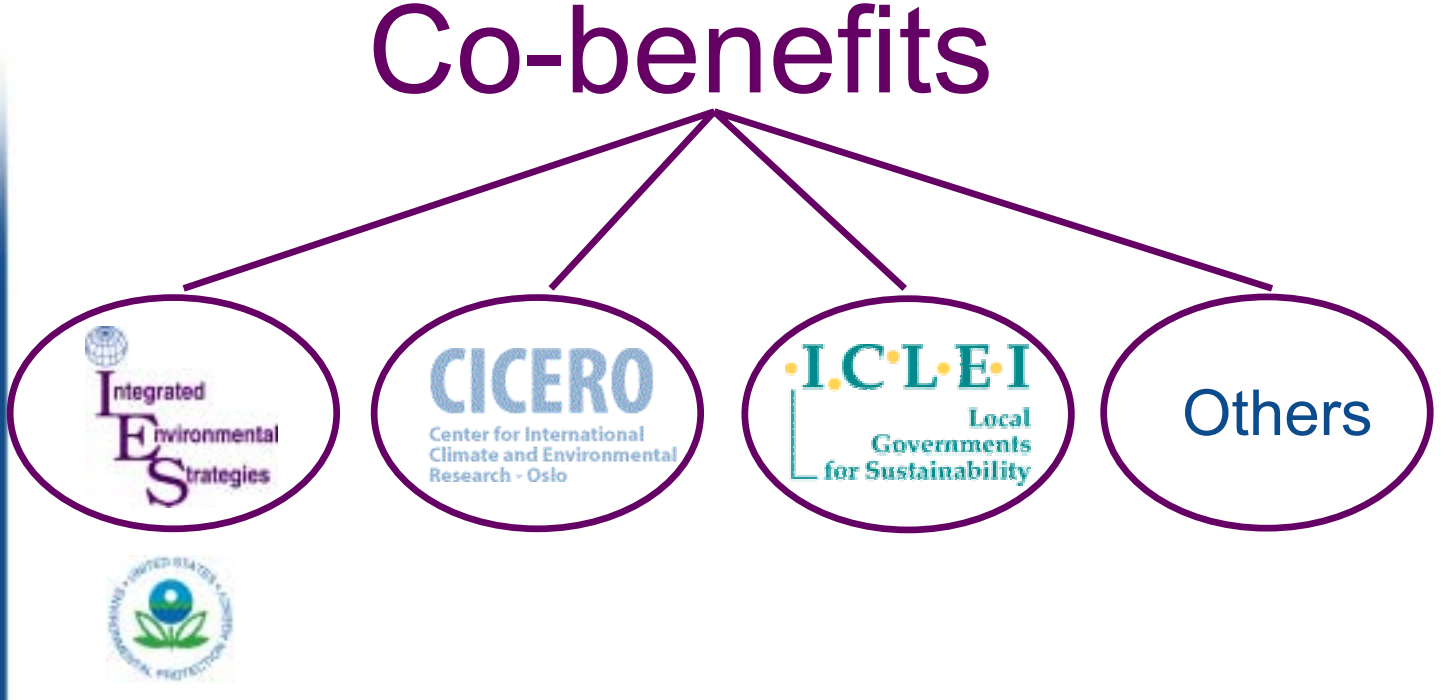
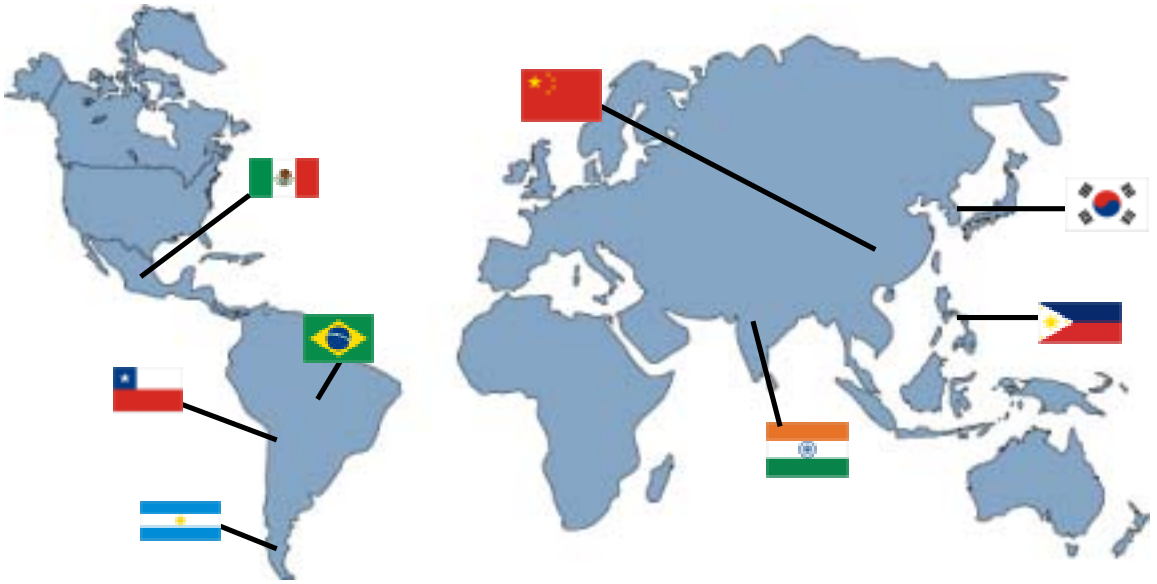
IES: One of Several Co-benefits Approaches



