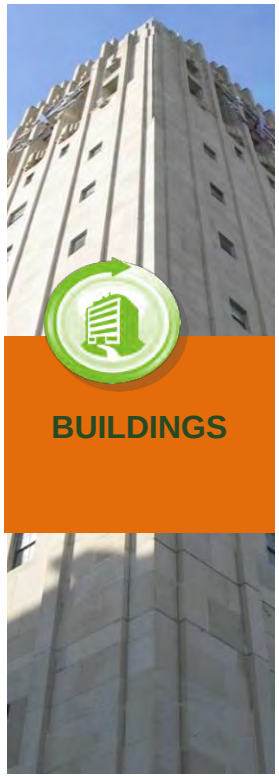
TRACE

ESMAP
Energy Sector Management Assistance Program

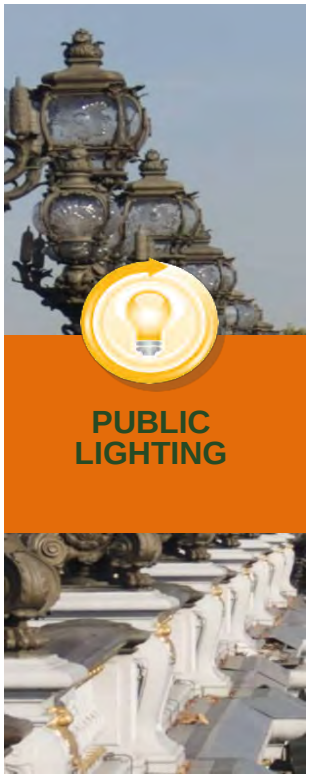
THE WORLD BANK

A Decision Support Tool for Evaluating Energy Efficiency Opportunities in Cities

TRANSPORT

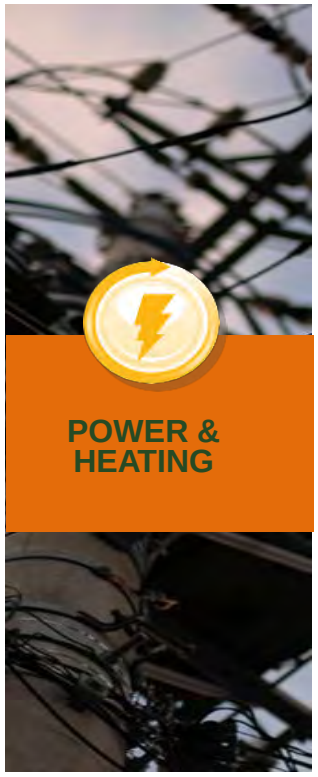


BUILDINGS



PUBLIC LIGHTING

WATER & WASTEWATER



POWER & HEATING

SOLID WASTE

Why TRACE?

Strong Demand from Cities

- Strong desire to reduce energy costs through EE improvements
- A lack of decision-support tool to identify major EE interventions across urban sectors
- Desire to learn from peer cities' and international best practices

Key Advantages of TRACE

- Cross-sectoral
- Focuses on areas under the control of the city authority
- Relatively low data requirements, low cost, intuitive and quick to implement
- Strong ownership of cities

