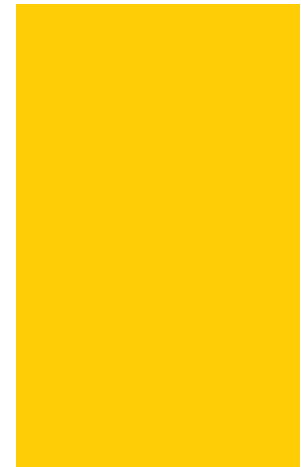


Low Carbon Development Planning Tools at ESMAP



Why Low Carbon Development Planning?

- Strong demand from countries
 - Providing access to energy
 - Reducing fuel imports bill
 - Improving energy security
 - Creating carbon markets
 - Developing industrial advantage



ESMAP's LCD Tools

EFFECT | MACTool | TRACE | ETOAG

- **ESMAP is building upon its LCD work:**
 - ESMAP Mandate – help developing countries “*achieve environmentally sustainable energy solutions for poverty reduction and economic growth*”
 - Completed or ongoing low carbon development work in 18 countries

- **Countries need LCD analytical tools:**
 - LCD work is often complex involving many variables over time
 - Focus on low carbon in development is not a well-trodden path
 - Many countries lack capacity to perform the detailed analysis

- **ESMAP developed tools that currently do the following:**
 1. Forecast the impact of development scenarios on GHG emissions
 2. Identify the marginal abatement costs associated with each scenario
 3. Assess energy efficiency measures at the city-level
 4. Help countries choose electricity supply options



Energy Forecasting Framework
and Emissions Consensus Tool

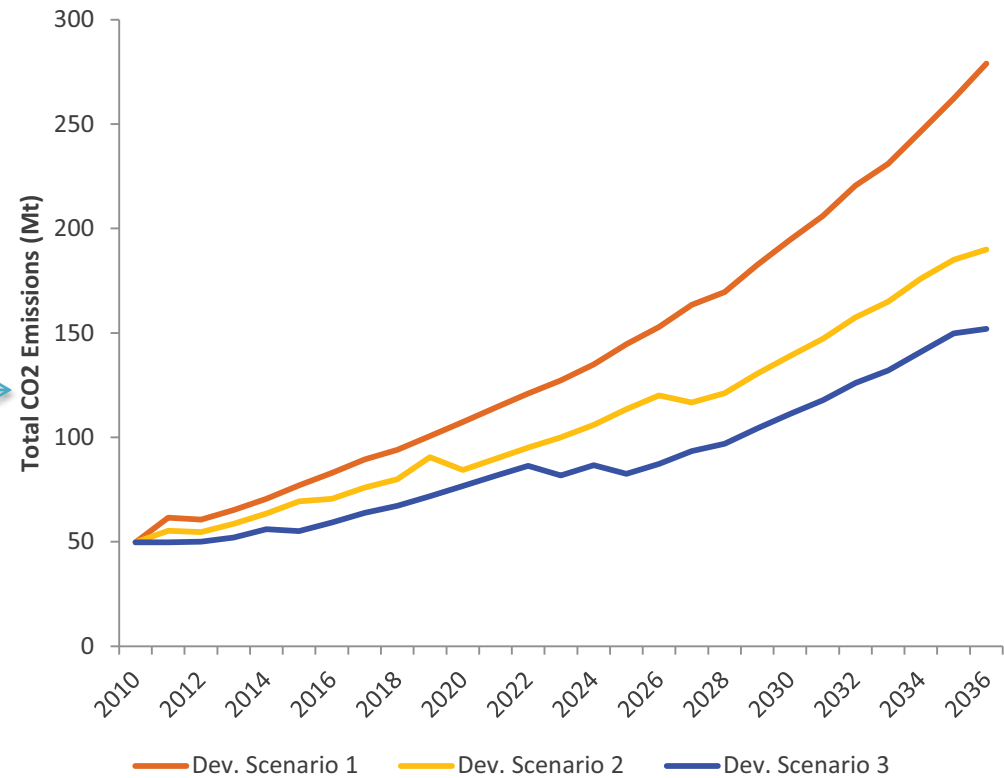
● AN OPEN TOOL FOR FORECASTING GHG EMISSIONS
IN LOW CARBON DEVELOPMENT

EFFECT yields GHG emission forecasts from data about energy producing/consuming assets in given development scenarios