Countries with IES Projects



- Argentina
- Brazil
- Chile
- **China**
- **India**
- **Mexico**
- Philippines
- **South Korea**

IES Tools and Resources

Integrated Environmental Strategies (IES)
Tools & Resources

- Comprehensive web page
- Journal articles
- Country case studies
- Workshop proceedings
- IES Handbook
- IES Training Modules

Support partners, share information & promote the program

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Focus on:
IES Handbook & Training Modules

IES Handbook & Training Module

- Increase geographic scope
- IES Handbook
  - Available on CD ROM / Online
  - Comprehensive IES Resource
  - Variety of audiences
  - Expands IES knowledgebase
- IES Training Modules
  - Used with Handbook
  - 2 Versions, Expandable / Collapsible
  - Customizable to audience
  - Basic IES concepts to detailed co-benefits training

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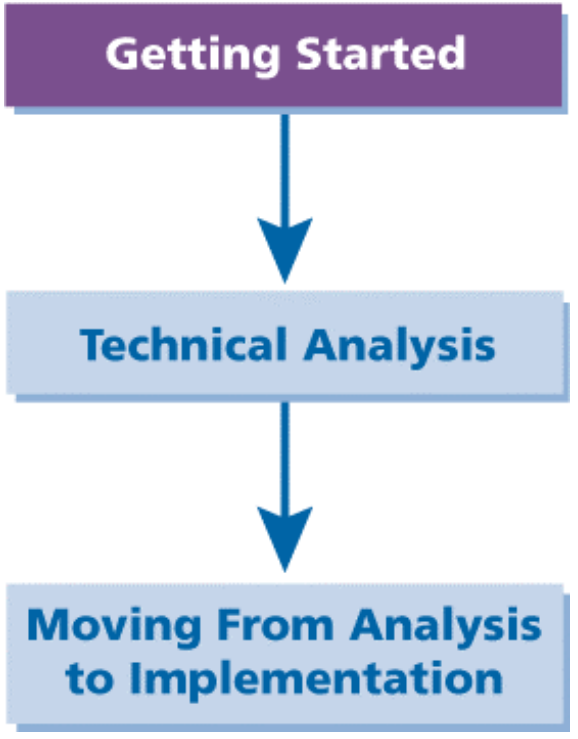
IES Training Module Sample Excerpt

- Version 1: Policymakers Module
- Section excerpted: Overview of the IES co-benefits approach

Overview of the IES Co-benefits Approach



Getting Started

- **Obtain project "buy-in" from senior policymakers**
- Assemble the project team
- Determine the scope of the project
- Develop the work plan

Obtain Project "Buy-in"

- What are the public policy priorities of the city or country?
- What relevant policies, regulations, decrees, and legislative acts are in place or expected?
- How can co-benefits projects be designed to support policy development or implementation?
- Which existing planning, policy review, or policymaking processes are most relevant to a co-benefits project?
- What institutional oversight or involvement is desired?

Getting Started (cont.)

