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Identifying, Quantifying, & Integrating Co-Benefits

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IGES
Institute for Global Environmental Strategies

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COURSE OUTLINE

Identifying Co-benefits

What are co-benefits?
Why are co-benefits important?
How can co-benefits be illustrated?

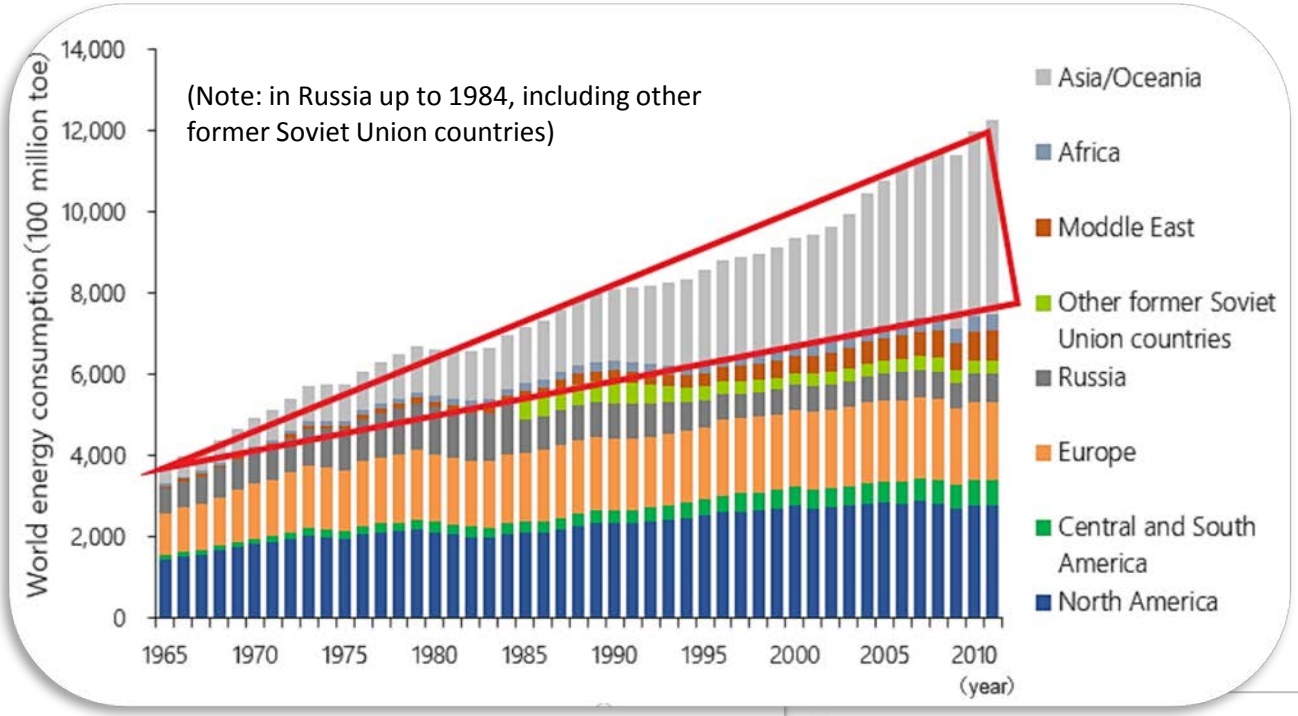
Quantifying and Applying Co-benefits

Why is it important to quantify co-benefits?
How can co-benefits be quantified?
Case studies

Integrating Co-benefits into Policies

How have co-benefits been integrated into policymaking process?
Institutions and Process with Case Study
Enabling Environment with Case Study

Linking

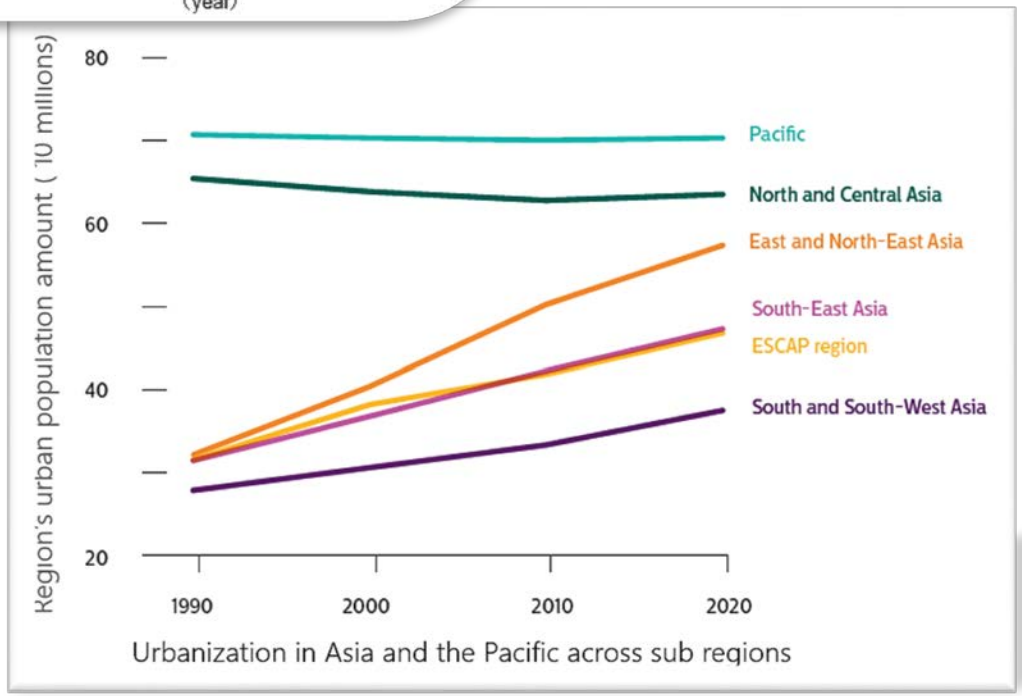


Energy Consumption in Asia 1965-2010

(Source : Based on 2012 Statistical review of world energy)

Urbanisation in Asia

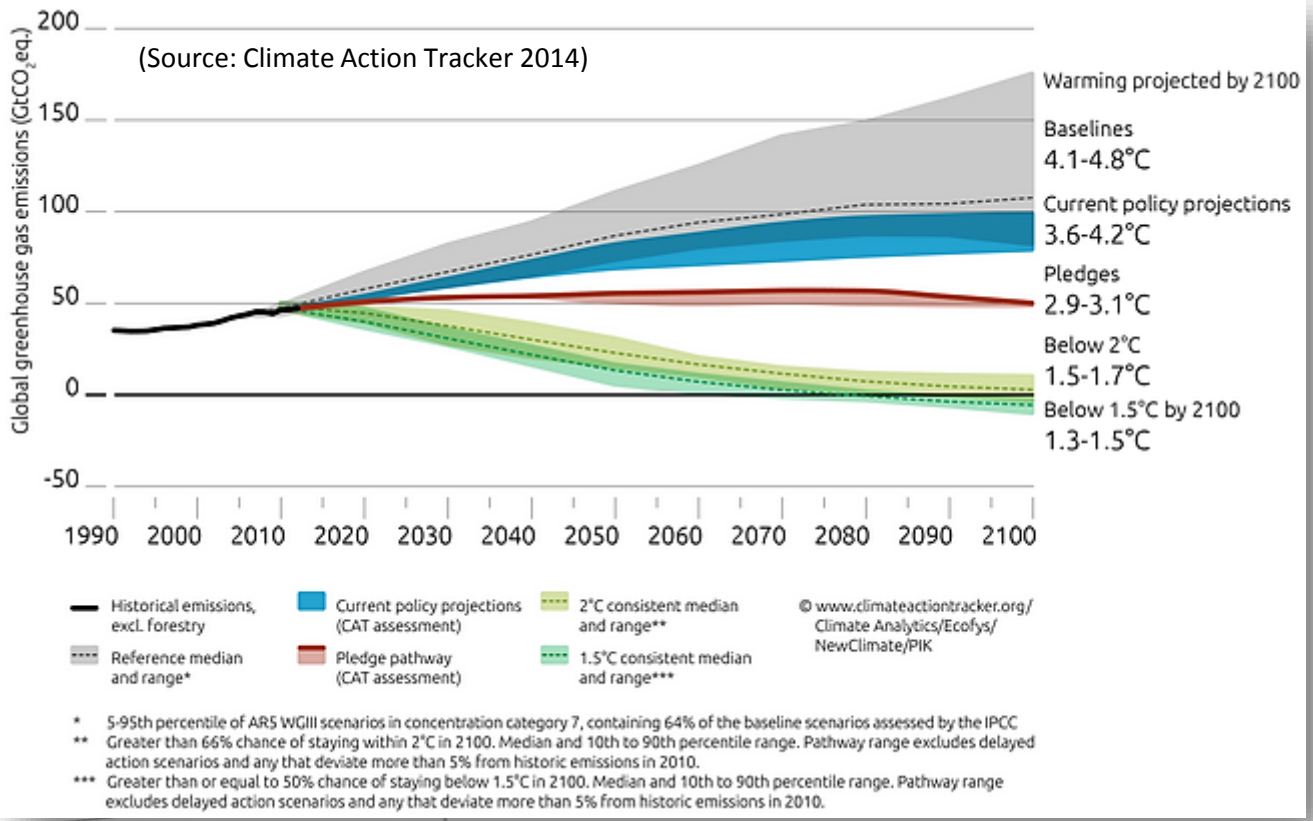
(Source : UN 2012 World Urbanization Prospects)