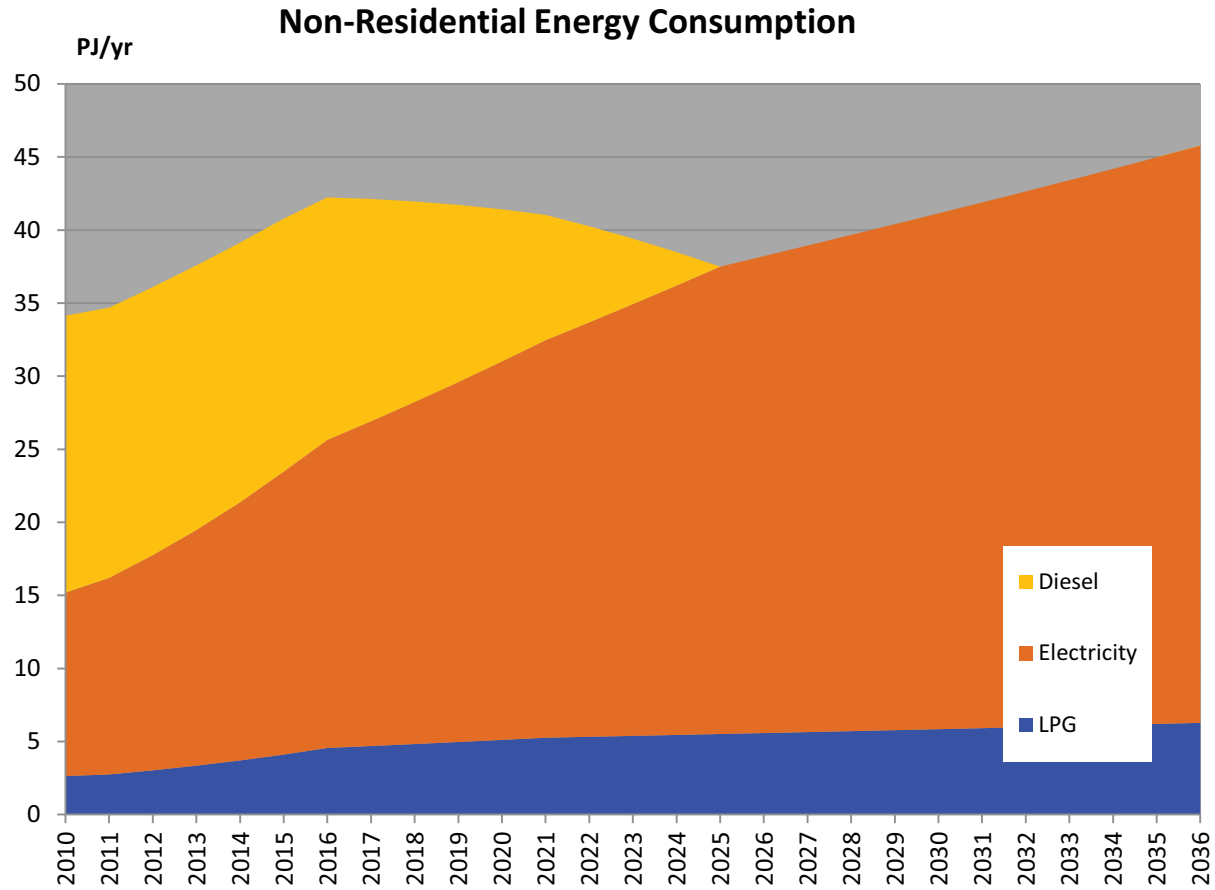
Development Scenario
Input data

Forecast
into Future

Scenario GHG
Emissions



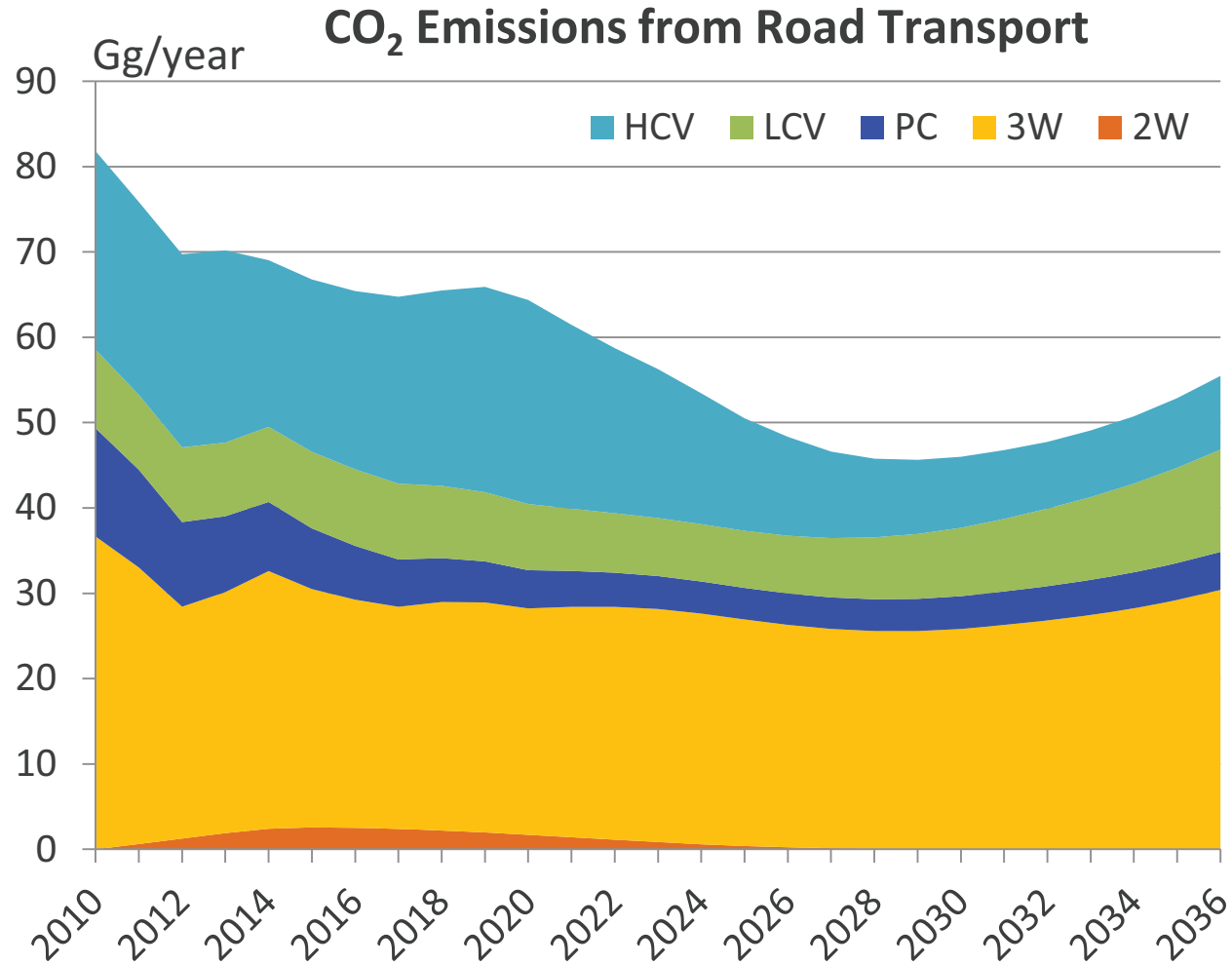
Generates intermediate results useful for low carbon development planning