- Obtain project “buy-in” from senior policymakers
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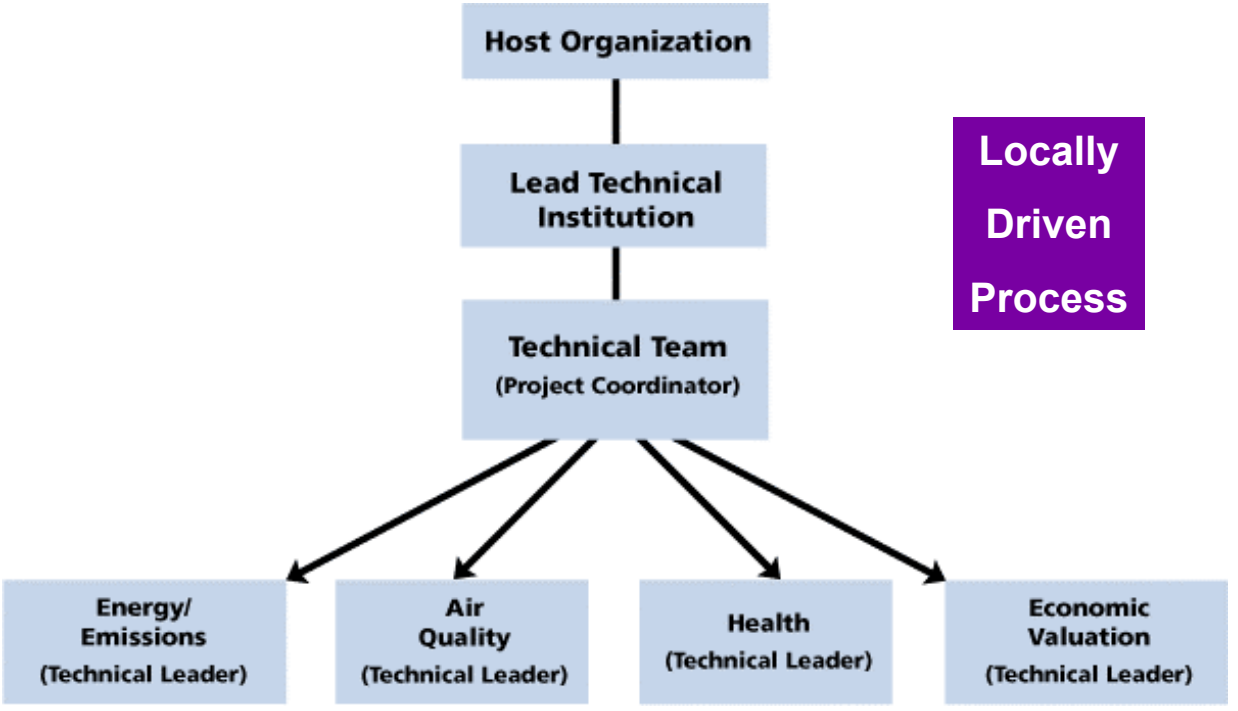
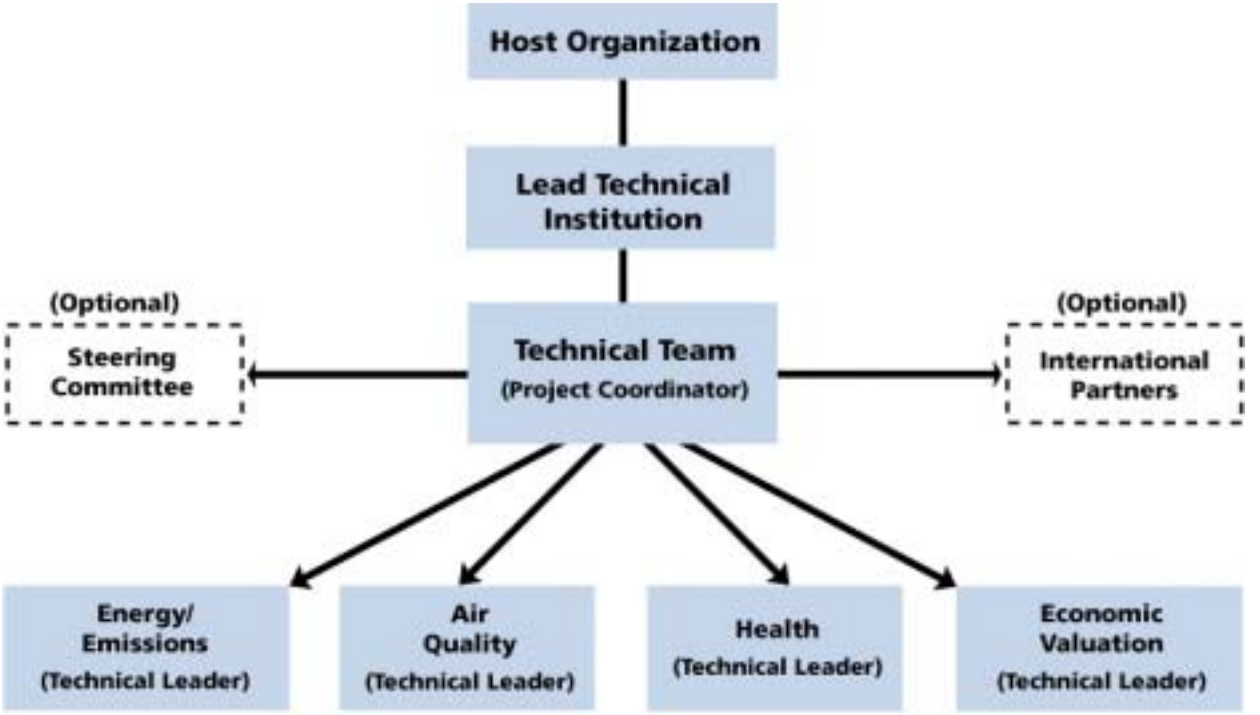
Assemble the Project Team: Key Players



Locally Driven Process

Assemble the Project Team: Key Players



Identifying Stakeholders

- Stakeholders may include:
  - Universities
  - Research institutes
  - Local and national government agencies involved in the environment, energy, transportation, public health, and economic development sectors.
  - Non-governmental organizations (NGOs)
  - Business groups
  - Trade associations
  - Representatives of key sectors that generate local air pollution
  - Labor unions
  - Public

Ways Stakeholders Can Participate in a Co-benefits Project

- Provide political support
- Assist with project design
- Provide data
- Help with the analysis
- Review project plans and results and provide feedback
- Identify funding
- Help disseminate project results

Getting Started (cont.)

