



East Asia and Pacific Region Sustainable Urban Energy Program (SUEP)

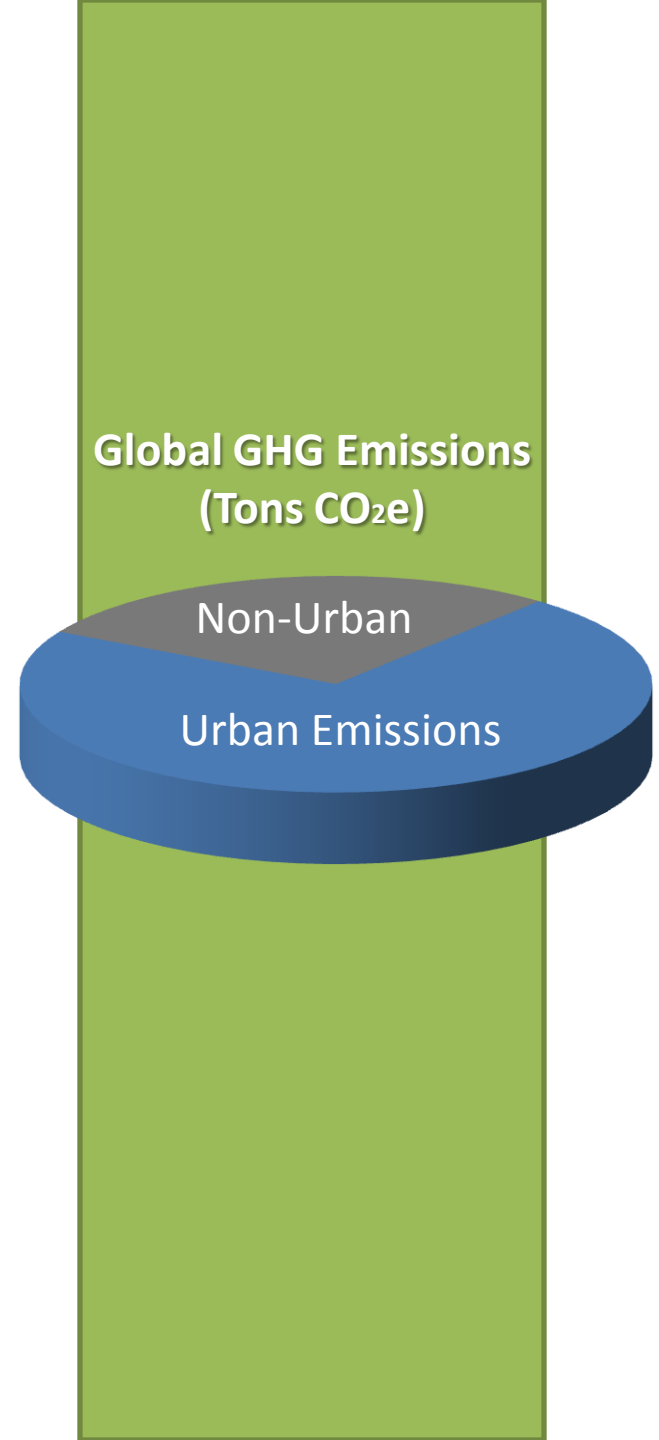
Surabaya Presentation

**Dejan Ostojic, Energy Sector Leader
The World Bank**



Background

- Cities account for nearly two-thirds of the world's annual energy consumption and about 70% of the world's greenhouse gas emissions.
- The East Asia and Pacific (EAP) region is facing particular challenges:
 - EAP urban population is expected to increase by 50% between 2000 and 2030.
 - EAP's urban share of its total population is expected to rise from 46% today to 60% by 2030.



Sustainable Green Cities...

...are energy efficient!