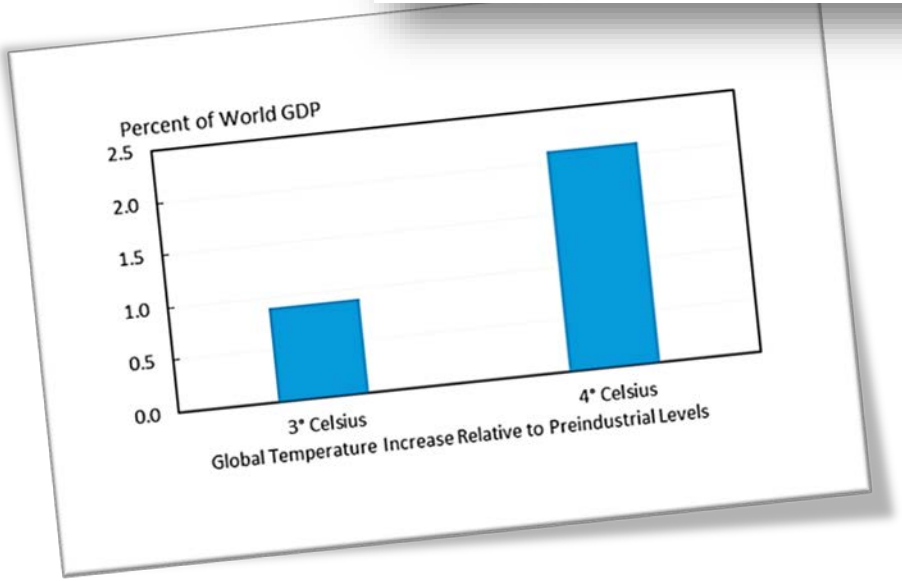


Impacts of Climate Change

Emission Scenarios and Projected Changes in Temperature

(Source: Climate Action Tracker 2014)



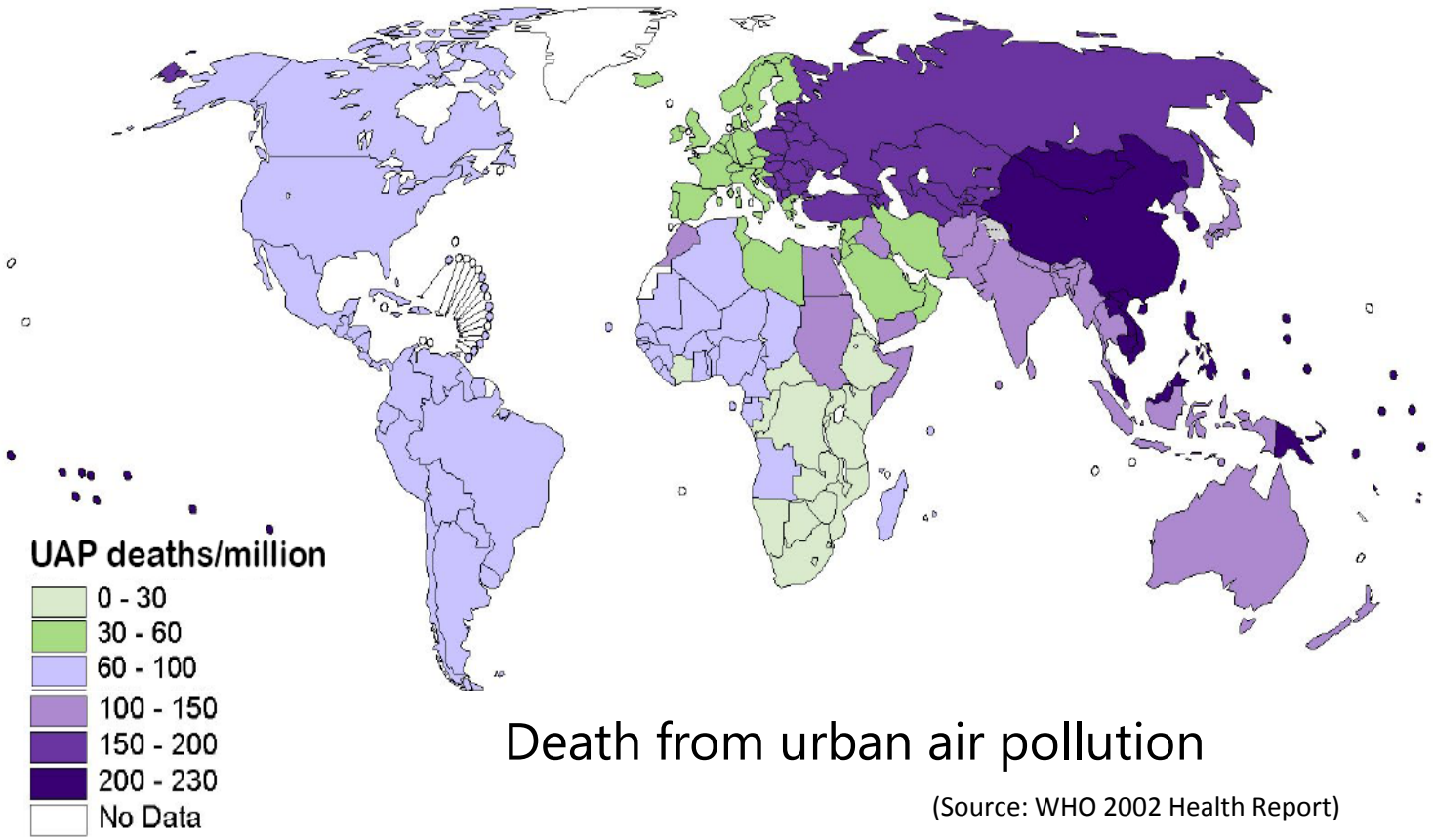


Costs of Climate Change

(Source: Nordhaus 2013 & CEA calculations)

A Different View on Climate Change Impacts

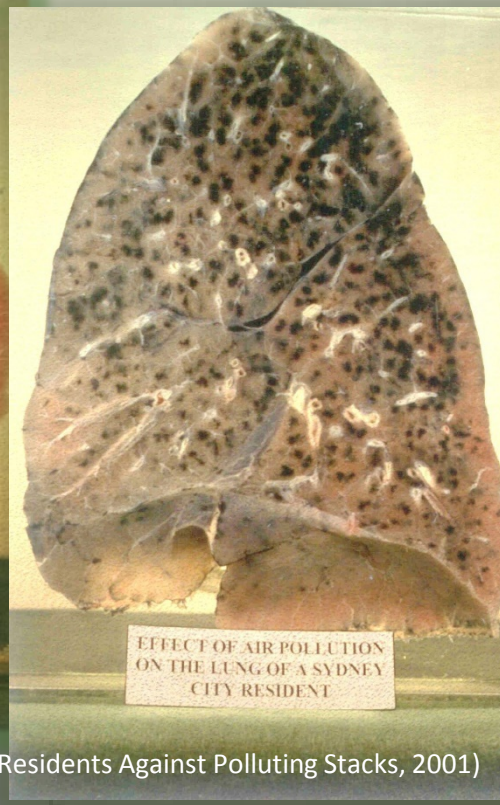
Air Quality in Asia



Death from urban air pollution

(Source: WHO 2002 Health Report)

Air pollution Impacts



(Source: Residents Against Polluting Stacks, 2001)

(Source :China Baidu)

How much should policymakers spend on mitigation climate change

Depends on costs and benefits

What are co-benefits?

Benefits that accrue as a side effect of targeted policies are known as *secondary benefits, policy spillover effects, 'co-benefits'* or *ancillary benefits.* (D. Pearce)

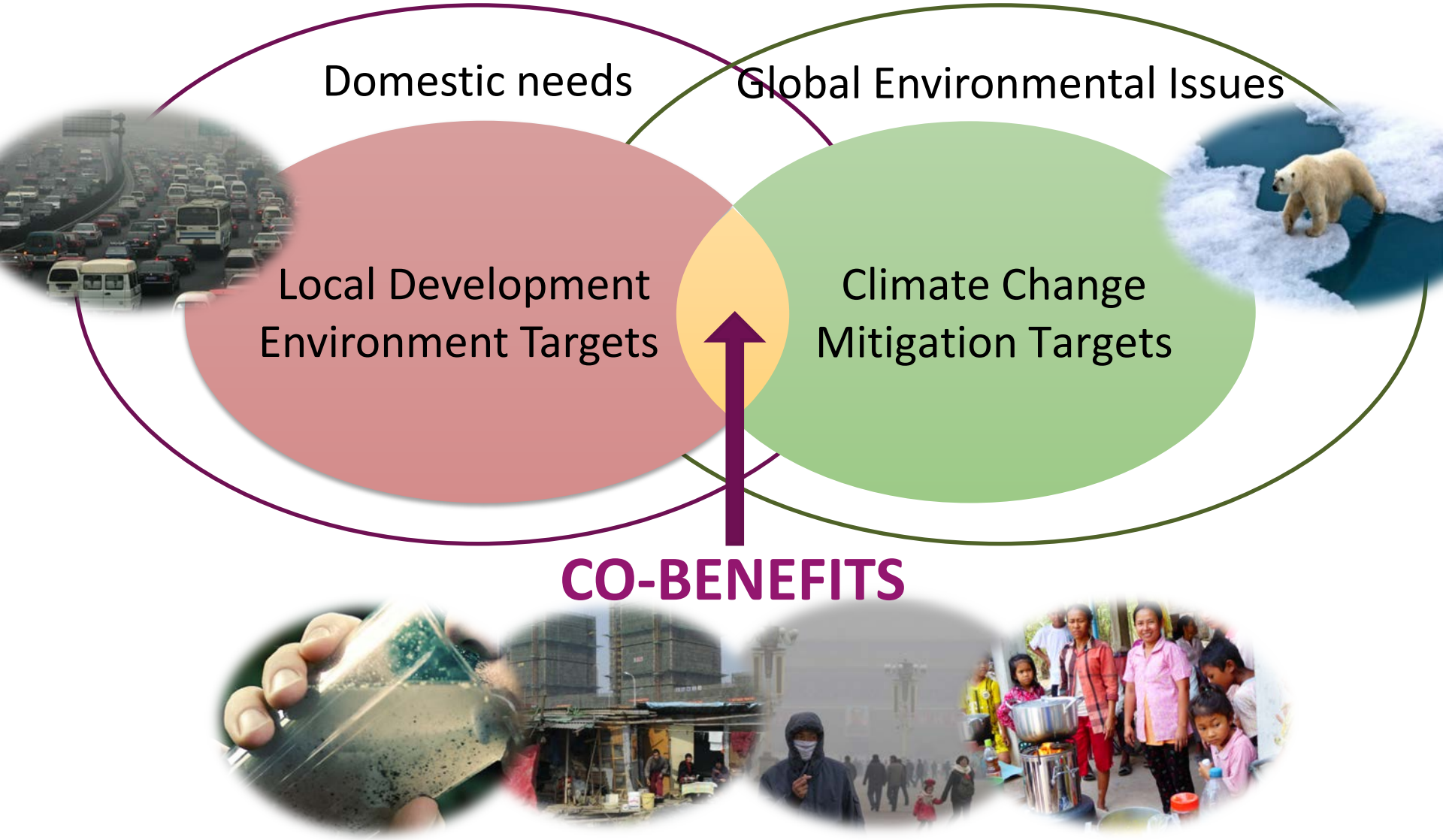
The benefits of polices that are implemented for various reasons at the same time – incl. climate change mitigation – acknowledging that most policies designed to address GHG mitigation also have other, often at least equally, important rationales e.g. related to objectives of development, sustainability, and equity. (IPCC)

