ANALYTICAL TOOLS FOR INFORMING CLIMATE POLICY

PMR MEETING, SYDNEY 2012

Agenda

- 'Analytical tools' demand drivers

- Broad categories of analytical models in sustainable development

- ESMAP's models

- Way forward

Fundamental drivers of the demand for Low Carbon Development analytical tools

- Reducing emissions
- Accessing energy
- Accessing finance
- Reducing energy costs
- Improving energy security
- Developing industrial advantage

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Analytical questions challenging many PMR participants

- How do we meet GHG emission targets without compromising development?

- What are the economic implications of meeting the targets to :
  - the different sectors in our economy
  - trade with our partners
  - geographic distribution of economic activity

- What is the reference case of our economy, and where will be in 20 years?

- What is the cost and attractiveness of abatement technologies or activities?

- What data do we have, and what data do we need?

- What kind of assumptions do we need to make?

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Why are models one of the tools for answering questions facing many governments

Countries need models :

- Models improve the understanding of climate policy analysis, which is often complex involving many variables interacting over time

- Models lower the hurdle into understanding climate policy/ low carbon development since the emphasis is fairly new in many developing countries

- Models require fairly limited resources to get started

Models do not answer all questions:

- Models are an informed simplification of reality

- Garbage in, and garbage out

- Limitations based on assumptions, computational challenges and knowledge gaps

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Three broad categories of models

Aggregated Macroeconomic Model

Hybrid Models

Engineering-related Models
Optimization
Simulation
Accounting

Applied Dynamics Analysis Global Economy
(ADAGE)
Global Trade and Environment model
(GTEM)

Integrated Planning Model (IPM)

Energy Forecasting Framework and Emissions
Consensus Tool (EFFECT)
Long range Energy Alternatives Planning System
(LEAP)

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Aggregated Macroeconomic Model Application: US "cap and trade bill" – Lieberman-Warner Act
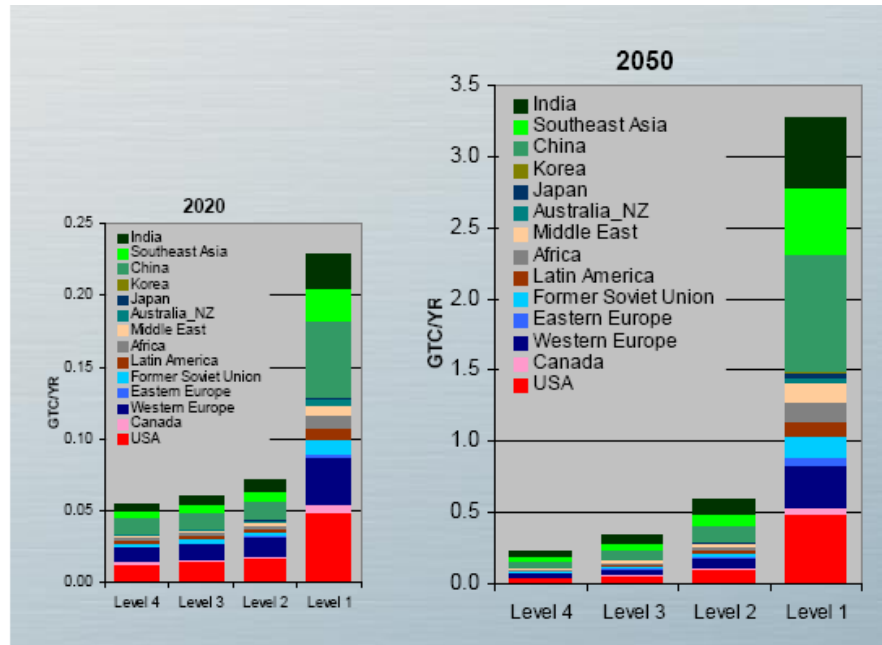
Applied Dynamics Analysis Global Economy (ADAGE)

- Global model which covers all interaction among business and households. Does economic modeling in addition to energy, environmental, climate change mitigation analysis
- **Strengths:** Better suited for modeling the long run, international analyses
- **Weaknesses:** Weak on technological representations