How it Works

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

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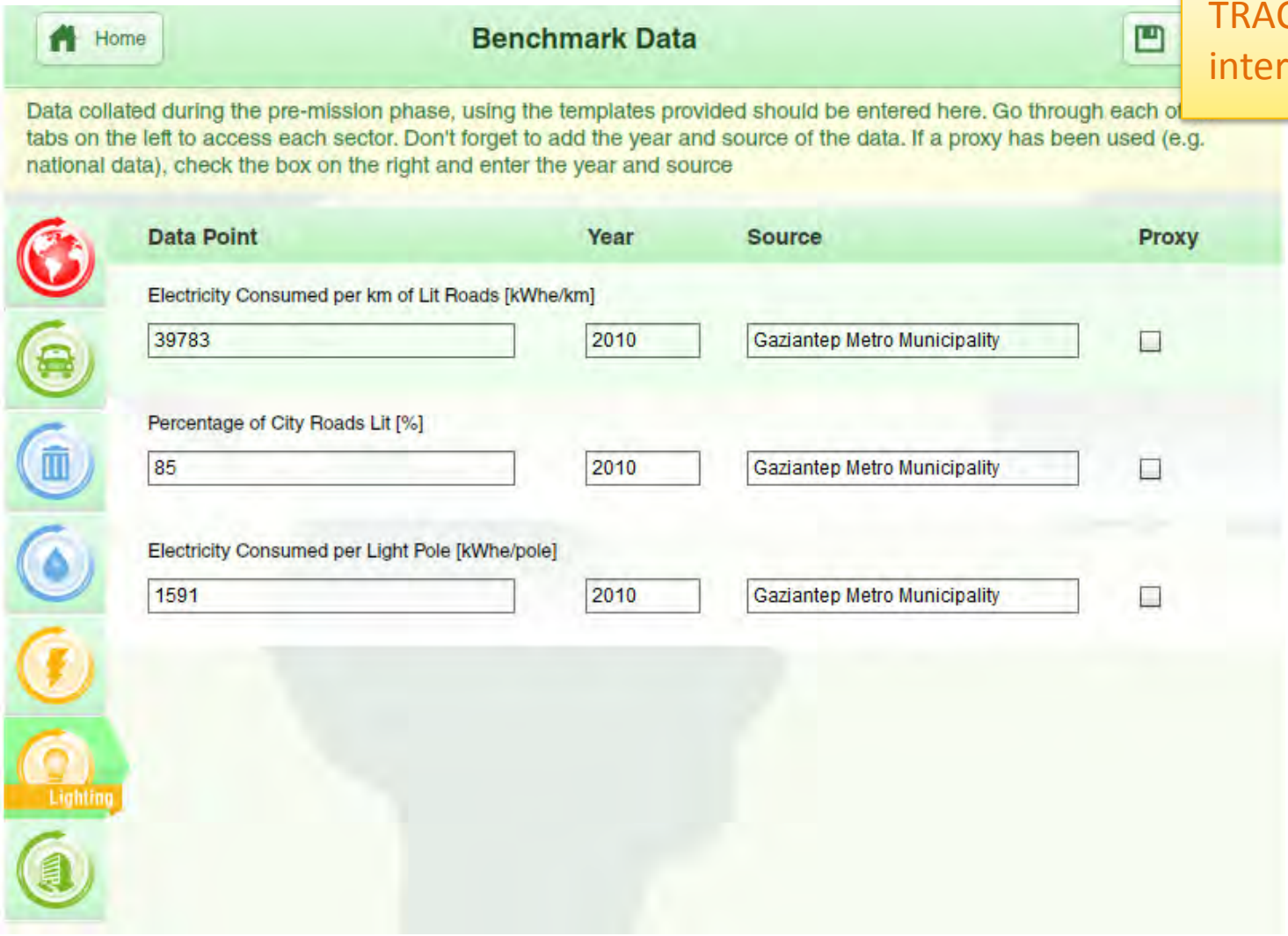
Benchmarking | Entering the data