Not limited to environmental benefits but also resource efficiency, job creation, social inclusiveness, and economic competiveness. (UN ESCAP)

In the process of controlling GHGs, the benefits from other pollutants that are also abated e.g. SO_2, NO_x, PM. In the process of abating air pollution, the benefits from CO_2 and other GHGs that are also mitigated. (PRCEE)

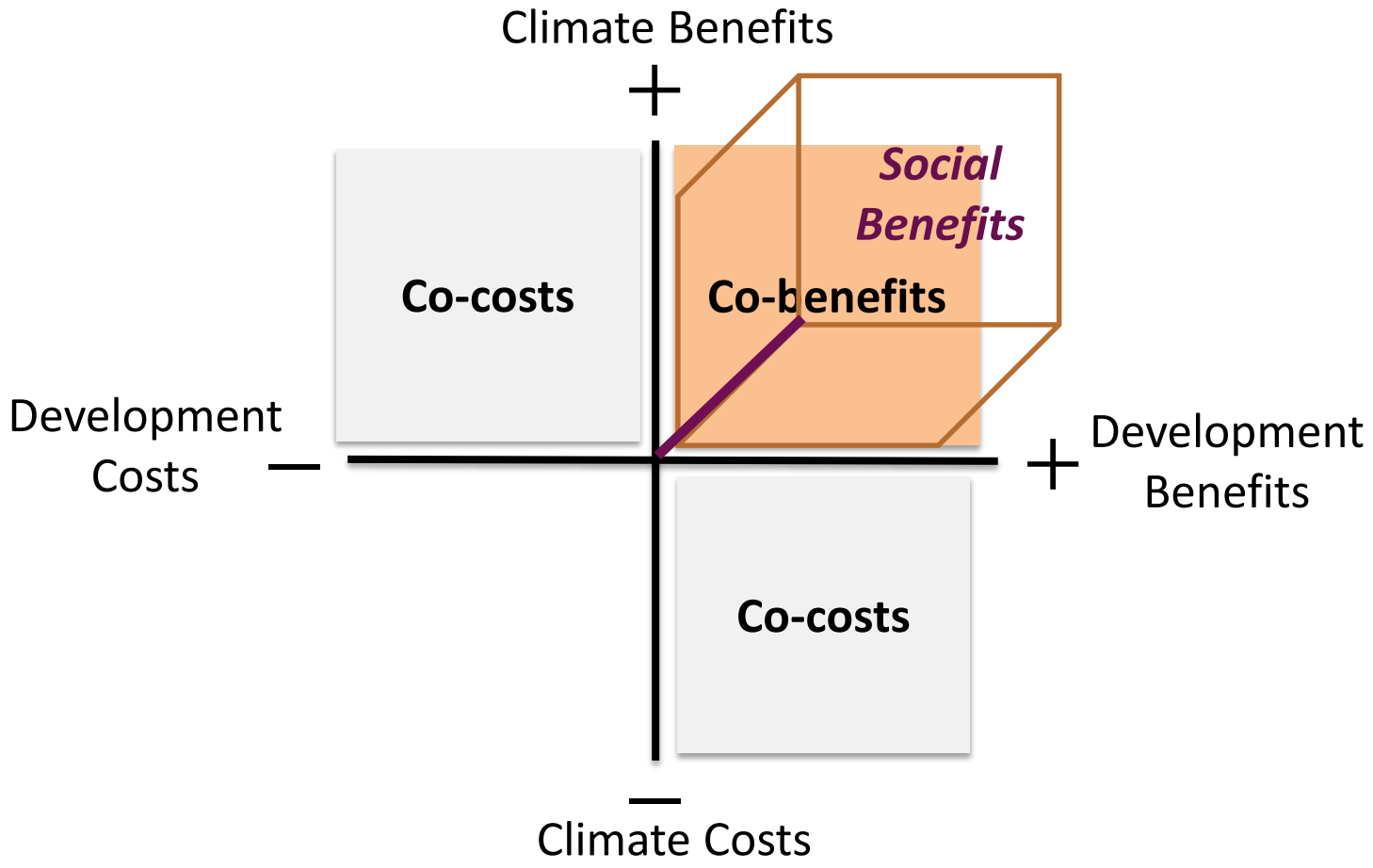
concentrate on the synergies between climate change and air pollution, recognising there are other useful definitions of co-benefits.

Visualising Co-benefits

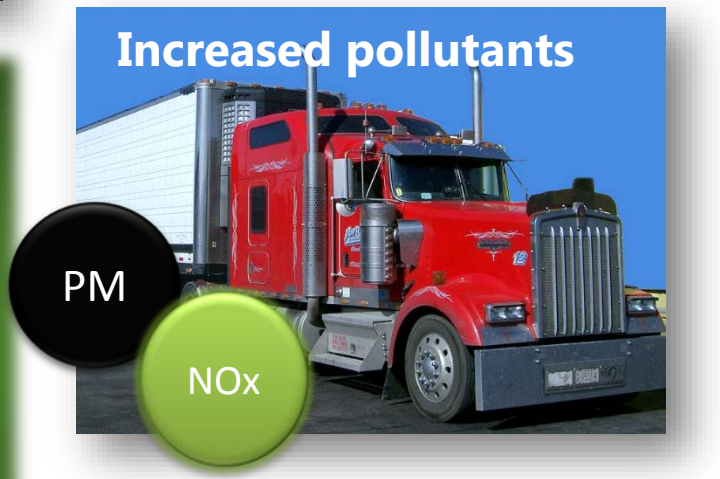


Expand our view of co-benefits…

Illustration of co-benefits in terms of costs and benefits



Some examples of co-costs



Co-benefits can be achieved in many sectors

	Action	Environmental Benefit	Climate Benefit
Air pollution	Improve combustion efficiency	SOx, NOx, Soot and Dust reductions	CO_2 reduction
	Fuel conversion		
	Transport measures		
Water pollution	Prevent sludge & methane	Water quality & odor reductions	CH_4 reduction
Waste	Appropriate landfill	Odour reduction	
	Biomass waste use	Waste reduction	

SLCP Impacts

What are SLCPs ?

(Source: www.ccacoalition.org/en/science-resources)

SHORT-LIVED CLIMATE POLUTANTS

Near term response to mitigation

(Note: modified by IGES)

SUBSTANCE	ANTHROPOGENIC SOURCES	LIFETIME IN ATMOSPHERE	IMPACTS/MITIGATION (LOCAL / REGIONAL / GLOBAL)
BLACK CARBON (BC)		DAYS	● ○ ·
TROPOSPHERIC OZONE (O_3)		WEEKS	● ○ ·
METHANE (CH_4)		12 YEARS	· ○ ●
HYDROFLUORO-CARBONS (HFCs)		15 YEARS (WEIGHTED BY USAGE	●

ANNUAL BENEFITS

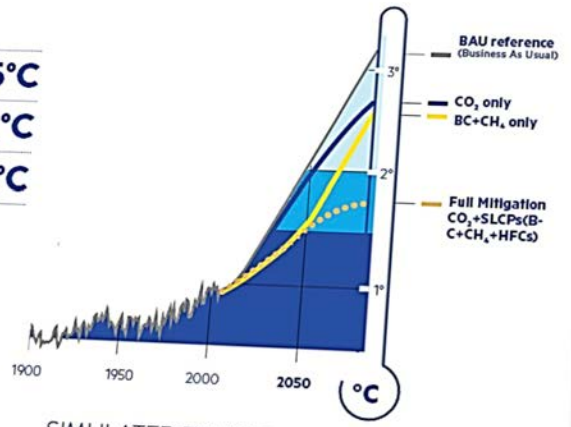
From large-scale mitigation **by 2030**

CLIMATE	AVOIDED WARMING	REDUCED RATE OF SEA-LEVEL RISE BY ~20% BY 2050	REDUCED RATE OF MELTING	REDUCED RATE OF SEA-LEVEL RISE BY ~20% BY 2050
HEALTH	2.4 MILLION	AVOIDED PREMATURE DEATHS ANNUALLY FROM OUTDOOR AIR POLLUTION	REDUCED AIR POLLUTION - WORLD'S LARGEST ENVIRONMENTAL HEALTH RISK	
CROPS	52 MILLION	TONNES OF AVOIDED CROP LOSSES FROM 4 MAJOR STAPLES YEAR		