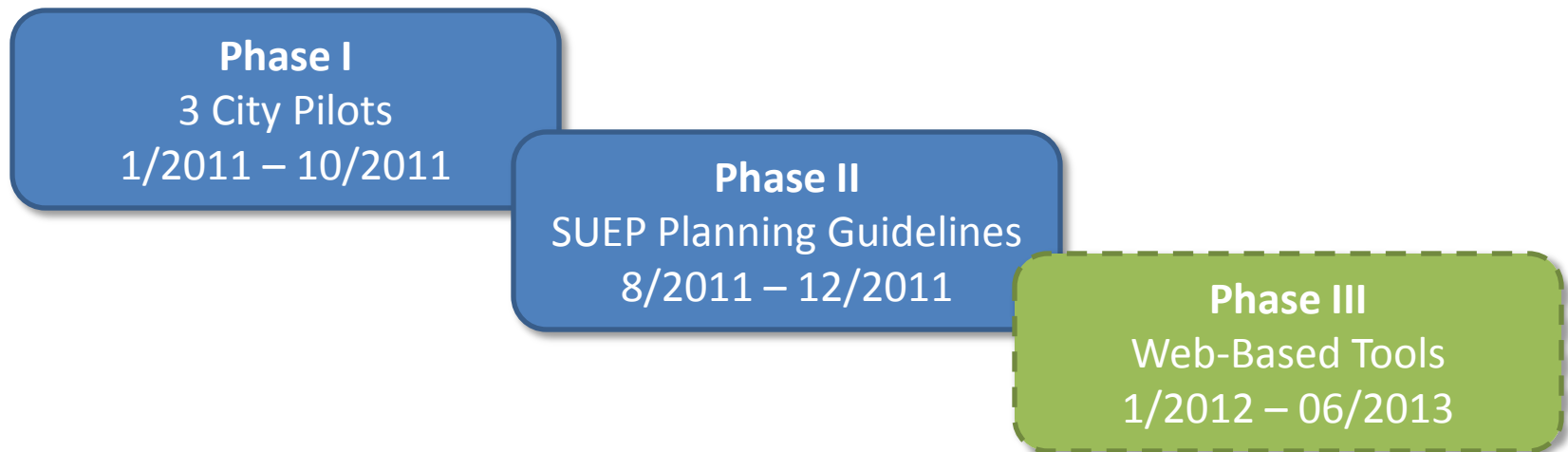
- Improving energy efficiency and mitigating emissions across municipal sectors:
 - Optimizes operating budgets
 - Improves air quality
 - Mitigates air pollution
 - Creates opportunities for multi-national financing and grant opportunities
- To support these benefits, monitoring, reporting, and verification tools are needed, as well as guidelines to support long term planning.

Program Objective and Structure

- **Objective**

- Supported by the Aus-Aid, the program aims to provide guidance to municipal governments in the EAP region for formulating long term urban energy and emissions sustainability plans.

- **Structure**



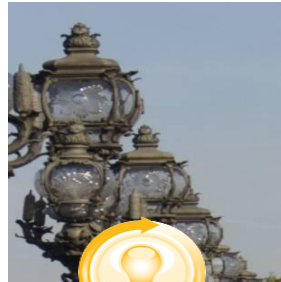
Sectors Included in the Program



TRANSPORT



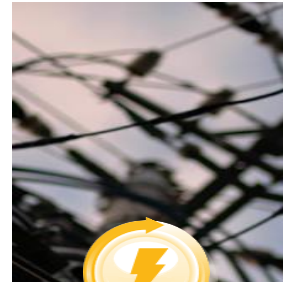
BUILDINGS



**PUBLIC
LIGHTING**



**WATER &
WASTEWATER**



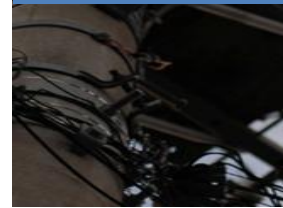
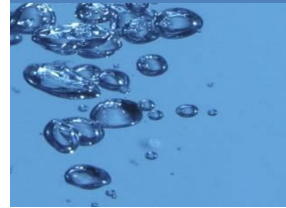
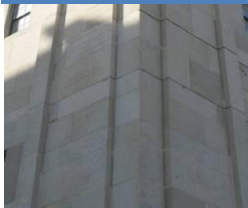
**POWER &
HEATING**



**SOLID
WASTE**



**CITY
MANGMT**



Phase I Overview

3 Pilot Cities



Phase I Methodology

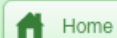
In three pilot cities...