Hybrid model application: US "cap and trade bill" – Lieberman-Warner Act

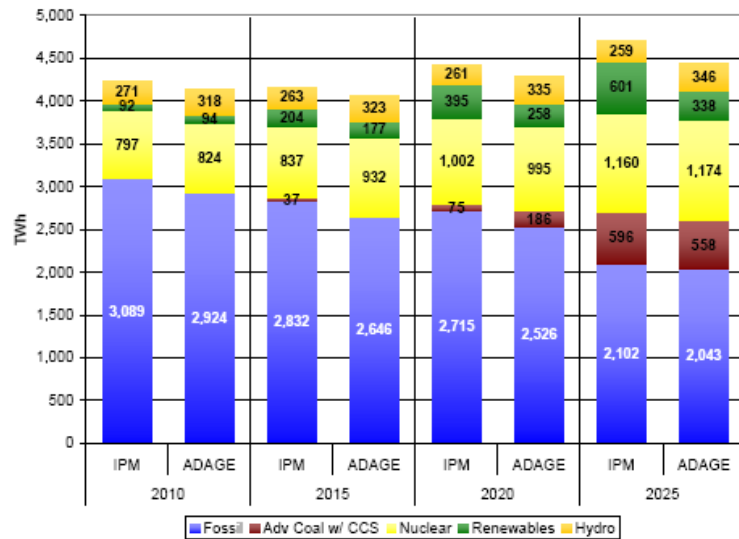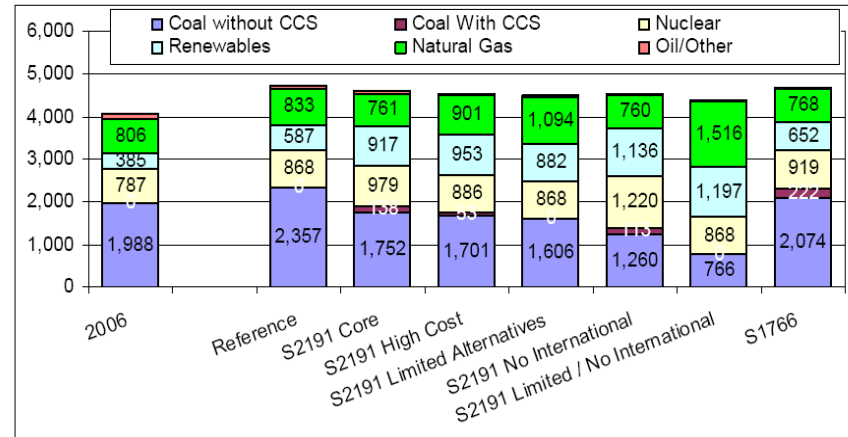S. 2191 Scenario Electricity Generation Mix

Figure 14: Generation by Fuel in Alternative Cases in 2020
(billion kilowatthours)

Source: National Energy Modeling System runs AEO2008.D030208F, S2191.D031708A, S2191HC.D031708A, S2191BIV.D031608A, S2191NOINT.D032508A, S2191BIVNOI.d033108A and S1766_08.D031508A.

Integrated Planning Model (IPM)
More focused on environmental policy and the power sector in the 48 US States; with a stronger focus on the environmental impact of power policy
Strengths: Better suited for short run
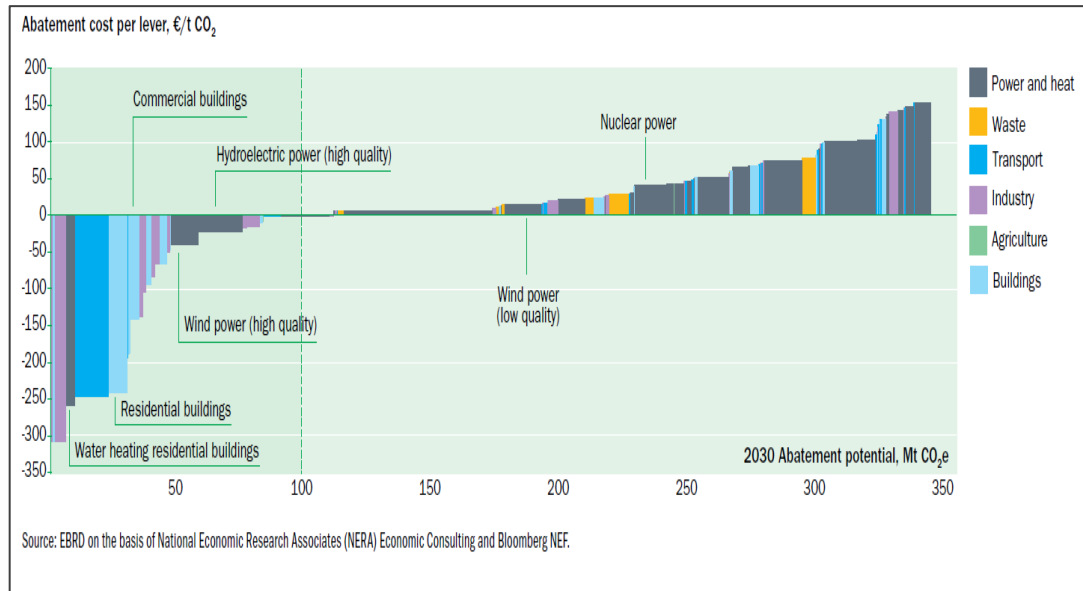Weaknesses: Relatively weak on technology options