SLCP CLIMATE BENEFITS

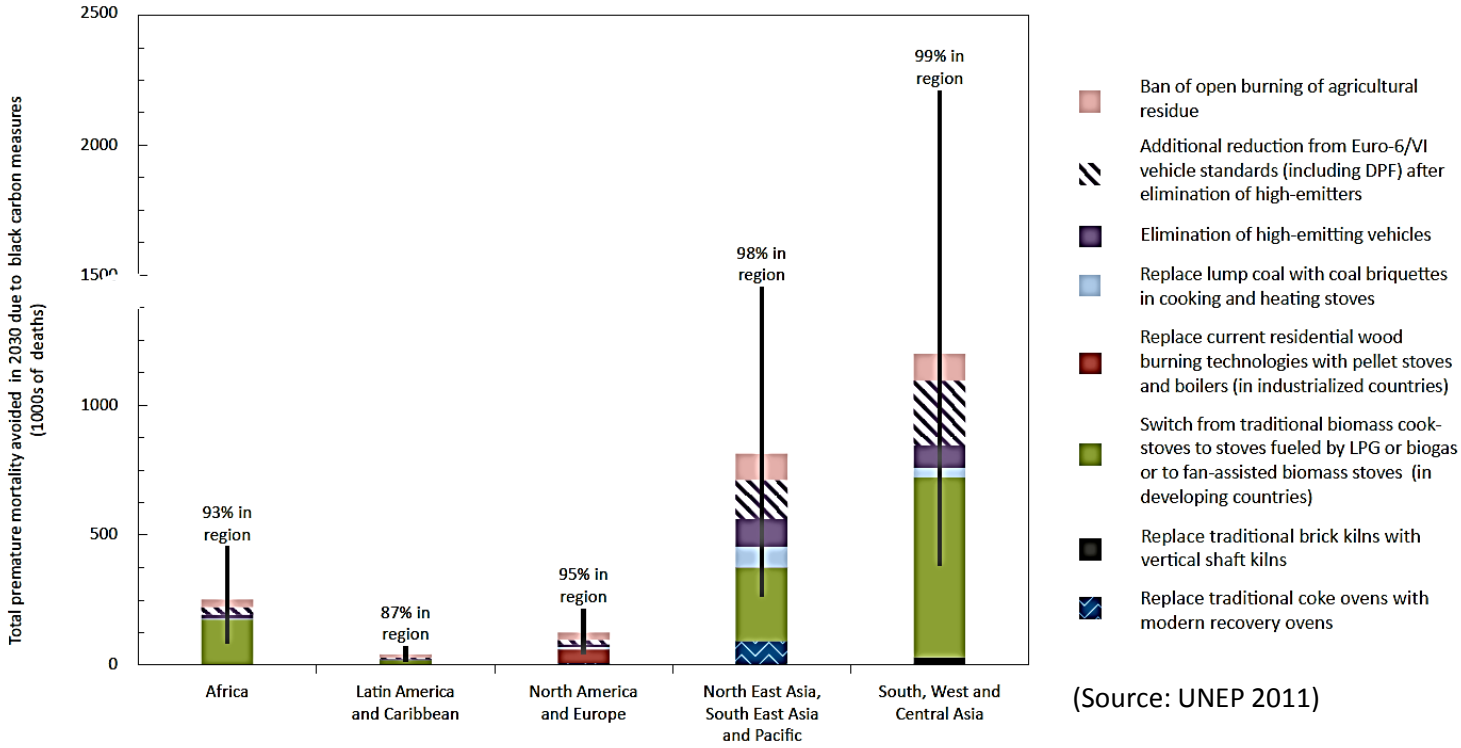
Avoided Global Warming **by 2050**

BC + CH_4	0.5°C
HFCs	0.1°C
SLCPs	0.6°C



SIMULATED TEMPERATURE CHANGE UNDER VARIOUS MITIGATION SCENARIOS

Why are SLCPs Important in Asia ?



(Source: UNEP 2011)

- Asia is significant source of SLCP emission region in the world.
- Asia needs to: **reduce climate change in near-term as well as long-term**
  reduce burden of air pollution
  feed a growing population

Emissions of SLCPs can achieve all these objectives

Co-benefits action plan phase I

- Form a team of up to 6 people
- Select a team leader and name
- Select a project or policy with possible co-benefits
  - ✓ **Consider the sector(s)**
  - ✓ **Location(s)**
  - ✓ **Scope**
- Begin to develop a presentation that:
  - ✓ **Explains why co-benefits are important**
  - ✓ **Describes the difference between co-benefits and co-costs**
  - ✓ **Use the co-benefits tree to list the co-benefits and co-costs associated with your action plan**

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Linking

Many countries in Asia have quantified co-benefits

	China	India	Indonesia	Japan (support)
Priority/ Focus Areas	Air Pollution SO_2, NOx, CO, PM (Electricity, Cement, Iron and steel, LPG) Traffic (PRCEE)	Clean coal technology, Thermal Efficiency (power plants)	Waste disposal sites, water treatment plants, Oil refineries (Industrial and domestic waste water treatment facilities, water quality improvement, slaughterhouse)	Uses Yen loans, grant aid, and technical cooperation to help developing countries to achieve sustainable development. Also uses CDM and JCM projects
Related Research	More than 10 years of research cooperation with USEPA, IIASA, and several national institutions (PRCEE, Beijing Normal Univ.)	More than five years of cooperation with USEPA and IIASA. Growing amount of work under TERI and urban emissions	More than five years cooperation with Japan	Verification of the effects of co-benefit on pollution policy and to evaluate the effects of co-benefits of various CDM technologies
Remarks	Domestic Co-benefit Projects are based on priority areas and multi-pollutant co-control; regional cooperation to promoting co-control.	Domestic Co-benefit Projects are based on identified priority areas	Domestic Co-benefit Projects are based on priority areas	There is a Co-benefit Quantitative Evaluation Manual

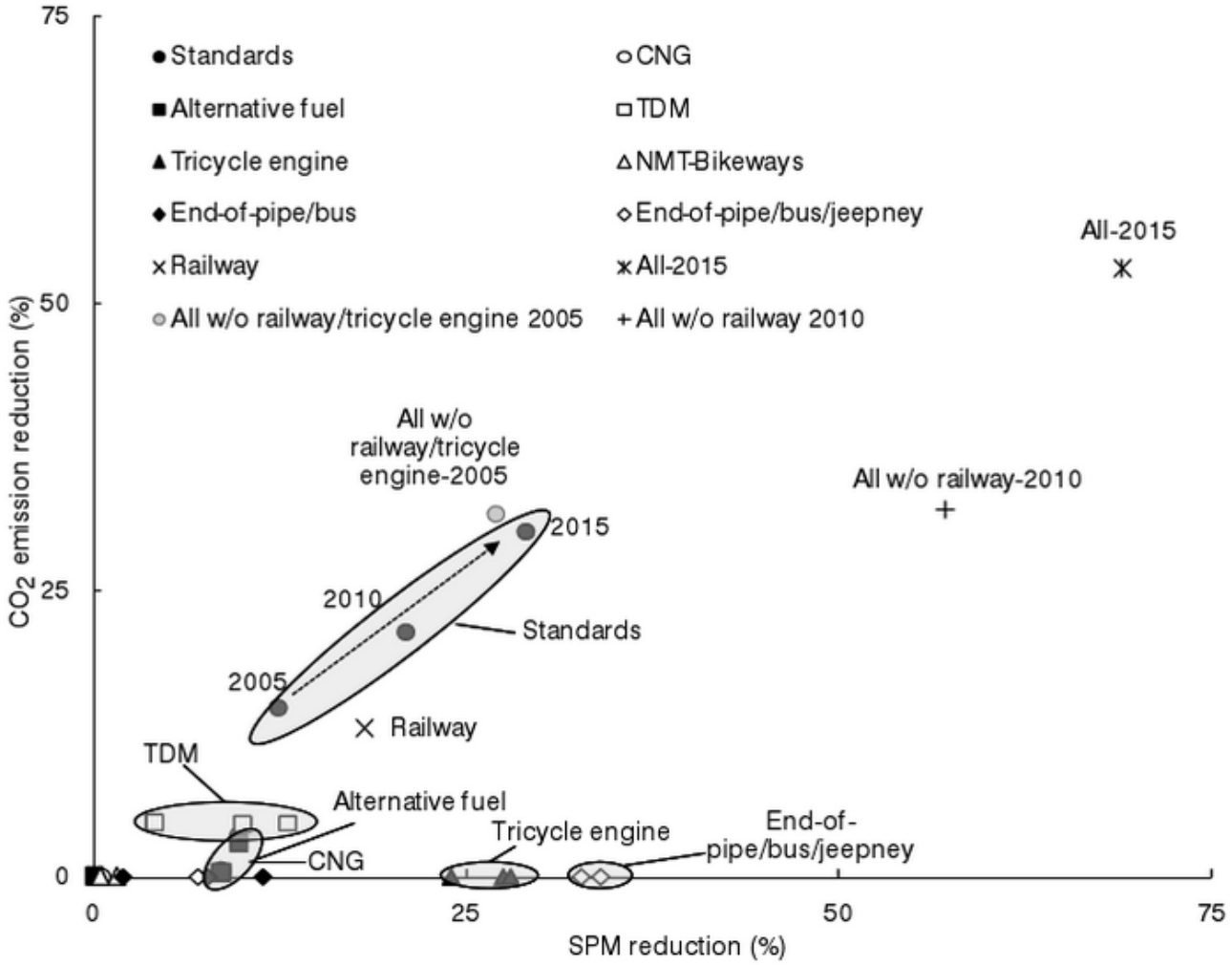
Why is it important to quantify co-benefits?