- **High-level energy and emissions profile** across 6 municipal service sectors – municipal buildings, public lighting, urban transport, power and heat, water and waste water, and solid waste.
- **One-on-one consultations** with relevant departments and stakeholders to identify, by sector:
 - Previous, on-going, and planned initiatives to improve energy efficiency and reduce emissions;
 - Key institutional, regulatory, and/or financing barriers to improving efficiency; and
 - Illustrative activities that could be undertaken to improve efficiency and mitigate emissions.
- Identification of **institutional and policy needs** to support long term energy efficiency and low carbon growth planning

The Tools

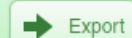
Three tools, three objectives

- **Municipal Energy Consumption Analysis (TRACE)**
 - Evaluates energy efficiency opportunities under direct municipal government control
- **Urban Greenhouse Gas Inventory**
 - Estimates emissions across all sectors and supports identification of carbon finance projects
- **Urban Energy Balance**
 - Traditional evaluation of city energy consumption as a whole, including public and private sectors



Home

Benchmark Results



Export



Save

Choose a Sector and a Key Performance Indicator from the menu to compare your city to others on the chart below. Uncheck a city in the table to remove it from the chart. Striped bars are proxy data. To generate a PDF file of a chart, click on Export.



Context

Select a KPI

Population Within Municipal Boundary



Climate Type



HDI (by Country)



Primary Electricity Consumption per Capita



Primary Electricity Consumption per GDP



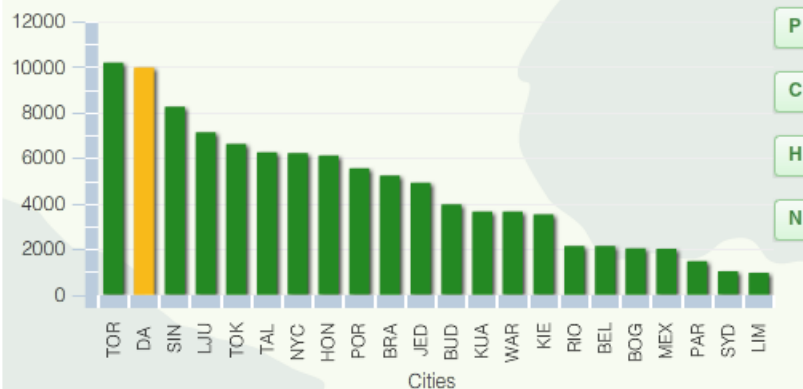
Primary Energy Consumption per Capita



Primary Energy Consumption per GDP



Primary Electricity Consumption per Capita [kWh/capita]



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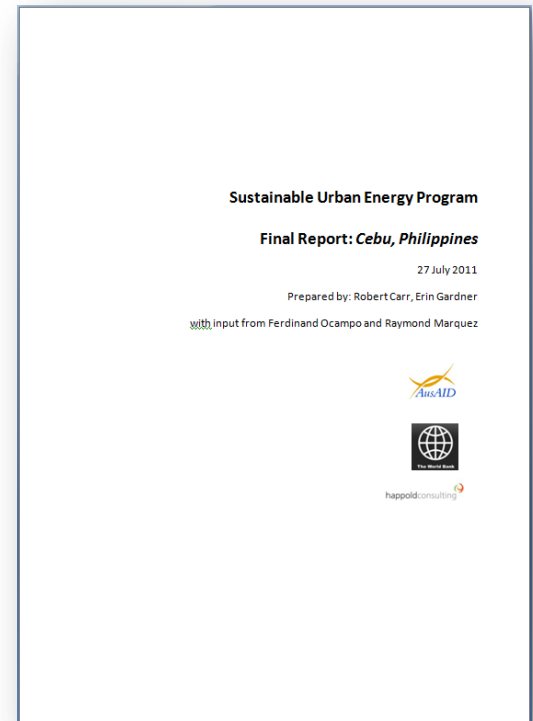
H

N

Selected	City	Value	
<input checked="" type="checkbox"/>	Toronto	10198	
<input checked="" type="checkbox"/>	Da Nang	10000	
<input checked="" type="checkbox"/>	Singapore	8268	
<input checked="" type="checkbox"/>	Ljubljana	7138	

Phase I City Reports

- Individual reports prepared for each city, which include:
 - City background information
 - Citywide energy consumption and emissions analysis
 - Sector findings and recommendations
 - Cross-sector and institutional recommendations
 - Preliminary roadmap for implementation and identification of next steps



Pilot City Comparisons

- All three cities in the study use a relatively **low amount of energy per capita and per GDP**, and as economic development continues, energy consumption is expected to rise significantly (about 7% per annum in Surabaya).
- All three cities experience **low energy intensity (MJ/pass-km) in the transportation sector**, but trends toward 4-wheel vehicles are significant and represent the highest areas of growth in energy consumption of all sectors.