TRACE has a simple user interface for entering data



Benchmarking | Results

Visual depiction of how a city compares with peer cities

Prioritization | Sector Results

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

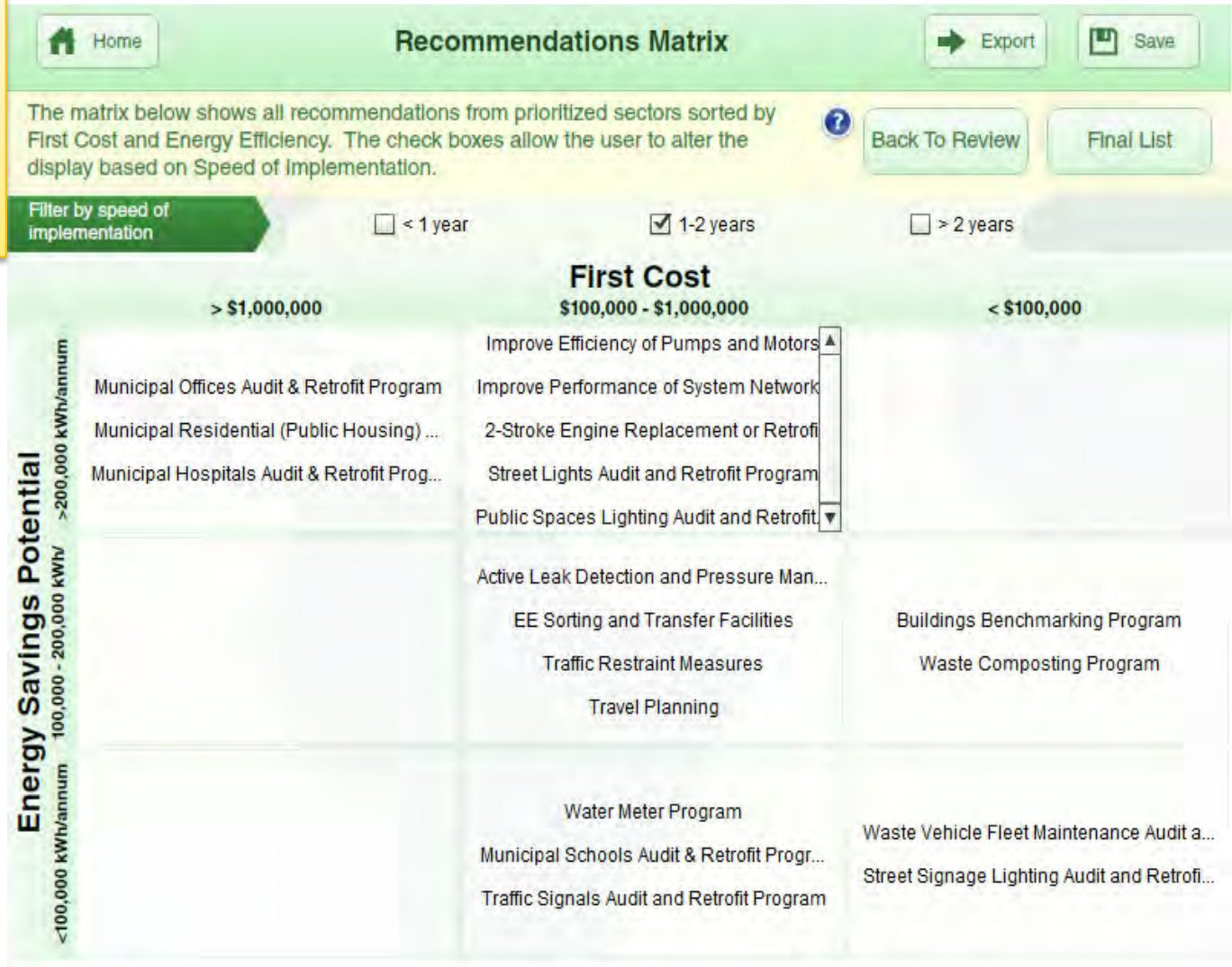
Rank	Sector	REI%	Spending (US $)	CA Control	Score	Check to Select
1	Potable Water	86.1	20,046,760	0.80	13,819,468	☑
2	Municipal Buildings	54.8	13,836,029	1.00	7,586,851	☑
3	Solid Waste	48.2	500,000	0.75	180,803	☑
4	Wastewater	5.0	1,194,840	0.90	53,767	☐