Quantification allows adding and comparing benefits and costs

- Quantification allows evaluating market and non-market impacts
- Co-benefits can change the output and outcome of a decision

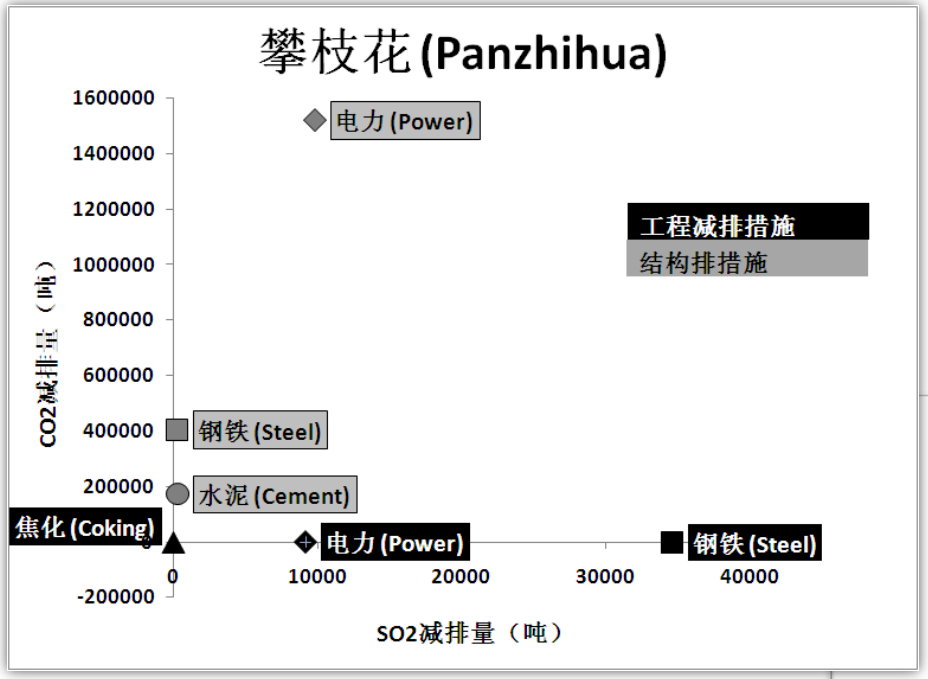
- Decisions about air pollution and climate change are made by politician. The more precise you can show benefits the more likely good policy become good politics

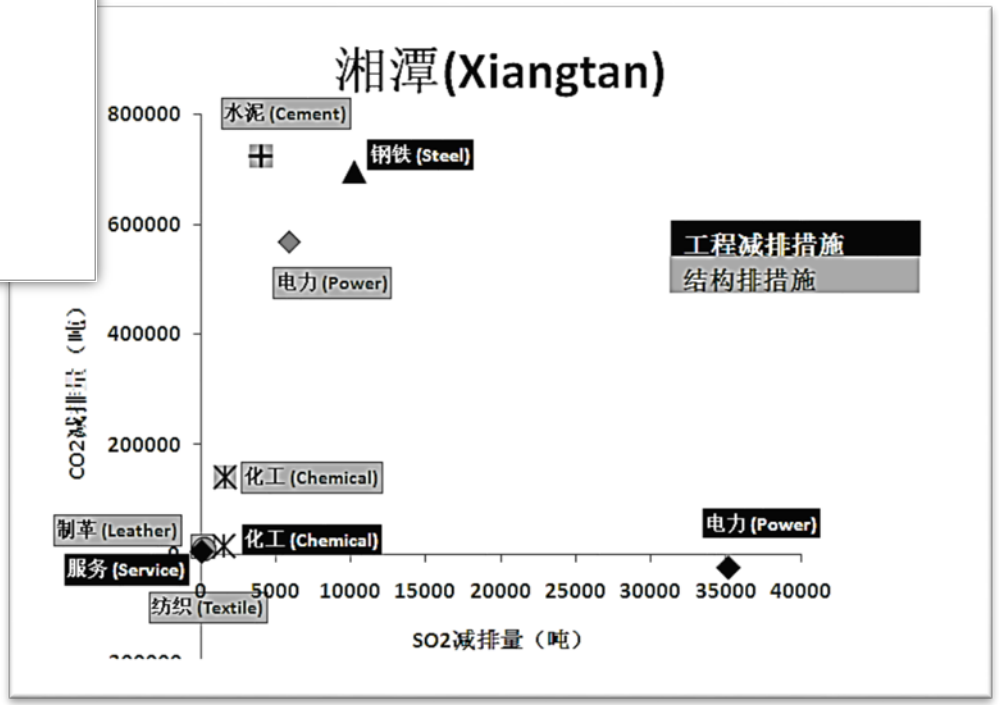
Another way to illustrate co-benefits is a co-benefits plot



(Source: Herran and Matsumoto, 2012)

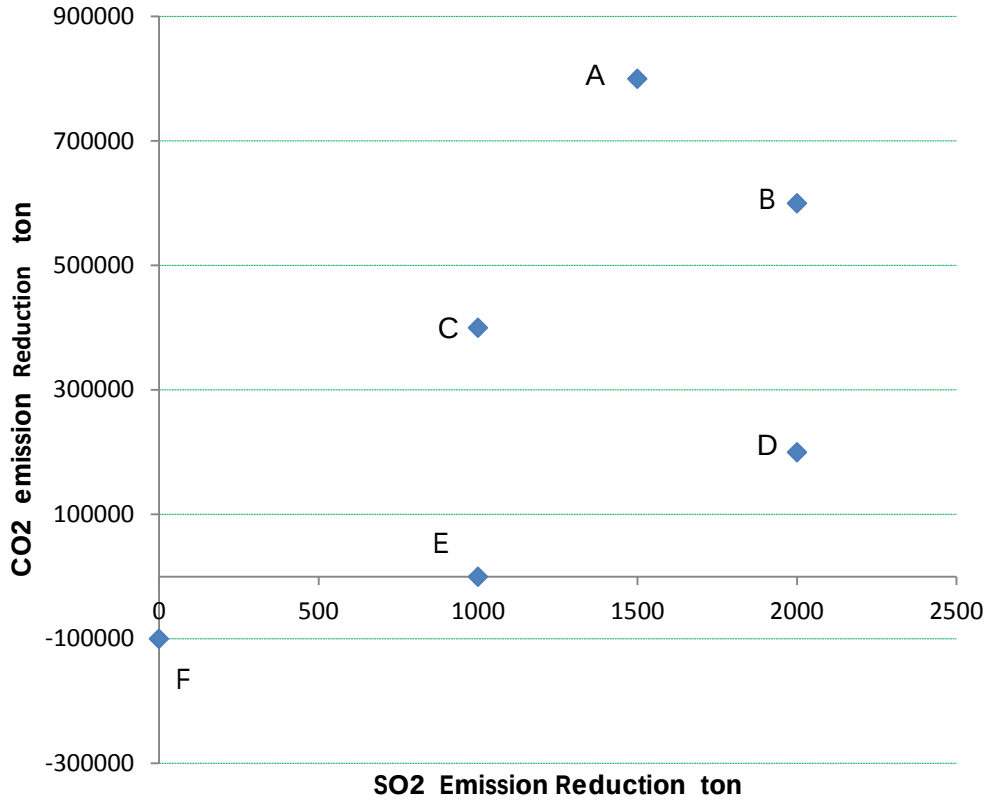
Case Study 1: Co-benefits in Chinese Cities





(Source: 污染减排的协同效益评价及案例研究, 中国环境出版社(北京), 中日污染减排与协同效益研究示范项目联合研究组著, 2012)

Let's pause for a relaxing quiz



- Which of the projects would you invest in if you were a city policymaker?
- What other considerations might be important in deciding your investment besides reductions in pollutants?

Main steps to quantify co-benefits

1. Identify problems and set objectives
2. Gather data for baseline
3. Develop scenario (A.S.I.)
4. Modelling/estimating multiple benefits
5. Policy integration and implementation

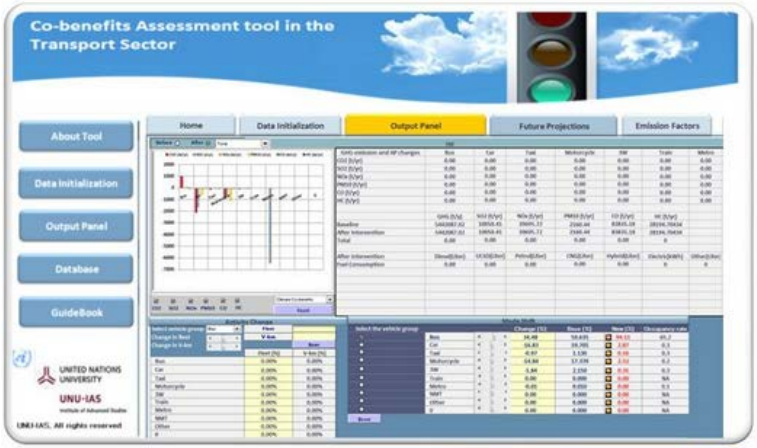
Case Study 2: Manila's Transport Sector

1 Want to save time and reduce GHGs!

Tools to quantify co-benefits

- TEEMP
- LEAP-IBC
- GAINS
- UNU co-benefits tool
- BenMAP

www.cobenefit.org



$$E = A \times F$$

2 Develop baseline: data needed

$$BT = BT_{wo} - BT_{w}$$

$$BT_i = \sum_j \sum_l (Q_{ijl} \times T_{ijl} \times \propto_j)$$

BT: Benefit of time savings
T_{ijl}: Average time of vehicle j on link l

3 Developing the scenario

Avoid unnecessary travel

Shift to more efficient modes

Improve vehicle technologies and design

Traffic Volume (vehicles/day)

Without Project

	1	2	3	4	5
Passenger Car	115,678	77,921	70,152	76,472	87,635
Public Utility Vehicle	4,632	3,714	7,505	5,158	7,182
Public Utility Bus	1,495	1,389	1,449	1,448	1,722
Truck	1,671	1,713	1,653	1,675	1,422

$$BT_i = \sum_j \sum_l (Q_{ijl} \times T_{ijl} \times \propto_j)$$

Q_{ijl}: Quantity of vehicle on link l

With Project

	1	2	3	4	5
Passenger Car	104,111	70,129	63,137	68,825	78,871
Public Utility Vehicle	2,316	1,857	3,752	2,579	3,591
Public Utility Bus	747	694	725	724	861
Truck	1,671	1,713	1,653	1,675	1,422