Generates sector-specific results useful for sector-based low carbon planning

Sectors covered :

- Transport (road and rail)
- Agriculture
- Power
- Industry
- Households
- Non-residential



Country	Status
Brazil	✓
China	✓
Georgia	✓
India	✓
Indonesia	✓
Macedonia	✓
Nigeria	✓
Philippines	✓
Poland	✓
Thailand	✓
Vietnam	✓

Legend	Status
	Completed
	Ongoing
	Just starting

Informing Government Policy &

World Bank lending:

India | Brought together disparate government departments. Highlighted the importance of two things: (1) regional transmission - Bank has loaned US\$2B towards those projects (2) hydropower - Bank is currently preparing studies for mobilizing US\$20B for hydropower projects

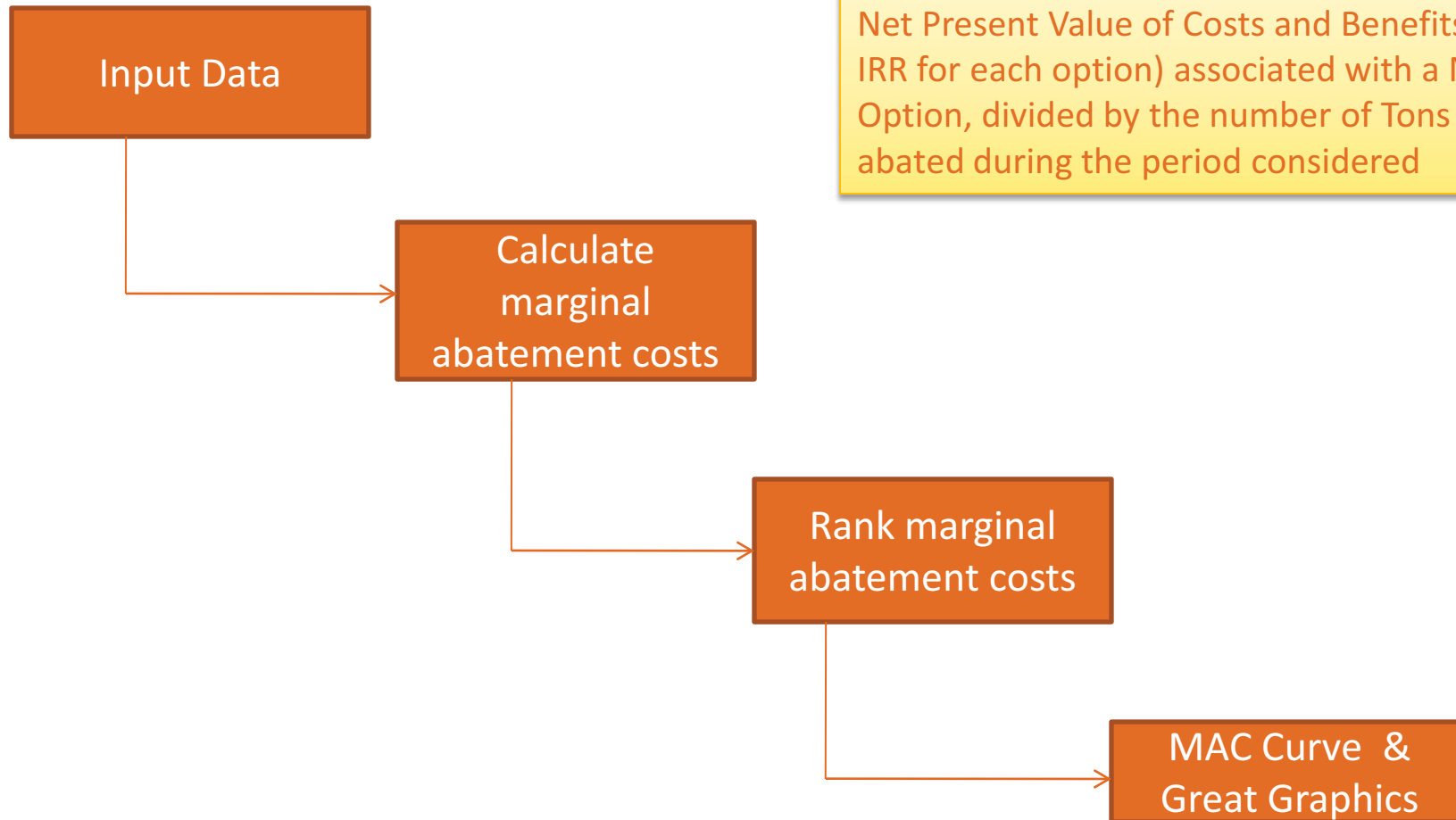
Poland | Catalyzed the approval of a US\$1.1B loan to Poland for renewable energy and energy efficiency work

Georgia | Developing a green transportation strategy championed by the Ministry of the Economy & Sustainable Development in order to reduce fuel imports

Nigeria | Energy Commission of Nigeria created an EFFECT Modeling Group within its Energy Planning and Analysis Dept. to investigate generation options for a 30-year time horizon