City Wide Sector Ranking

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

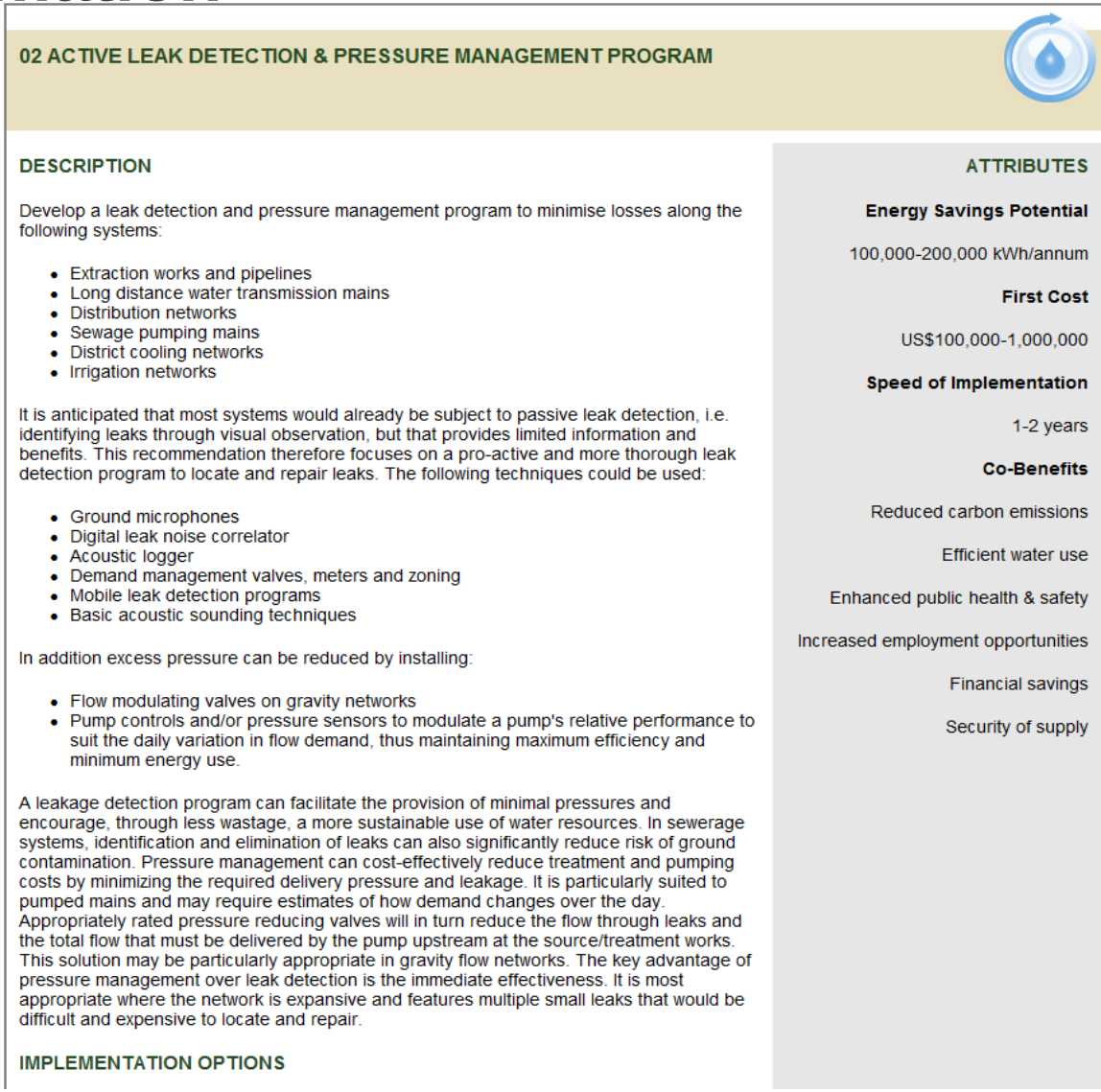
Recommendations

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



Recommendations | More information

- 59 recommendations in total
- Mix of strategic programs and specific sector activities
- 191 case studies with hyperlinks to other resources and tools
- Each recommendation 'rated' on three attributes: *Energy Savings Potential, First Cost, Speed of implementation*
- 23 "technical" recommendations include energy savings calculators



02 ACTIVE LEAK DETECTION & PRESSURE MANAGEMENT PROGRAM

DESCRIPTION

Develop a leak detection and pressure management program to minimise losses along the following systems:

- Extraction works and pipelines
- Long distance water transmission mains
- Distribution networks
- Sewage pumping mains
- District cooling networks
- Irrigation networks

It is anticipated that most systems would already be subject to passive leak detection, i.e. identifying leaks through visual observation, but that provides limited information and benefits. This recommendation therefore focuses on a pro-active and more thorough leak detection program to locate and repair leaks. The following techniques could be used:

- Ground microphones
- Digital leak noise correlator
- Acoustic logger
- Demand management valves, meters and zoning
- Mobile leak detection programs
- Basic acoustic sounding techniques

In addition excess pressure can be reduced by installing:

- Flow modulating valves on gravity networks
- Pump controls and/or pressure sensors to modulate a pump's relative performance to suit the daily variation in flow demand, thus maintaining maximum efficiency and minimum energy use.

A leakage detection program can facilitate the provision of minimal pressures and encourage, through less wastage, a more sustainable use of water resources. In sewerage systems, identification and elimination of leaks can also significantly reduce risk of ground contamination. Pressure management can cost-effectively reduce treatment and pumping costs by minimizing the required delivery pressure and leakage. It is particularly suited to pumped mains and may require estimates of how demand changes over the day. Appropriately rated pressure reducing valves will in turn reduce the flow through leaks and the total flow that must be delivered by the pump upstream at the source/treatment works. This solution may be particularly appropriate in gravity flow networks. The key advantage of pressure management over leak detection is the immediate effectiveness. It is most appropriate where the network is expansive and features multiple small leaks that would be difficult and expensive to locate and repair.

IMPLEMENTATION OPTIONS

ATTRIBUTES

Energy Savings Potential

100,000-200,000 kWh/annum

First Cost

US$100,000-1,000,000

Speed of Implementation

1-2 years

Co-Benefits

Reduced carbon emissions

Efficient water use

Enhanced public health & safety

Increased employment opportunities

Financial savings

Security of supply

Status of TRACE Usage

Country	City	Status
Bosnia and Herzegovina	Sarajevo	Completed
Brazil	Belo Horizonte	Completed
Brazil	Rio de Janaeiro	Ongoing
Ethiopia	Addis Ababa	Ongoing
Georgia	Tblisi	Completed
Ghana	Accra	Ongoing
Indonesia	Surabaya	Completed
Kenya	Nairobi	Ongoing
Kosovo	Pristina	Completed
Macedonia	Skopje	Completed
Philippines	Cebu	Completed
Philippines	Quezon City	Completed
Serbia	Belgrade	Completed
Sri Lanka	Culombo	Just Started
Turkey	Gazientep	Completed
Vietnam	Da Nang	Completed

TO GET MODEL | Download from ESMAP Website
http://esmap.org/TRACE

TRAINING | E-learning course available at:
http://einstitute.worldbank.org/ei/course/trace-how-use-tool-rapid-assessment-city-energy

ADDITIONAL SUPPORT | ESMAP Staff

ESMAP
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FOR ADDITIONAL SUPPORT, CONTACT:

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Thank You.

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TRACE Vital Statistics

Clients	City mayors and municipal bodies
Benchmarking KPIs	28 KPIs spread across 6 sectors
KPI Data Base	93 cities; 1500 data points with a minimum 8 data points per KPI
Sector Prioritization	Relative energy intensity, energy expenditure, city authority control or influence
EE Recommendations	59 recommendations spread across 6 sectors and CA management
Decision-Making Attributes	Energy savings potential, upfront capital cost, speed of implementation
Case Studies	191 cases spread across 6 sectors
Basic Training	Essential as it requires experts' participation
Duration	~3 months
Deployment	Sarajevo (Bosnia Herzegovina), Belo Horizonte (Brazil), Addis Ababa (Ethiopia), Tbilisi (Georgia), Accra (Ghana), Nairobi (Kenya), Kosovo, Skopje (Macedonia), Belgrade (Serbia), Gaziantep (Turkey), Da Nang (Vietnam), Cebu and Quezon (Philippines), Surabaya (Indonesia),