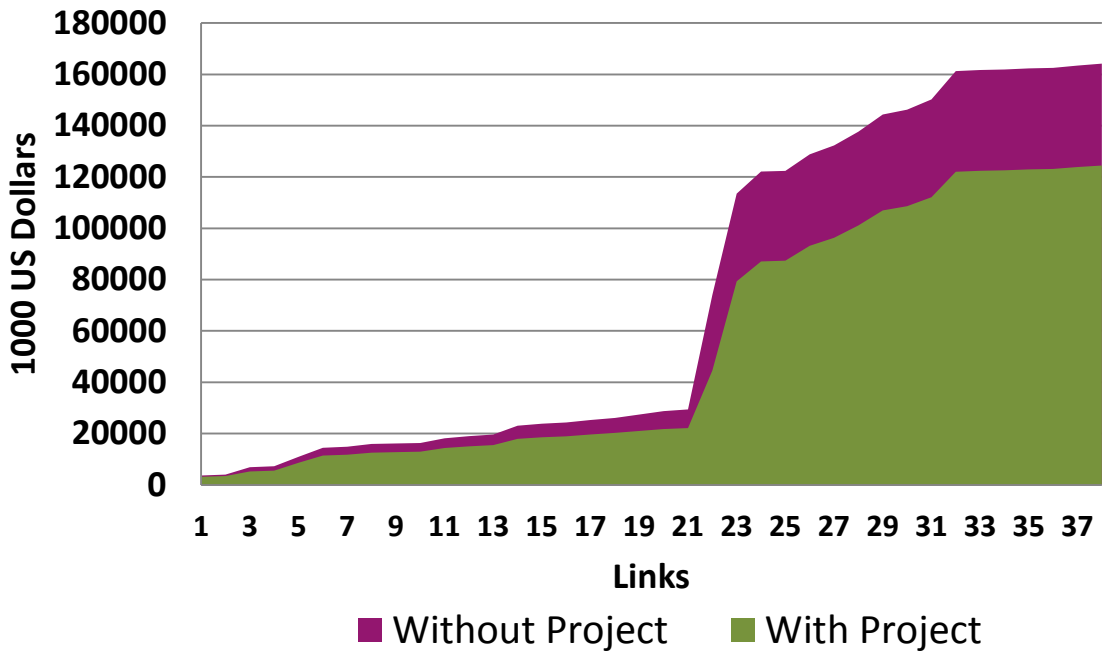
4 Calculation: Assumed Value of Time

Vehicle Type	Value of Time *USD/vehicle-minute*
Passenger Car	0.02
Public Utility Vehicle	0.02
Public Utility Bus	0.09
Truck	-

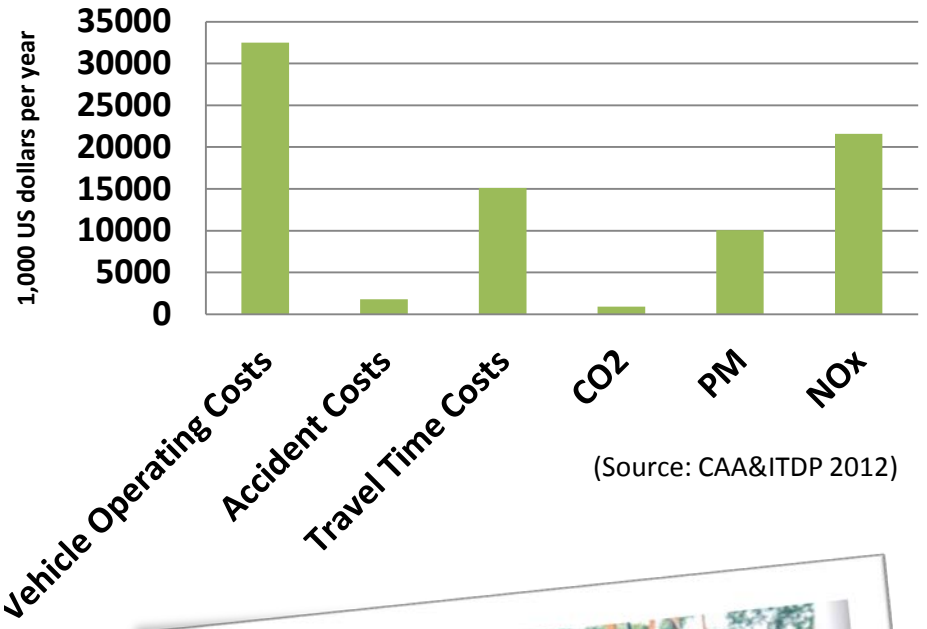
$$BT_i = \Sigma\Sigma(Q_{ijl} \times T_{ijl} \times \propto_j)$$

$\propto_j$: Value of time of vehicle j on link l

Commuting Time With/Without Manila Bus Project



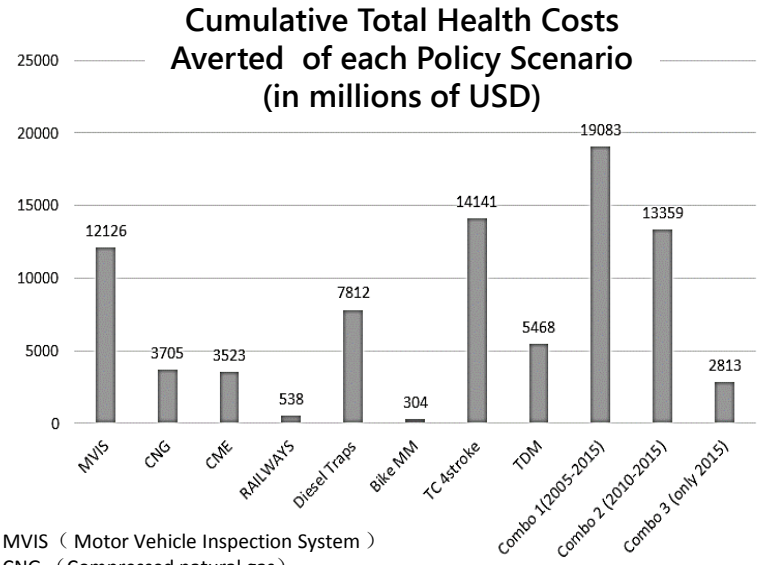
Co-benefits of Manila BRT



(Source: CAA&ITDP 2012)

(Source: CAA 2013)

Health Impact Assessment



MVIS（ Motor Vehicle Inspection System ）
CNG （Compressed natural gas）
CME（Coco-methyl esters）
RAILWAYS
Diesel Traps
Bike MM
TC 4stroke (Two stroke tricycles switching to four-stroke engines)
TDM （Transportation Demand Management through license plate scheme ）
Combo1（ Combination of policies: all policies except railways and switching of two stroke to four stroke tricycles
Combo2（All policies except railways ）
Combo3（All policies including railways）

(Source: IGES based on IES 2005)

Co-benefits action plan phase II

- Please add to your group's action plan by deciding on the following:

  - ✓ **The main benefits you will quantify**
  - ✓ **The tools and methods you might use to estimate the benefits**
  - ✓ **The data that you will need to estimate the reductions in GHGs, air pollutants and other benefits**
  - ✓ **The scenario you will estimate and how you will develop that scenario**
  - ✓ **The types of challenges or constraints you may confront in estimating the benefits**

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- How can co-benefits be illustrated?

Quantifying and Applying Co-benefits

- Why is it important to quantify co-benefits?
- How can co-benefits be quantified?
- Case studies

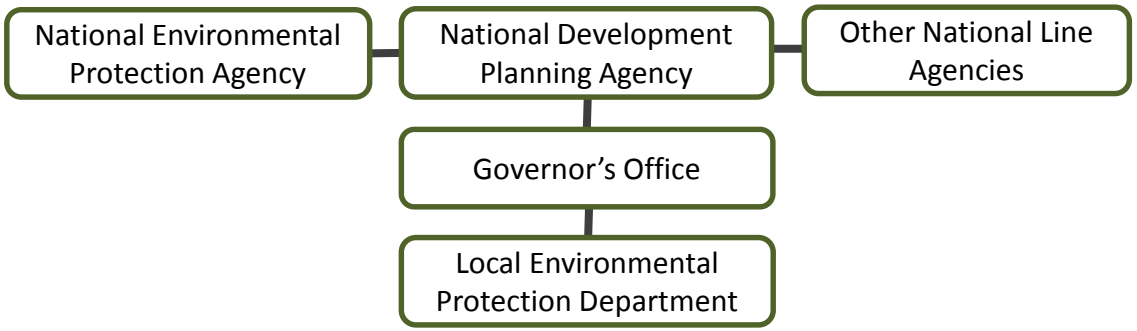
5 **Integrating Co-benefits into Policies**

- **How have co-benefits been integrated into policymaking process?**
- **Institutions and Process with Case Study**
- **Enabling Environment with Case Study**