MiniCam
Highly integrated model which focuses on energy, agricultural systems and greenhouses gases
Strengths: Strong focus on technological gap between business as usual and atmospheric stabilization
Weaknesses:

Engineering-related model application – Marginal Abatement Cost Curves for Turkey

Abatement cost per lever, €/t CO₂

Source: EBRD on the basis of National Economic Research Associates (NERA) Economic Consulting and Bloomberg NEF.

Marginal Abatement Cost Curve models (e.g. MACTool, McKinsey, etc)

- Shows the cost of reducing a ton co2 emissions using different options
- Strengths: easy to visualize complex information, several models available
- Weaknesses: can be data intensive

Progress

- 'Analytical tools' demand drivers

- Broad categories of analytical models in development

- ESMAP's models

- Way forward

ESMAP's LCD Planning Tools

META| EFFECT | MACTool | TRACE

ESMAP developed tools that currently do the following:

META | Help countries choose electricity supply options

EFFECT | Build development scenarios and forecast their impact on GHG emissions

MACTool | Identify the marginal abatement costs associated with each scenario

TRACE | Assess energy efficiency opportunities at the city-level

EFFECT **Why EFFECT?**

Strong Demand from Countries:

- Building LCD scenarios consistent across sectors

- Forecasting GHG emissions

Key Advantages of EFFECT:
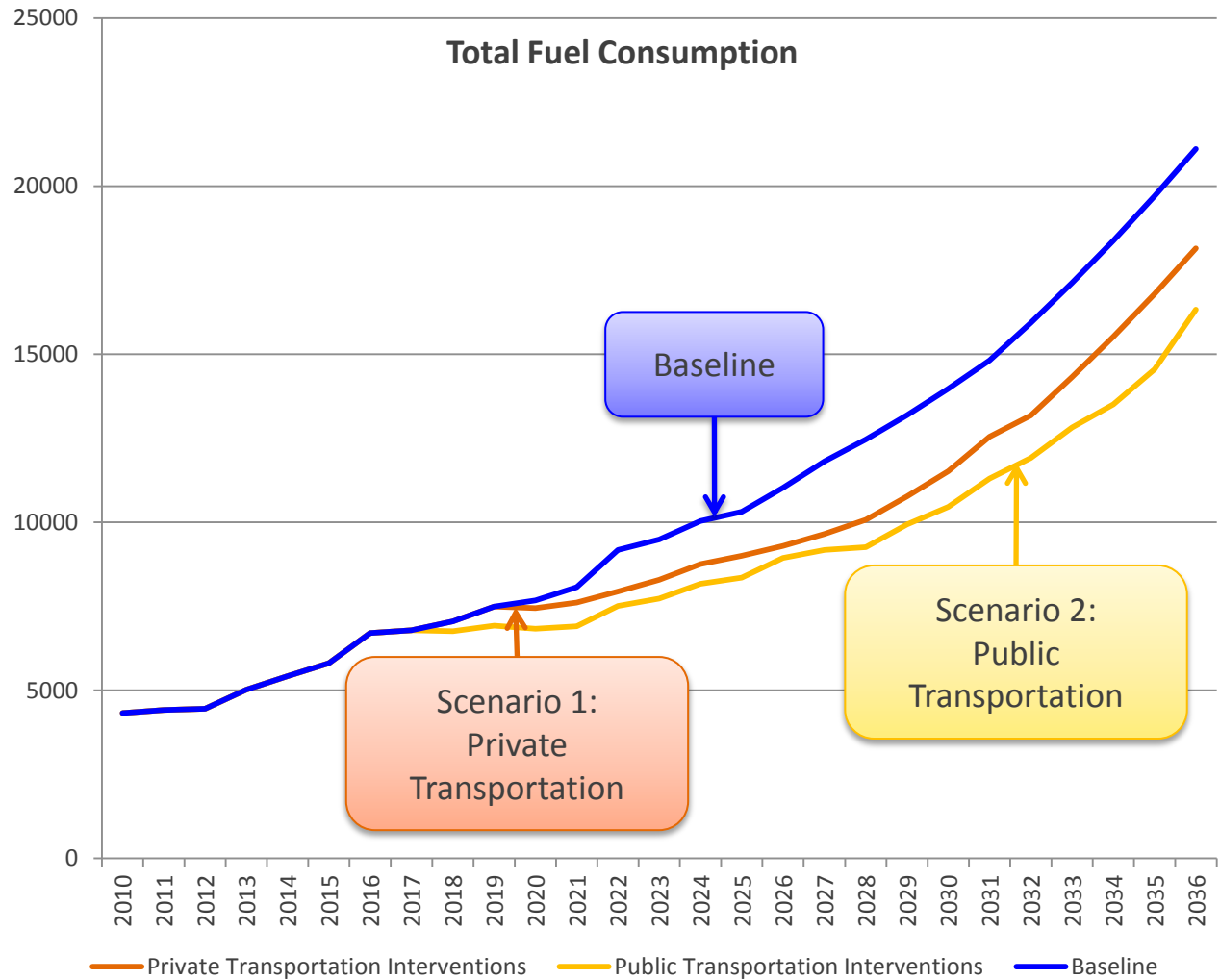
- Transparent - Enables consensus building among a wide range of stakeholders