- Obtain project “buy-in” from senior policymakers
- Assemble the project team
- **Determine the project scope**
- Develop the work plan

Key Scoping Decisions

- Project goals
- Desired outcomes and influence on policymakers
- Appropriate sector(s) to focus on
- Emissions included in analysis
- Health endpoints included in analysis
- Geographic boundaries
- Time line
- Specific measures that will be considered
- Data sources and potential gaps
- Models to be used

Example: Scoping Decisions in Beijing IES Project

- **Energy sector categories initially considered**:
  - Power generation
  - Industrial (steel, cement, petroleum, chemical)
  - Residential
  - Transportation
  - Agriculture
  - Commercial
  - Construction

- **Policy scenarios analyzed**:
  - Business as usual (no change)
  - Promote industrial and residential use of clean energy
  - Transform industrial structure (relocation from urban locations)
  - Improve residential energy efficiency and light vehicle fuel economy
  - Promote green transportation and reduced private vehicle use

Example: Scoping Decisions in Beijing IES Project (cont.)

- **Emissions examined**:
  - **Conventional pollutants**
    - Particulate matter (PM_{10})
    - Sulfur dioxide (SO_2)
    - Nitrous oxides (NO_x)
  - **Global GHGs**
    - Carbon dioxide (CO_2)

- **Health endpoints analyzed**:
  - Mortality
  - Respiratory hospital admissions
  - Chronic bronchitis
  - Outpatient visits (pediatrics)
  - Emergency room visits
  - Asthmatic disease in adults

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Example: Scoping Participants in Philippines IES Project

- Filipino research team
- Philippines Department of the Environment and Natural Resources
- Philippines Department of Transportation and Communication
- Philippines Department of Energy
- U.S. Environmental Protection Agency
- U.S. Agency for International Development
- International experts from other co-benefits projects
- Non-governmental organizations (NGOs)
- Business representatives
- Academics

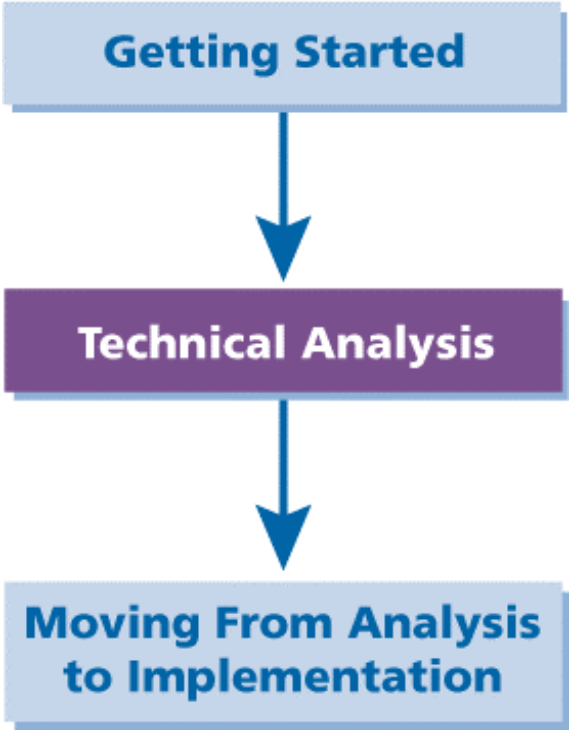
Getting Started (cont.)

- Obtain project “buy-in” from senior policymakers
- Assemble the project team
- Determine the project scope
- **Develop the work plan**

Develop the Work Plan

- Goals
- Management structure
- Schedule
- Tasks
- Products
- Desired outcomes
- Information gaps
- Research recommendations (in some cases)
- Outreach/communication plan