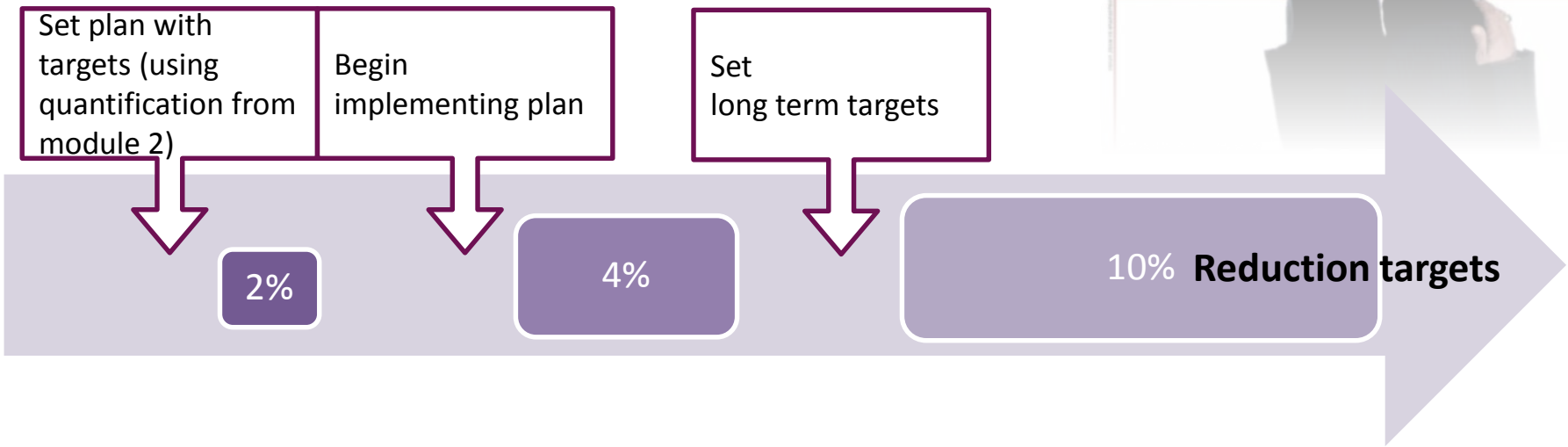
Linking

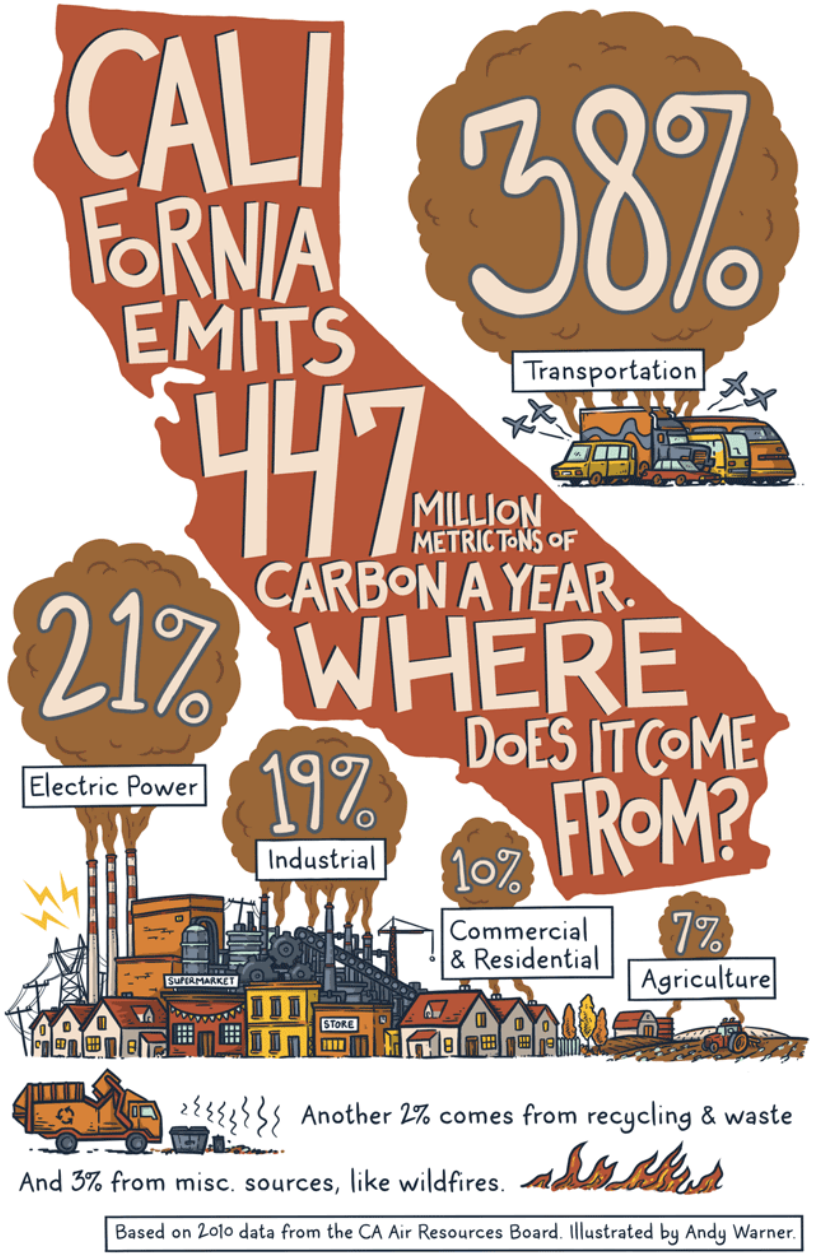
Case Study 3: California Global Warming Solutions Act, Assembly Bill (AB) 32

Lets start by thinking about INSTITUTIONs



Lets continue by thinking about PROCESS

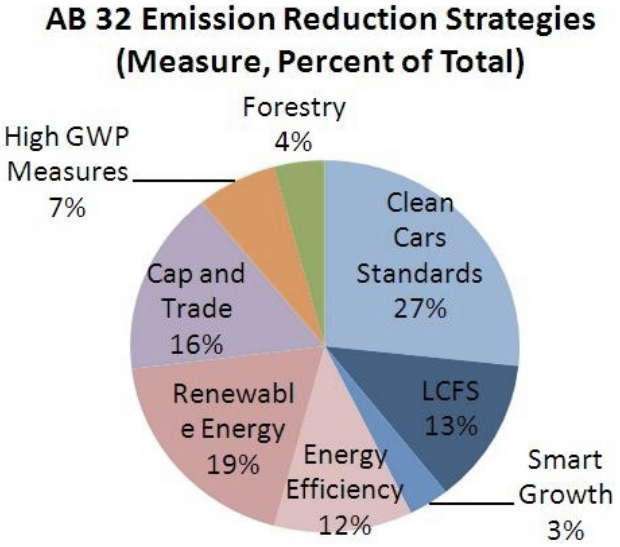




Objective of AB 32

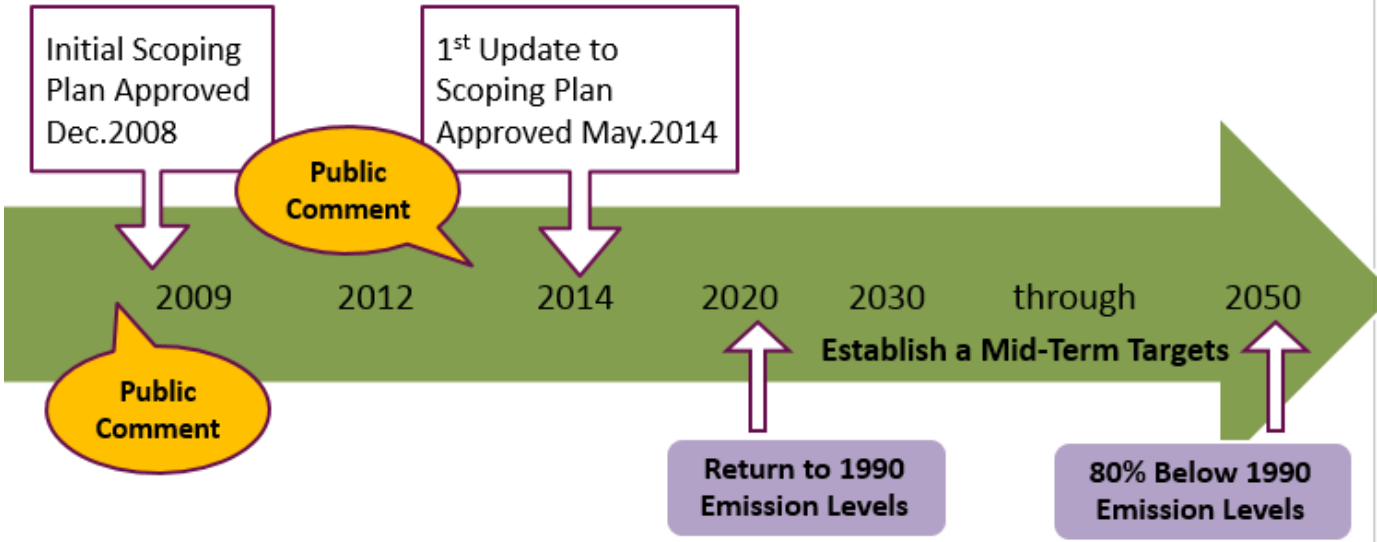
Mandates development of rules and regulations to return California's GHG emissions to 1990 levels by 2020 (Reduction of ~43 $MMTCO_2E$ by 2020).

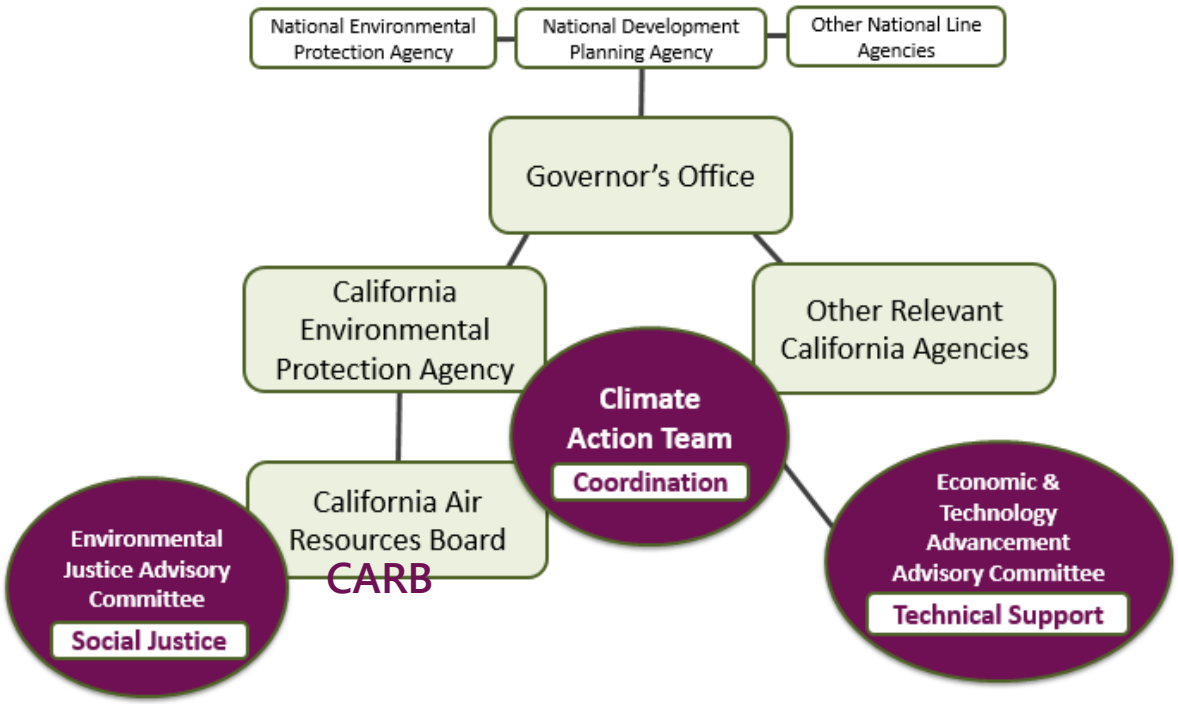
AB32 Starts with 2020 targets



Source: CARB, Emissions Reductions from Scoping Plan Measures; 2020 GHG Emissions Forecast