- Flexible - Enables customization to suit local conditions

- Adept - Compiles a large amount of local data from multiple sources

EFFECT Use:

- Brazil, China, Georgia, India, Indonesia, Macedonia, Nigeria, Philippines, Poland, Thailand, Vietnam,

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Georgia Example: LCD Scenario Comparison

With all else being equal, public transportation interventions result in a greater reduction in fuel consumption

Total Fuel Consumption

Baseline

Scenario 1: Private Transportation

Scenario 2: Public Transportation

Private Transportation Interventions — Public Transportation Interventions — Baseline

Why MACTool?

Countries conducting low carbon studies/implementing Cap-and-Trade systems to achieve voluntary emission reductions. There is need to:

- Achieve the targets efficiently
- Choose among many mitigation options
- Know the potential results
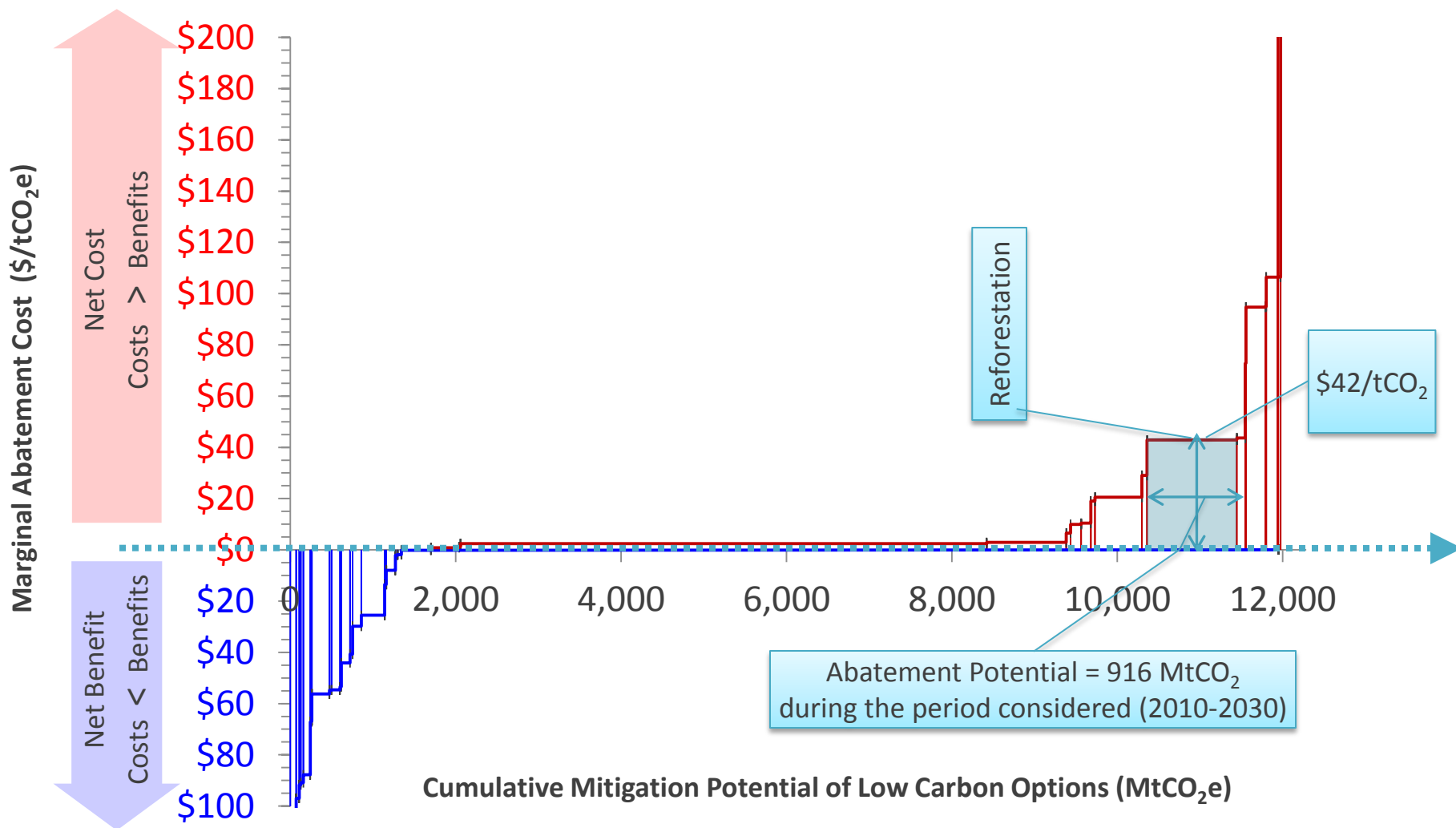- Know the potential costs

Key Advantages of MACTool:

- Considers the break-even carbon price
- Discount rate customizable by technology
- Visual display of the results easy to share with stakeholders

MACTool Use

- Macedonia, Vietnam, Brazil

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Marginal Abatement Cost Curve

Marginal Abatement Cost ($/tCO$_2$e)

Net Cost Costs > Benefits

Net Benefit Costs < Benefits

$200
$180
$160
$140
$120
$100
$80
$60
$40
$20
$0

$20
$40
$60
$80
$100

0   2,000   4,000   6,000   8,000   10,000   12,000

Reforestation

$42/tCO$_2$

Abatement Potential = 916 MtCO$_2$
during the period considered (2010-2030)

Cumulative Mitigation Potential of Low Carbon Options (MtCO$_2$e)

MACTool The Break-even Carbon Price

Key Questions	Example Mitigation Option: Cogeneration from Sugarcane

Public Sector

Is there an option for a low-carbon scenario?

YES: Extracting condensing turbine, 90 bars

What is the mitigation potential ?

158 MtCO2e (7.5MtCO2/year)

Does it make sense economically from a public planning perspective ?

YES: **Marginal Abat. Cost** = - $ 105 /tCO2
(8% social discount rate)

Private Sector

Would it happen spontaneously ?