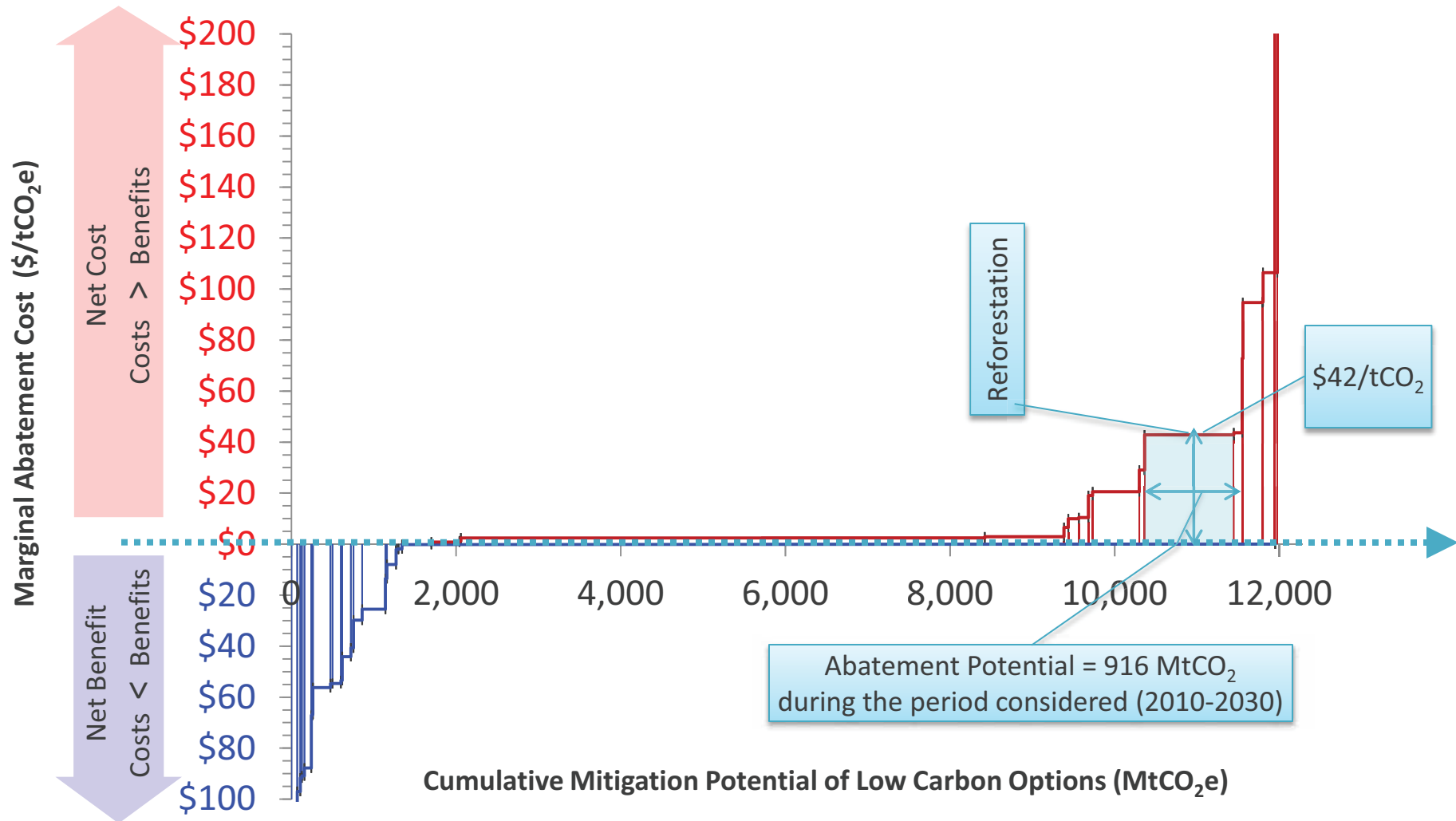


- AN EASY & TRANSPARENT WAY TO BUILD A MARGINAL ABATEMENT COSTS CURVE

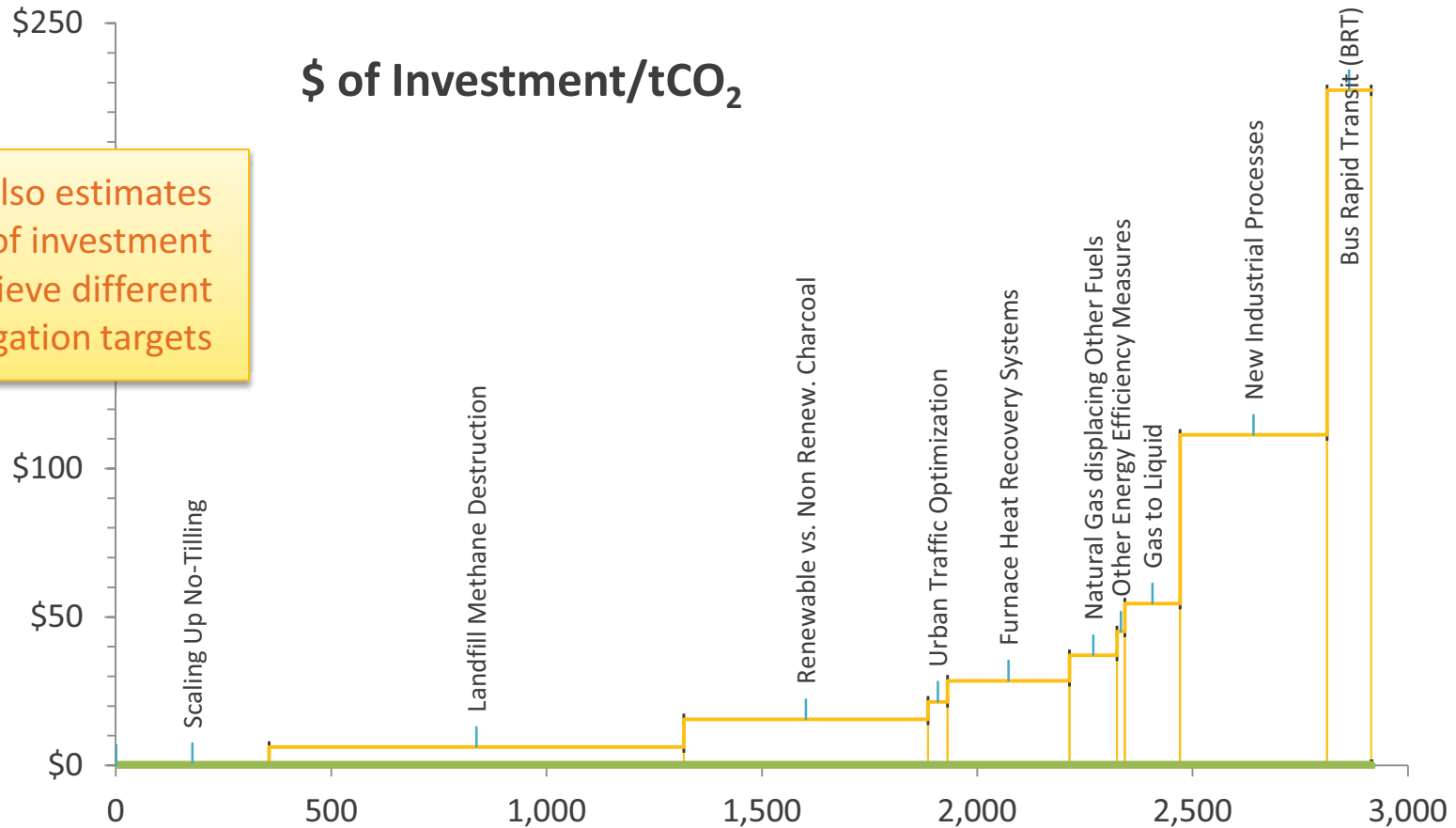


Marginal Abatement Cost (MAC):
Net Present Value of Costs and Benefits (unique IRR for each option) associated with a Mitigation Option, divided by the number of Tons of CO₂ abated during the period considered