Overview of the IES Co-benefits Approach



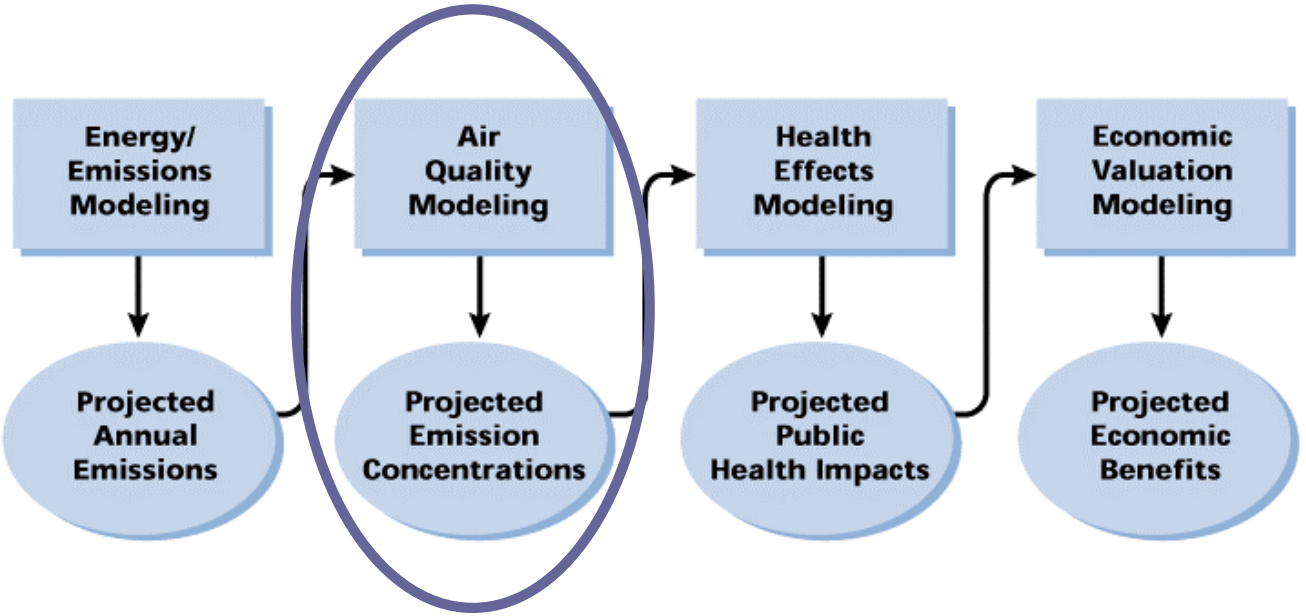
Technical Analysis

Energy/Emissions Modeling

- Develop/identify base-year emissions inventory of local air pollutants and global GHGs
- Finalize set of scenarios for analysis
- Model future energy demand and resulting emissions for each scenario

Overview of Energy/Emissions Models Used in IES

Model	Description	Emissions Examined	IES Projects Used In
Energy and Power Evaluation Program—Model for Analysis of Energy Demand (ENPEP-MAED)	Bottom-up model that projects future electricity generation of power plants within a study region and calculates corresponding future GHG emissions based on the *Energy: Prospectiva 2000 Energy Report.*	• SO_2 • NO_x • PM • CO_2	• Argentina
MARKAL (Market Allocation)	Bottom-up model that depicts the evolution of a specific energy system at the national, regional, state, provincial, or community level over 40 to 50 years.	• SO_2 • NO_x • PM_{10} • CO_2	• China (Shanghai)
Long-range Energy Alternative Program (LEAP)	Bottom-up model that forecasts energy consumption by sector and projects national energy demand by summing sectoral energy consumption. Emission factors are used to calculate total emissions.	• TSP • PM_{10}	• China (Beijing) • Korea • Brazil


Energy/ Emissions Modeling
Air Quality Modeling
Health Effects Modeling
Economic Valuation Modeling
Projected Annual Emissions
Projected Emission Concentrations
Projected Public Health Impacts
Projected Economic Benefits

Air Quality Modeling

- Finalize list of emissions for analysis
- Collect local air quality monitoring and meteorological data
- Model future atmospheric concentrations of emissions for each scenario

Overview of Air Quality Models

- Project future atmospheric concentrations of pollutants and GHGs
- Two main classes of emissions-based air quality models typically used:
  - Primary
  - Secondary

Primary Models

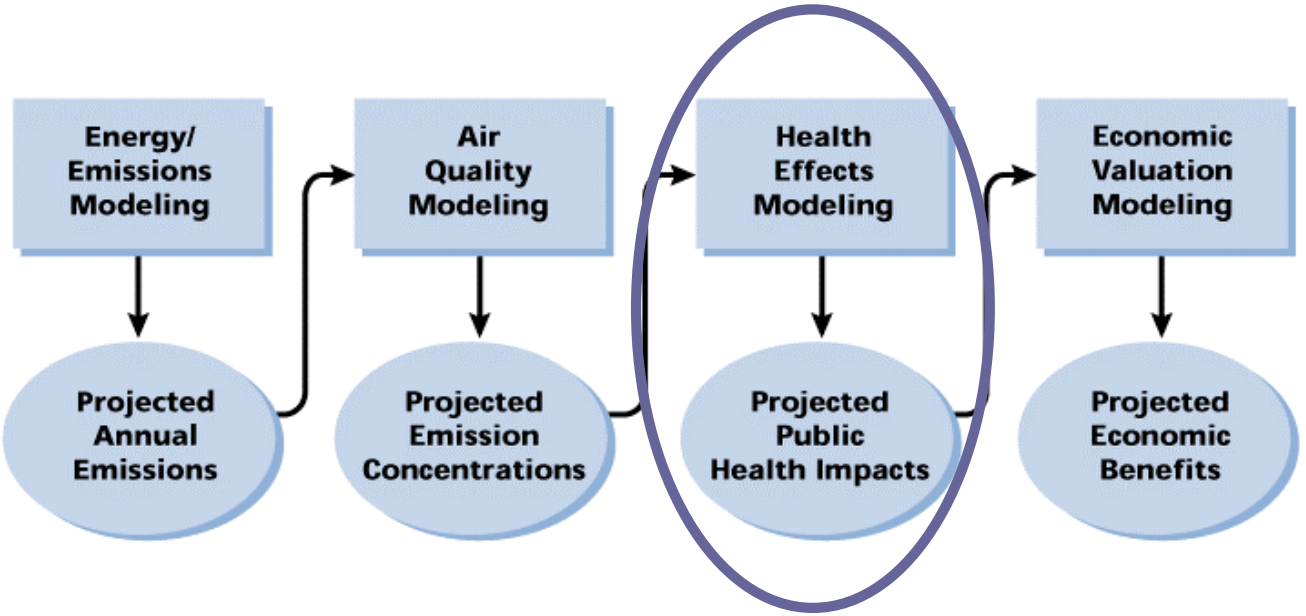
- Most frequently used type of air quality model
- Models primary pollutants
- Perform complex mathematical equations
- Advantage: fewer data inputs required
- Gaussian models
  - Commonly used dispersion model