Pilot City Comparisons

- All three cities have **low building energy intensity** (kWh/m²), as the existing building stock is predominantly smaller, low-rise buildings with minimal lighting, air conditioning and appliances. New buildings are responsible for the trending of higher energy consumption.
- All three cities are served by national electricity companies that provide **subsidized power**, and are, for the most part, out of the control of city mayors. Electricity represents a predominance of GHG emissions (69% Surabaya, 26% Cebu, 54% DaNang).

Pilot City Comparisons

- Cebu and DaNang both have significant amount of **renewable electricity generation** (Cebu has 35% of electricity production from geothermal, DaNang has 43% electricity from hydropower), while the grid serving Surabaya does not contain any geothermal or hydropower.
- The most significant difference between the cities are their **institutional frameworks** (e.g., top-down versus bottom-up)

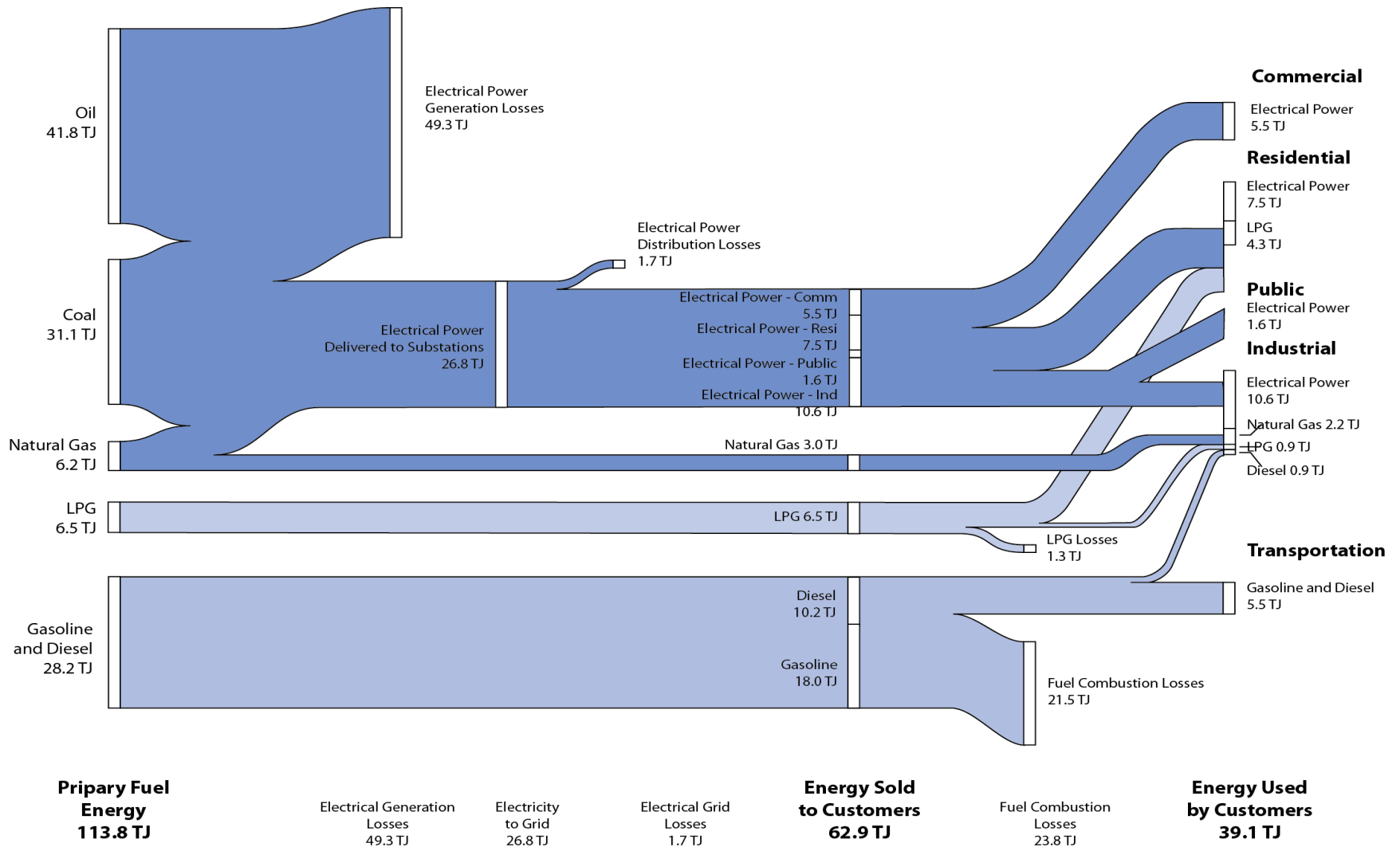
Surabaya Energy Consumption and Greenhouse Gas Emissions