The process introduced a path to 2020 and beyond



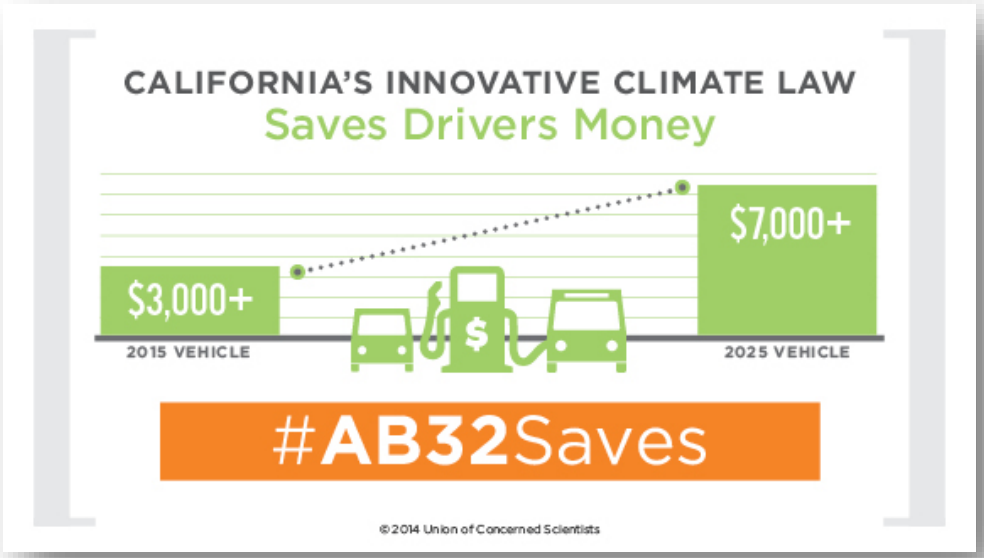


The Institutions supporting this process were important

- ✓ Method: 44 sector-specific climate strategies in 5 sectors
- ✓ Estimation: The cost of mitigating a ton of GHG in 2020,
  The benefits of energy savings, The benefits of reduced air pollution

Selected & Estimated Co-benefits

Economic	**Energy Efficiency, Energy Access, Economic Development** • Homeowners can save about $200/year through energy efficiency • $76 billion increase in Gross State Product (GSP) • $48 billion increase in real household incomes
Environmental	**Improved Air Quality, Land use, Ecosystem Services** • Air Quality • Reduce combustion-generated soot (PM2.5): 15 tons/day • Reduction of nitrogen oxides: 61 tones/day
Social	**Public Health, Green Jobs (Job Creation)** • $4.3 billion in 2020: 770 fewer premature deaths and 76,000 fewer work days lost • The creation of 403,000 new efficiency and climate driven jobs



Lets look at how those benefits were communicated

Case Study 4: Jakarta BRT

After a slow start, TransJakarta delivers benefits

We need an effective enabling environment…

Case Study 4: Jakarta BRT

1999-2004
Pre-BRT

- Governor's Office
  - Jakarta Transportation Agency (DisHub)

2004-2006
BRT-Lines 1-3

- Governor's Office
  - Jakarta Transportation Counsel
  - Jakarta Transportation Agency (DisHub)
  - TransJakarta

2007-2008
BRT-Lines 4-7

- Governor's Office
  - Jakarta Transportation Counsel
  - Jakarta Transportation Agency (DisHub)
  - TransJakarta

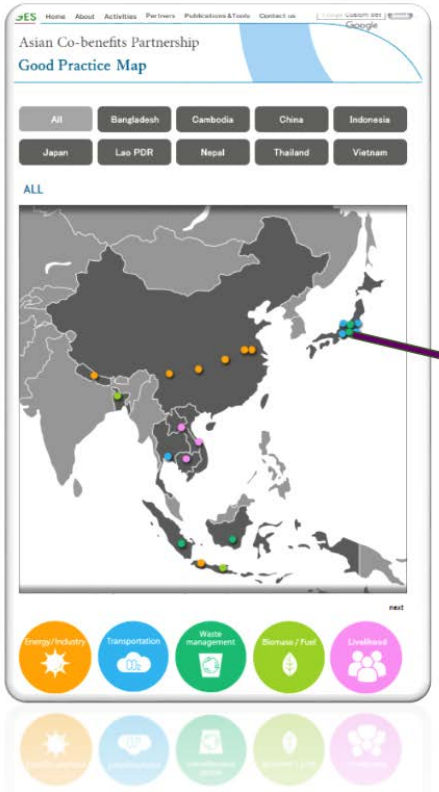
Co-benefits action plan phase III

- Please add to your group's plan by deciding on the following:

✓ The institutional structure(s) that will support the design and implementation your action plan

✓ The policymaking process that will support your action plan

✓ Other elements of an enabling environment that will support your plan



Asian Co-benefits Partnership

www.cobenefit.org

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Clean Development Mechanism

The Indian Bagepalli Biogas Program

Introduced 5,500 biogas units that convert cow dung into cooking fuel in poor households. Local women and communities benefited from the income generated by selling emission credits


(Source: www.fairclimatefund.nl)


(Source: www.wordorg.net)

Co-benefits


(Source: www.goldstandard.org)

Nationally Appropriate Mitigation Action

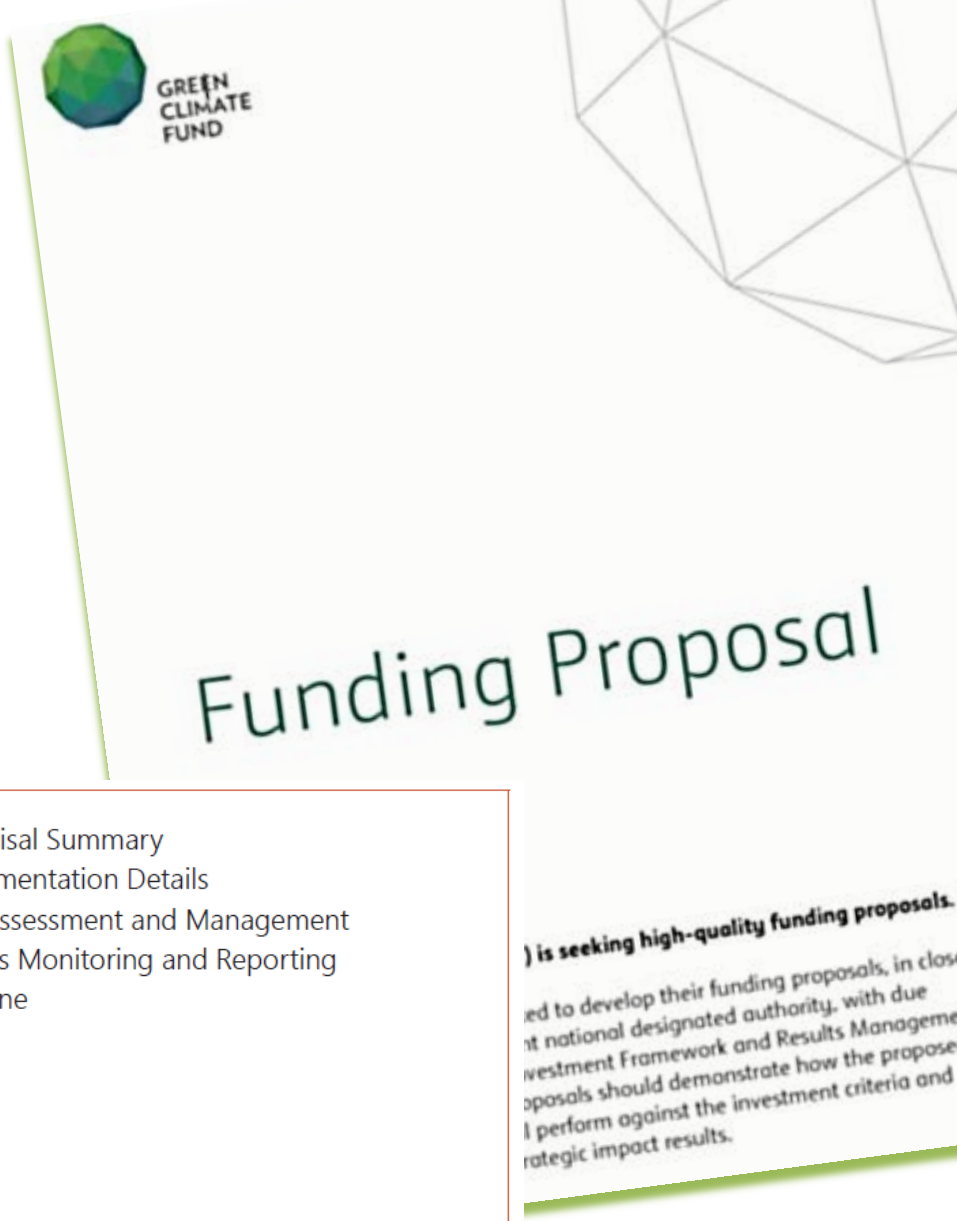
Bus Rapid Transit for Kampala

Aims at reducing transport-related GHG emissions by building 9 BRT routes and non-motorized transport lanes linked to the BRT

Bio-energy in Pakistan

Seeks to develop and disseminate environment-friendly and cost-effective technologies and management practices of bio-energy generation from organic waste

GCF released $183 million for the initial 8 project in SIDS & LDCs (as of 2015)



Proposal Outline

A. Summary
B. Detailed Description
C. Rationale for GCF Involvement
D. Expected Performance against Investment Criteria
    D.1. Impact Potential
    D.2. Paradigm Shift Potential
    D.3. Sustainable Development Potential.
    Describe environmental, social and economic co-benefits including the gender-sensitive development impact.
    D.4. Needs of the Recipient
    D.5. Country Ownership
    D.6. Efficiency and Effectiveness
E. Appraisal Summary
F. Implementation Details
G. Risk Assessment and Management
H. Results Monitoring and Reporting
I. Timeline

Source: Author's simplification of GCF, 2015b