**NO: Private Sector Expected IRR is 18% > 8%
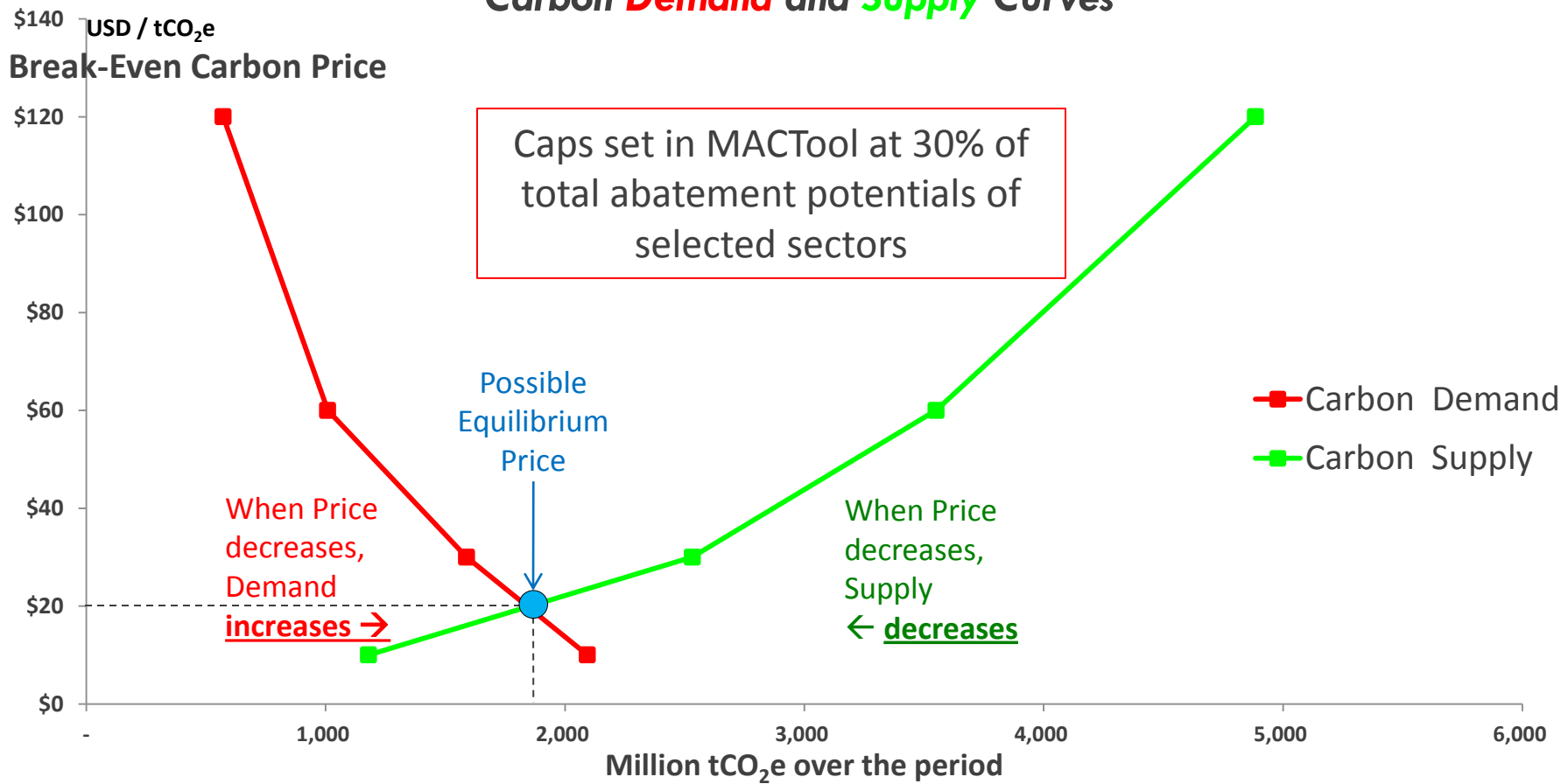Incentive required = + $ 8 /tCO2**

Break-Even Carbon Price = +$8/tCO2

How much financing is needed ?

Additional investment = + $ 35 billion
(+$1.6 bi /year)

Testing liquidity and equilibrium price

*MACTool allows to set **(and modify)** caps and build **(and update)** the expected Carbon **Demand** and **Supply** Curves*