An example of a Gaussian dispersion model is the U.S. EPA's Industrial Source Complex Model (ISC3), which can project emission concentrations from a variety of different industrial sources

Secondary Models

- Models both primary and secondary pollutants
- Includes photochemical reactions
- More data inputs required
- 3-D Eulerian grid model
  - Commonly used photochemical grid model

The U.S. EPA developed the Comprehensive Air Quality Mode (CAMx) and Urban Airshed Model (UAM), which project atmospheric concentrations of both primary and secondary pollutants for each discrete cell grid in a given airshed


Energy/ Emissions Modeling
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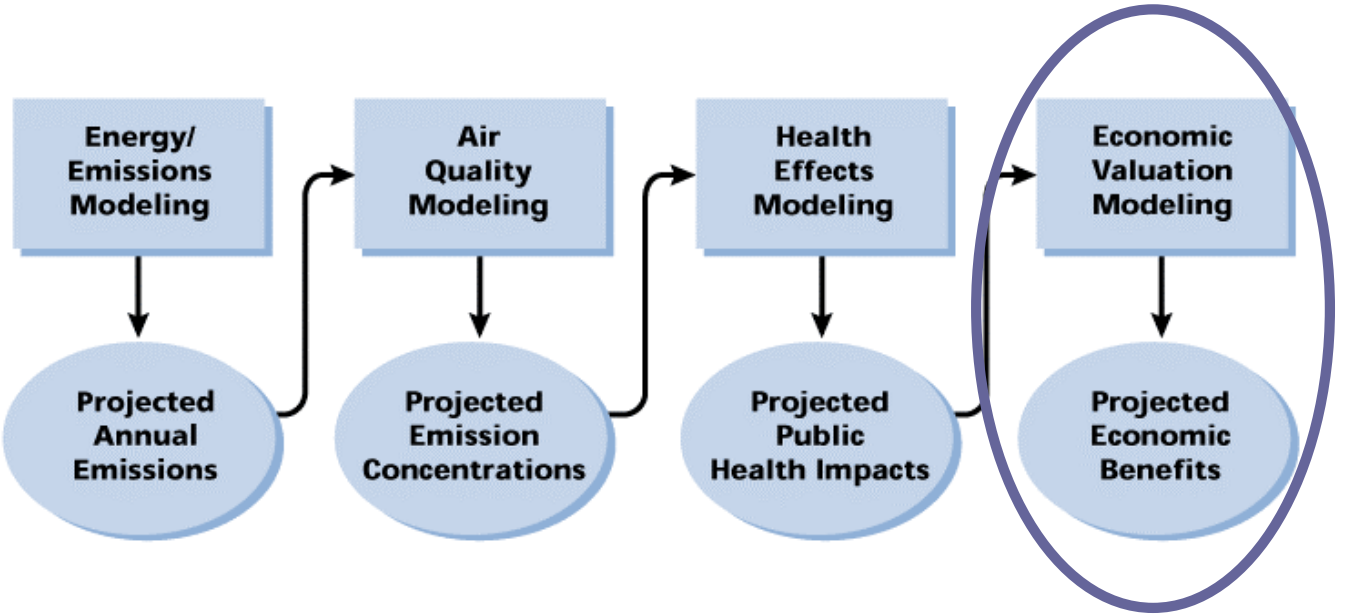
Projected Economic Benefits

Health Benefits Modeling

- Finalize health endpoints for analysis
- Determine how to analyze relationship between pollutant concentrations and health effects
- Collect health data
- Analyze public health benefits for each scenario

What is a Health Effects Model?

- IES Air Quality Analysis Output: projected air pollutant concentrations
- Health Analysis: Translate projected air pollutant concentrations into health impacts (mortality / morbidity)
- Tool used: Health Effects Model
- Additional Data will be required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Projected Public Health Impacts
Projected Economic Benefits

Economic Valuation of Health Benefits

- Calculate economic value of health benefits for each scenario

Economic Valuation—Background

- Assigns monetary values to avoided health endpoints
- Critical input to benefit-cost analysis
- Does not value GHG emission reductions
- To date, IES projects have only performed economic valuation for health benefits
- Still not fully mature
- Can be controversial

"The IES project was the first attempt to assign estimates of economic value to health impacts of energy and emission control options. This is a major achievement in China."