MACTool Marginal Abatement Cost Curve

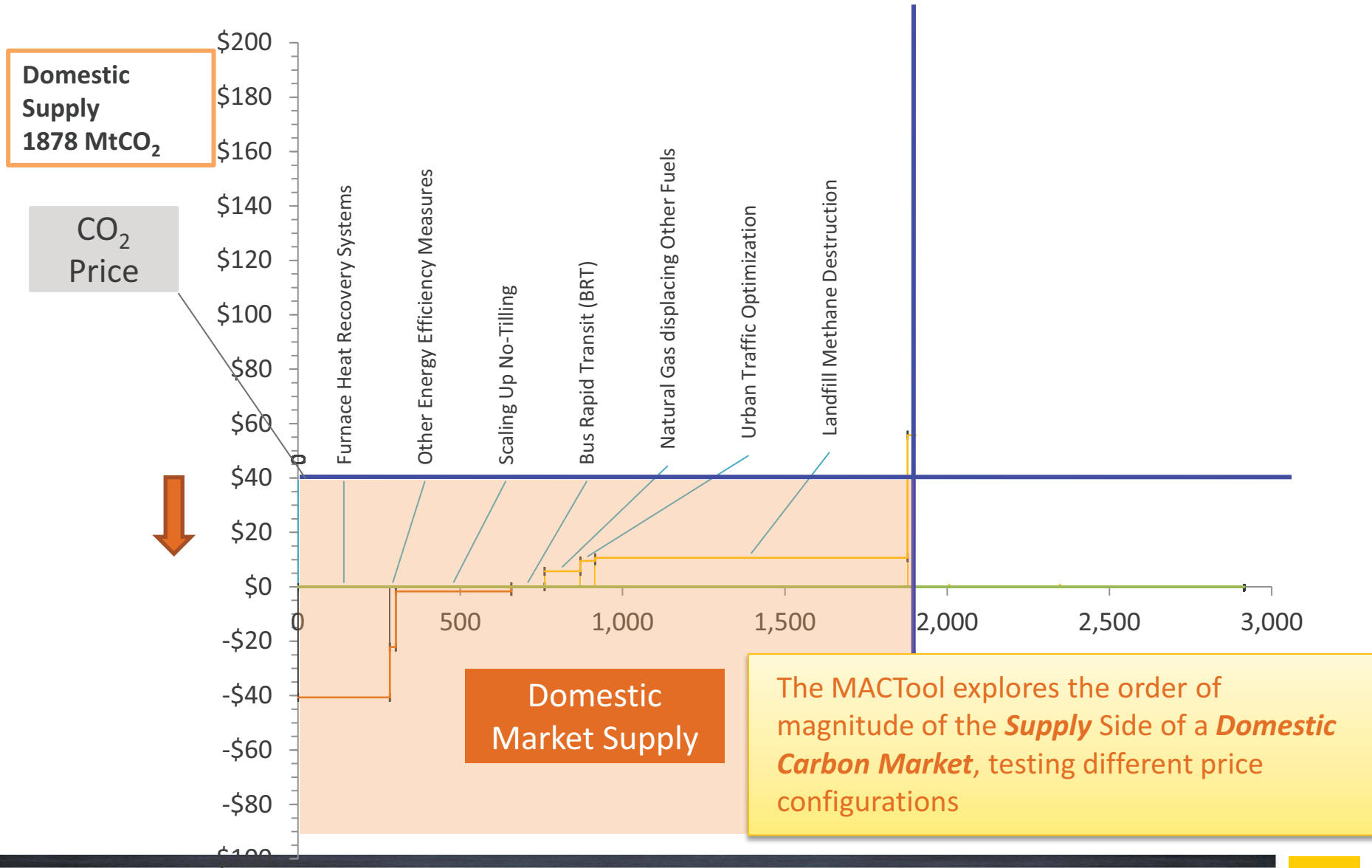


\$ of Investment/tCO₂

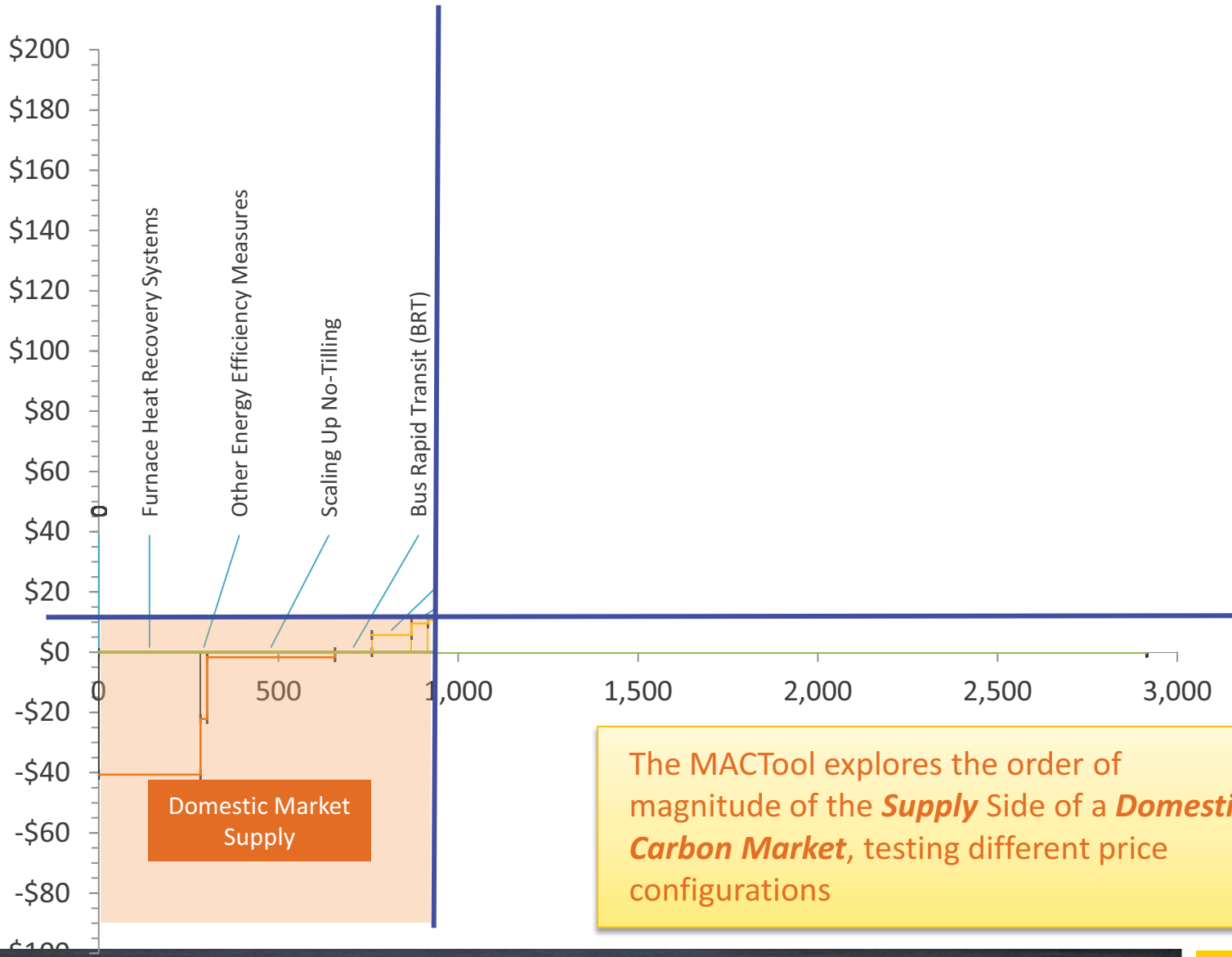


The MACTool also estimates the volume of investment needed to achieve different sets of mitigation targets

Investment Needed	Scaling Up No-Tilling	Landfill Methane Destruction	Renewable vs. Non Renew. Charcoal	Urban Traffic Optimization	Furnace Heat Recovery Systems	Natural Gas displacing Other Fuels	Other EEy Measures	Gas to Liquid	New Industrial Processes	Bus Rapid Transit (BRT)
\$Million	252	5,957	8,794	972	8,074	4,088	827	6,986	37,995	23,290



Domestic Supply
760 MtCO₂



The MACTool explores the order of magnitude of the **Supply** Side of a **Domestic Carbon Market**, testing different price configurations

3 COUNTRIES

Country	Status
Brazil	✓
Macedonia	✓
Vietnam	✓

Legend

Completed

Ongoing

Just starting

Informing Government Policy \$

World Bank lending:

Brazil | Government designing a domestic cap and trade program using MACTool for supply and demand analysis at different CO₂ price levels (with Partnership for Market Readiness)

Macedonia | to provide needed investment estimates for the Macedonia Sustainable Development Strategy in the transport sector