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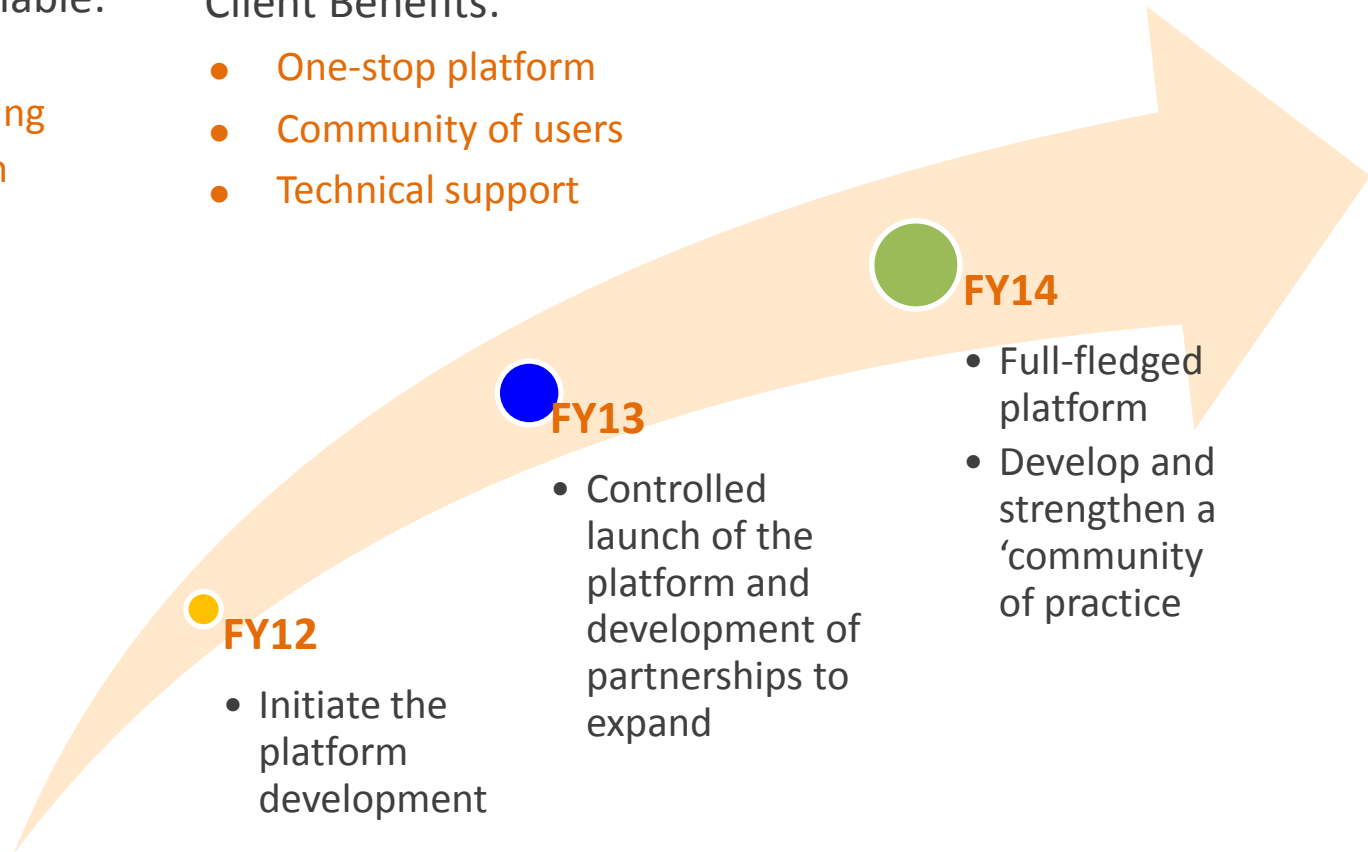
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An Open Platform *for* Low Carbon Development/Climate-Smart Planning Instruments

Platform will enable:
- Open-access
- Crowd-sourcing
- Collaboration
- Data sharing

Client Benefits:
- One-stop platform
- Community of users
- Technical support

FY12
- Initiate the platform development

FY13
- Controlled launch of the platform and development of partnerships to expand

FY14
- Full-fledged platform
- Develop and strengthen a 'community of practice

A partnership among

THE WORLD BANK · ESMAP Energy Sector Management Assistance Program · GREEN GROWTH knowledge platform · Global Green Growth Institute · giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH · **LEDs global partnership**

On-going discussions with

SEI STOCKHOLM ENVIRONMENT INSTITUTE · McKinsey&Company · NREL NATIONAL RENEWABLE ENERGY LABORATORY · UNEP RISØ CENTRE ENERGY, CLIMATE AND SUSTAINABLE DEVELOPMENT · UNDP