—Bai Guoqiang, Shanghai Environmental Protection Bureau, China

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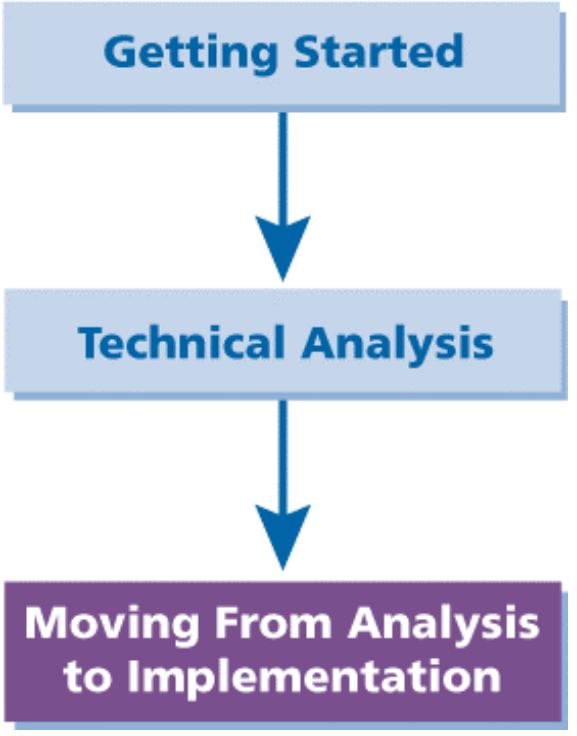
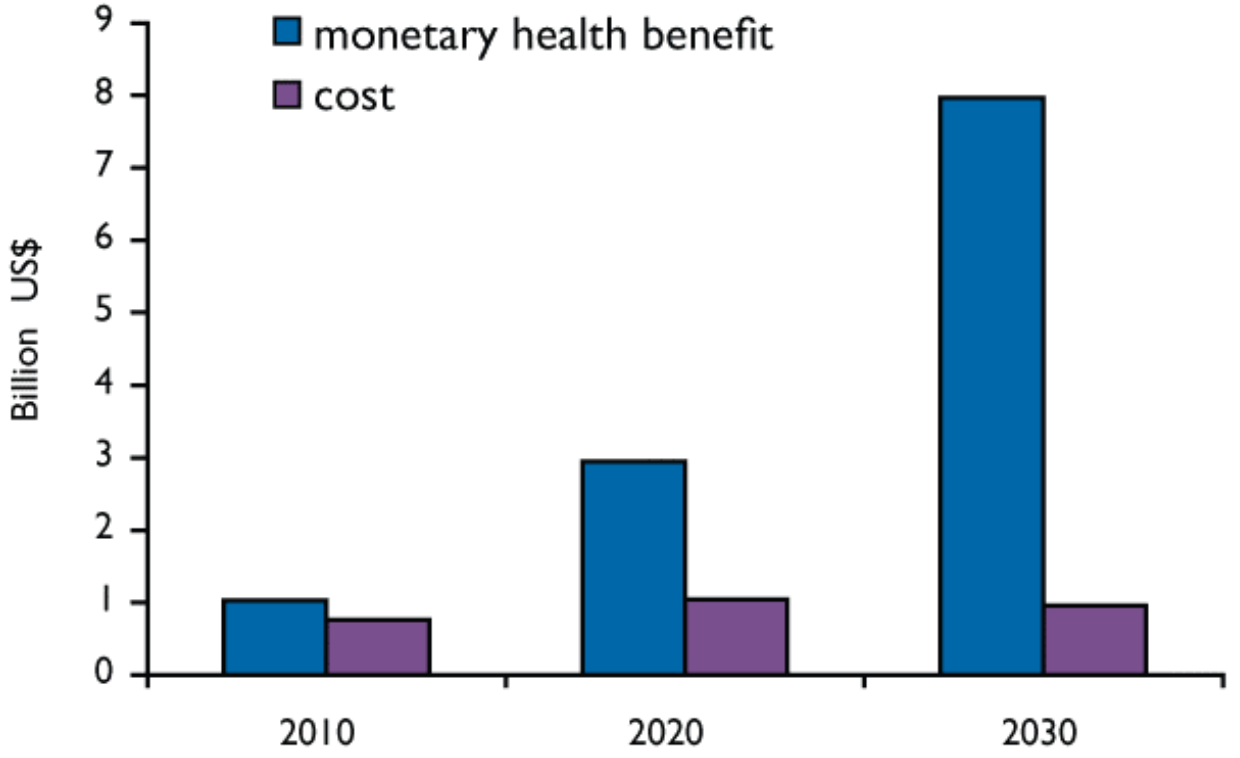
Overview of the IES Co-benefits Approach



Moving From Analysis to Implementation

- **Estimate costs for implementing each scenario**
- Compare scenarios and develop a recommendation
- Share results

Sample IES Results – Beijing, China



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Moving From Analysis to Implementation

- Estimate costs for implementing each scenario
- **Compare scenarios and develop a recommendation**
- Share results

Moving From Analysis to Implementation (cont.)

- Estimate costs for implementing each scenario
- Compare scenarios and develop a recommendation
- **Share results**

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Example IES Results

Santiago, Chile

In 2020, the public health benefits of improved air quality are estimated to be worth $700 million U.S. dollars.