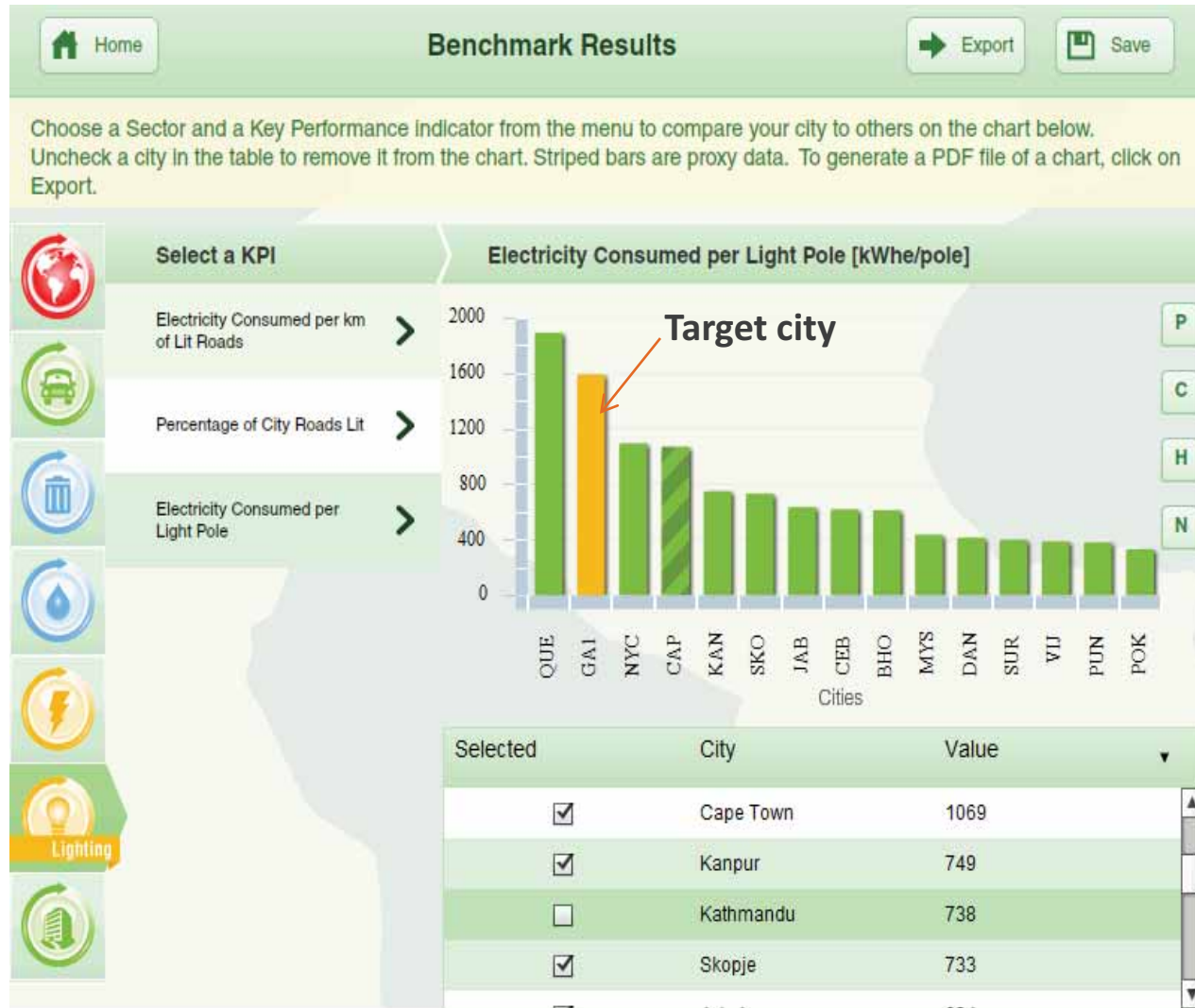


- A DECISION SUPPORT TOOL FOR EVALUATING ENERGY EFFICIENCY OPPORTUNITIES IN CITIES

TRACE helps cities identify under-performing sectors, evaluate improvement and cost-saving potentials, and prioritize sectors and EE interventions.

Energy Efficient Cities Initiative
Tool for Rapid Assessment of City Energy





Visual depiction of how a city compares with peer cities

Comprehensive sector prioritization with quantified potential benefits

Home
Sector Prioritization
Export
Save

Based upon the answers to the sector prioritization questions, two separate lists of sectors have been created: CA Control and City-wide. 6 of 8 selected

City Authority Sector Ranking

Rank	Sector	REI%	Spending CA (US \$)	Control	Score	Check to Select
1	Potable Water	86.1	20,046,760	0.80	13,819,468	<input checked="" type="checkbox"/>
2	Municipal Buildings	54.8	13,836,029	1.00	7,586,851	<input checked="" type="checkbox"/>
3	Solid Waste	48.2	500,000	0.75	180,803	<input checked="" type="checkbox"/>
4	Wastewater	5.0	1,194,840	0.90	53,767	<input type="checkbox"/>

City Wide Sector Ranking

Rank	Sector	REI%	Spending CA (US \$)	Control	Score	Check to Select
1	Public Transportation	40.6	53,775,872	0.55	12,015,546	<input checked="" type="checkbox"/>
2	Private Vehicles	36.5	199,442,747	0.15	10,930,996	<input checked="" type="checkbox"/>
3	Street Lighting	51.2	12,999,355	0.90	5,998,875	<input checked="" type="checkbox"/>
4	Power	31.5	538,517,487	0.01	1,701,657	<input type="checkbox"/>

A matrix of recommendations based on savings potential, first cost, and speed of implementation

Home
Recommendations Matrix
Export
Save

The matrix below shows all recommendations from prioritized sectors sorted by First Cost and Energy Efficiency. The check boxes allow the user to alter the display based on Speed of Implementation.

Filter by speed of implementation

< 1 year
 1-2 years
 > 2 years

Energy Savings Potential	First Cost		
	> \$1,000,000	\$100,000 - \$1,000,000	< \$100,000
>200,000 kWh/annum	Municipal Offices Audit & Retrofit Program Municipal Residential (Public Housing) ... Municipal Hospitals Audit & Retrofit Prog...	Improve Efficiency of Pumps and Motors Improve Performance of System Network 2-Stroke Engine Replacement or Retrofi Street Lights Audit and Retrofit Program Public Spaces Lighting Audit and Retrofit	
100,000 - 200,000 kWh/y		Active Leak Detection and Pressure Man... EE Sorting and Transfer Facilities Traffic Restraint Measures Travel Planning	Buildings Benchmarking Program Waste Composting Program
<100,000 kWh/annum		Water Meter Program Municipal Schools Audit & Retrofit Progr... Traffic Signals Audit and Retrofit Program	Waste Vehicle Fleet Maintenance Audit a... Street Signage Lighting Audit and Retrofi...

14 CITIES IN 13 COUNTRIES

Country	Status
Bosnia and Herzegovina	✓
Brazil	✓
Ethiopia	✓
Georgia	✓
Ghana	✓
Indonesia	✓
Kenya	✓
Kosovo	✓
Macedonia	✓
Philippines	✓
Serbia	✓
Turkey	✓
Vietnam	✓

Legend

Completed
Ongoing
Just starting

Informing Government Policy \$**World Bank lending:**

Turkey | Informed the creation of the Sustainable Cities pillar in the US\$4.45billion, 2012-2015 Country Partnership Strategy

Indonesia | The WB used TRACE to conduct city-level case studies. Findings are helping to create Energy and Emissions Sustainability Plan (EESP) Guidelines

Macedonia | TRACE work Feeds into the broader Green Growth Agenda, and is helping inform bank-financed Municipal Infrastructure Investment Project

ETOAG Electricity Technology Options Assessment Guide

ANTICIPATED JUNE 2012

- Compares over 50 electricity generation technologies including renewables
- Assesses externalities, levelized, generation, and delivery costs of electricity from different options
- Developed from United States, Romania and India case studies
- User-modifiable to suit local conditions



ESMAP's LCD Planning Tools Platform Strategy

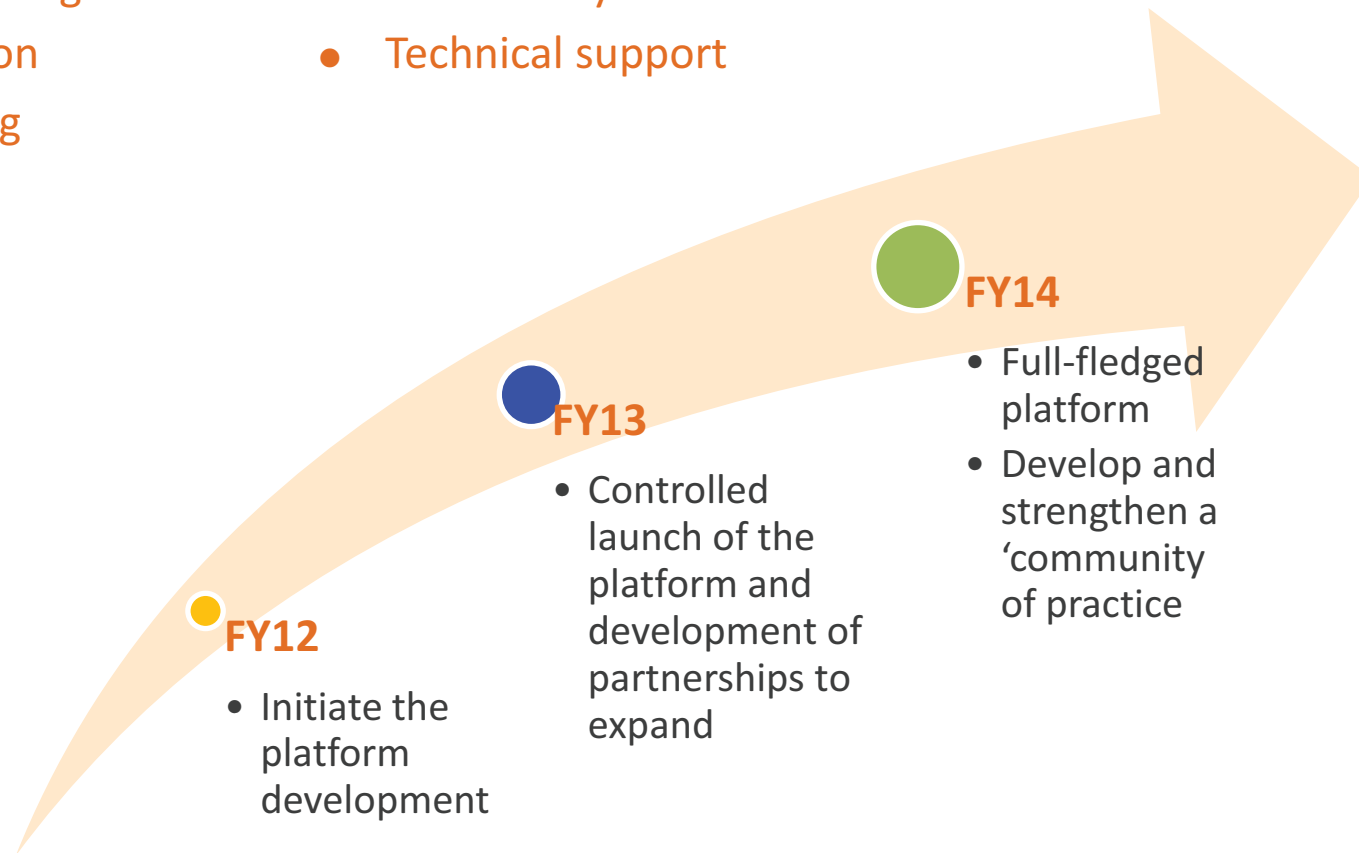
ANTICIPATED 2013

Platform will enable:

- Open-access
- Crowd-sourcing
- Collaboration
- Data sharing

Client Benefits:

- One-stop platform
- Community of users
- Technical support



PEDZI MAKUMBE
ENERGY SPECIALIST

PMAKUMBE@WORLDBANK.ORG

+1 202 473 9371

Thank You.

The World Bank | 1818 H Street, NW | Washington DC, USA
www.esmap.com | esmap@worldbank.org