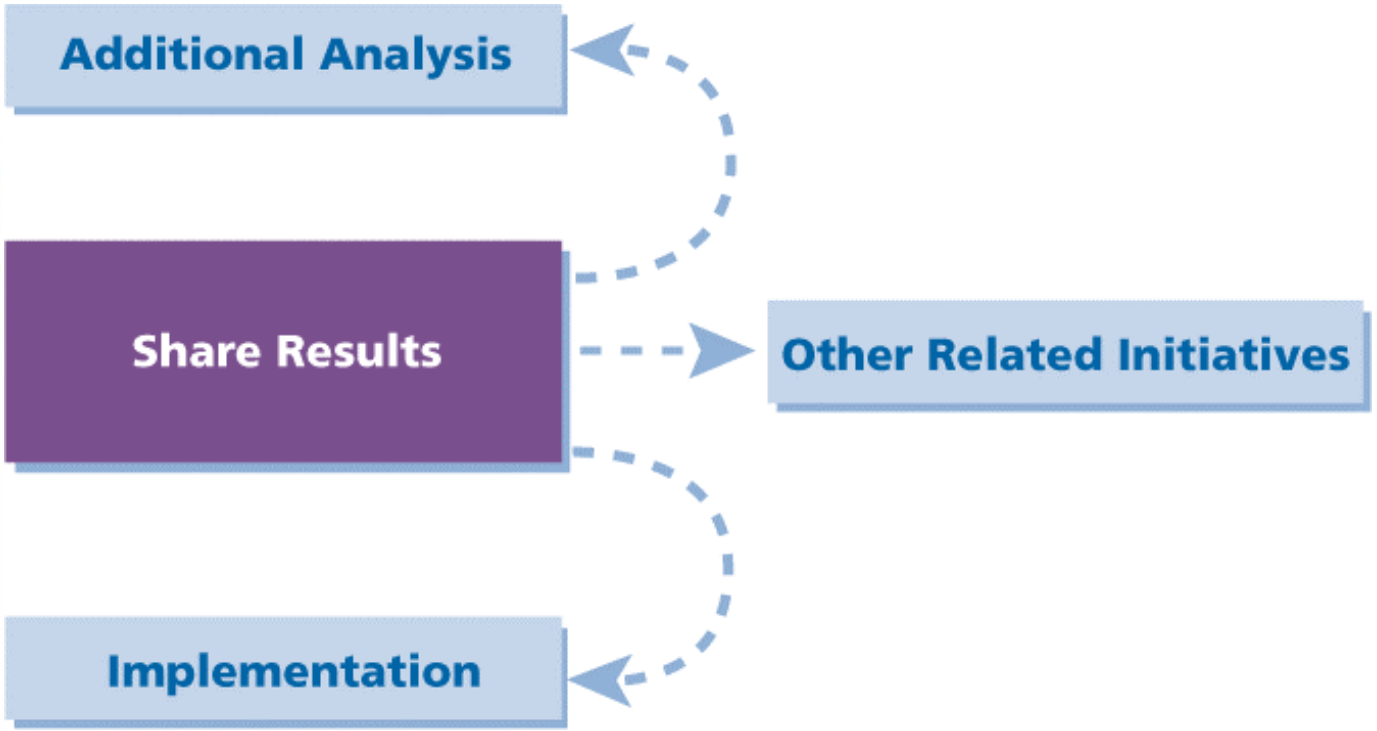
Shanghai, China

By 2010, the potential annual carbon reductions could equal the carbon dioxide emitted from the combustion of more than 100 million barrels of oil.

Buenos Aires, Argentina

Between 2000 and 2010, improved air quality could save as many as 4,000 lives each year.

Share Results – Typical Next Steps



IES Benefits

- IES supports countries in developing cost-effective strategies for reducing both local air pollution and GHG emissions.
- IES can assist countries that are parties to the UNFCCC to meet their national communications commitments.
- IES promotes implementation of measures with multiple benefits.
- IES builds and enhances technical and institutional capacity in integrated energy and environmental analysis.
- **IES promotes collaboration within and among countries.**

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IES Benefits (cont.)

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- IES builds and enhances technical and institutional capacity in integrated energy and environmental analysis.
- IES promotes collaboration within and among countries.
- **IES is flexible and iterative.**

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Hands-On Exercise # 2
Thinking About Stakeholders

GHG Measure	Government Stakeholders	NGO & Private Stakeholders
Wind Power in China	Y National Development & Reform Commission (NDRC), Center for Renewable Energy Development (CRED), Provincial DRCs	Y China Wind Energy Association (CWEA), Gold Wind, GE Wind, China Renewable Egy Society
Renovation of aging taxicab fleets to current year models [*Chile, Philippines*]		
Expansion of subway, rail (light/heavy), trolley and bus lines [*Argentina, China, Philippines*]		
Improvements in consumer appliance Energy Efficiency [*Argentina, S. Korea*]		
Use of residential and commercial solar water heaters [*China, Mexico, S. Korea*]		
Improved vehicle inspection and maintenance programs [*Brazil, China, Mexico, Philippines*]		
Increasing building energy efficiency (residential and commercial) [*Argentina, Chile*]		

Resources

- IES Program Manager:
  - Katherine Sibold, sibold.katherine@epa.gov
- EPA IES Web site: www.epa.gov/ies
- Thank You !