EE and Emissions Mitigation Initiatives

Previous and On-Going

- **National Level**
 - National Energy Conservation Master Plan (RIKEN) (2005)
 - National Energy Management Blueprint (PEN) (2006)
 - National Energy Policy (2006)
 - Presidential Decree No. 2/2008 on Energy and Water Efficiency
 - Building energy codes (building envelope, A/C, lighting, energy auditing).
- **City level**
 - Surabaya development plan
 - Transportation plan.
 - Water efficiency program
 - Mayor's letter
 - CDM landfill gas capture program
 - **Eco2 Cities**

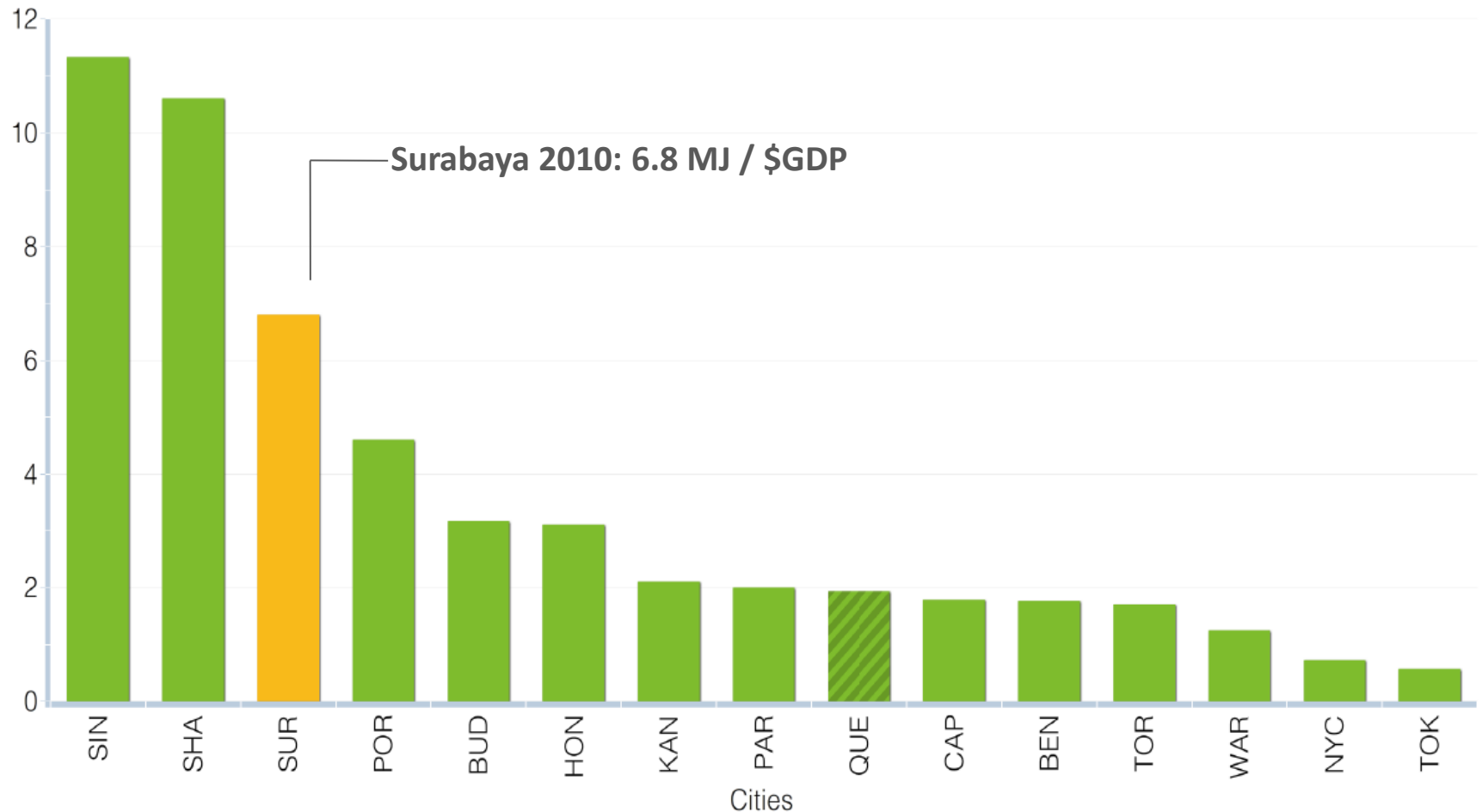
Surabaya Urban Energy Balance



Primary Energy Consumption per unit GDP

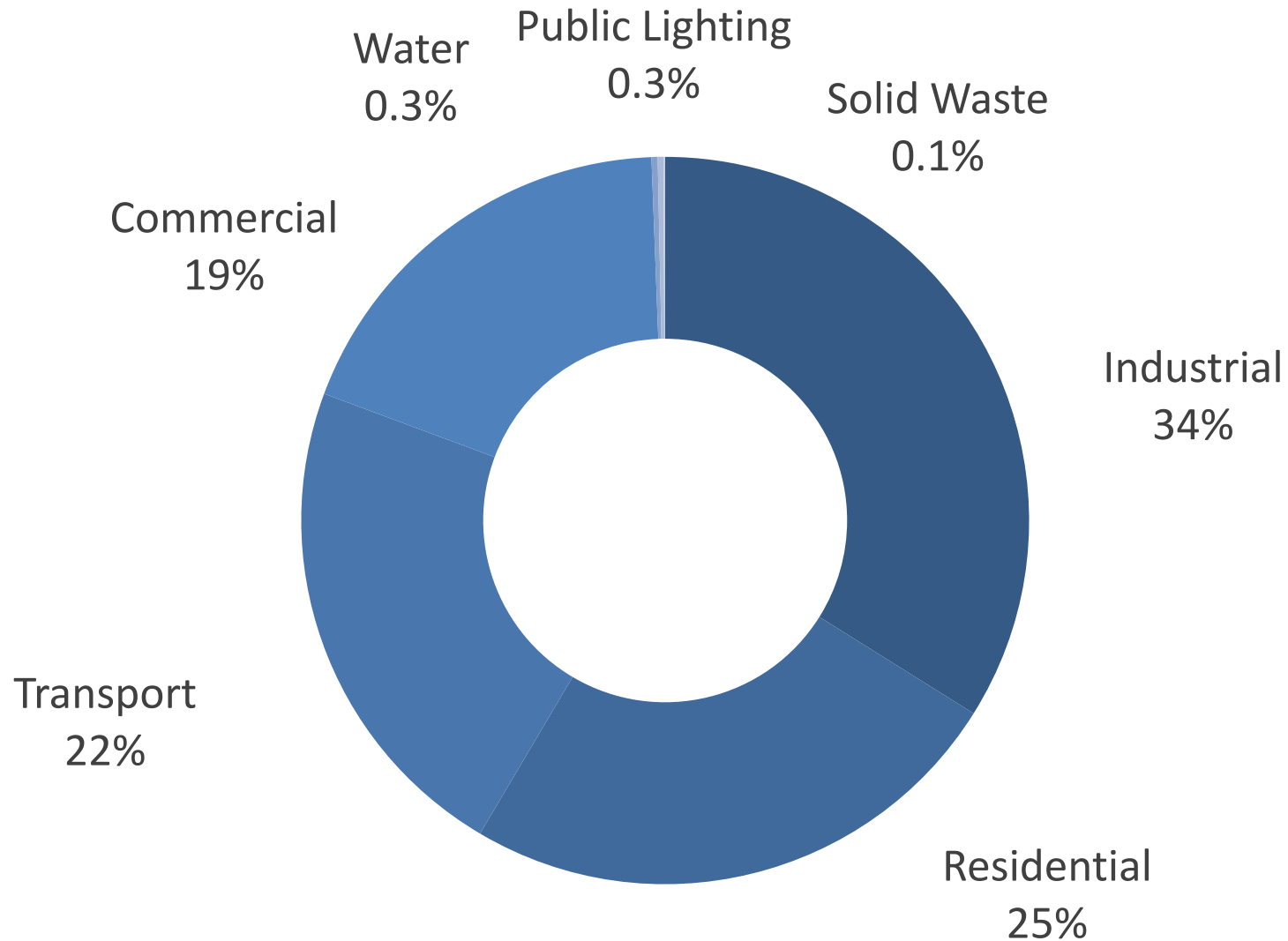
Citywide

MJ/\$GDP



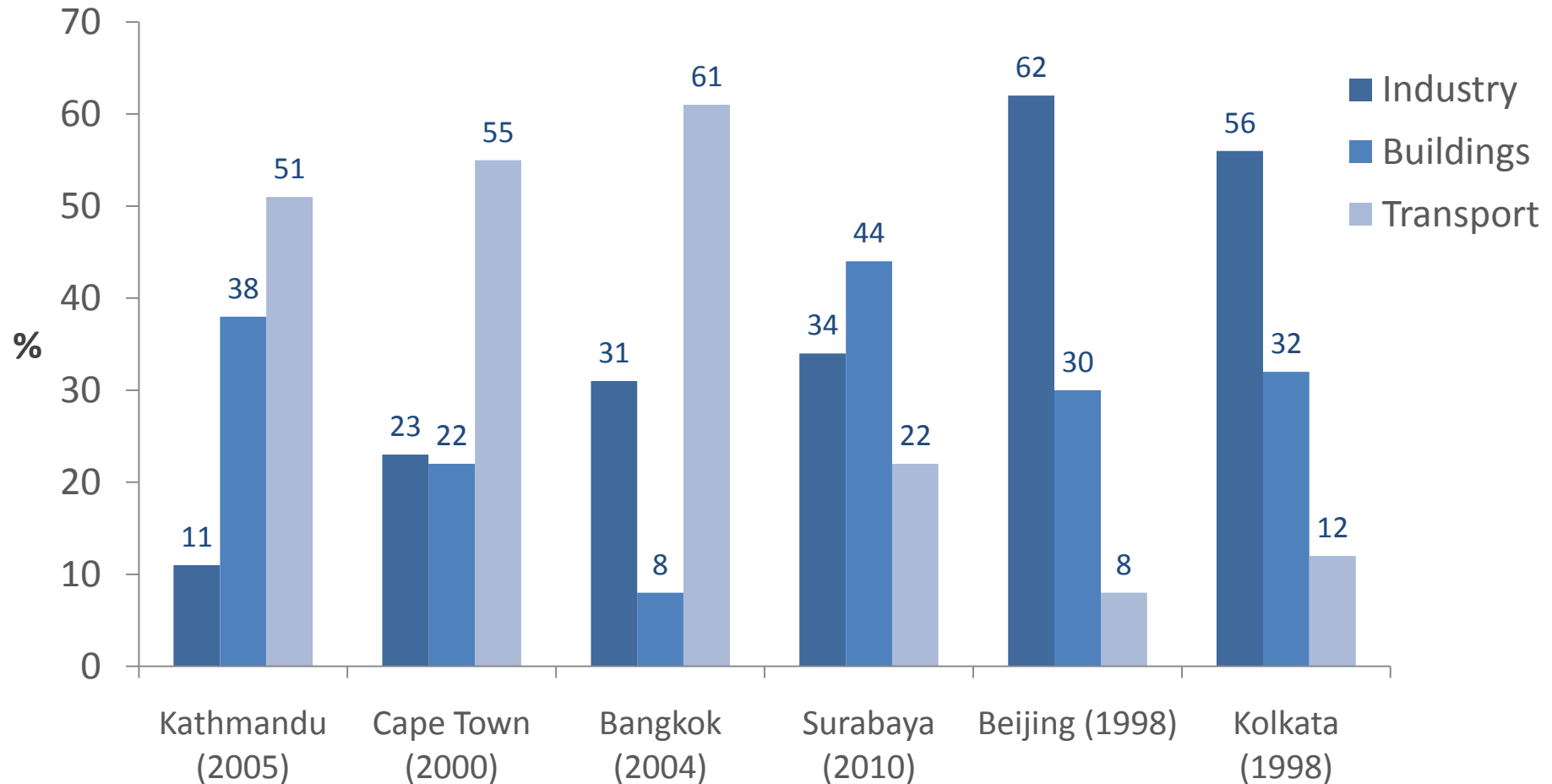
Primary Energy End Use by Sector

Citywide



Primary Energy End Use by Sector

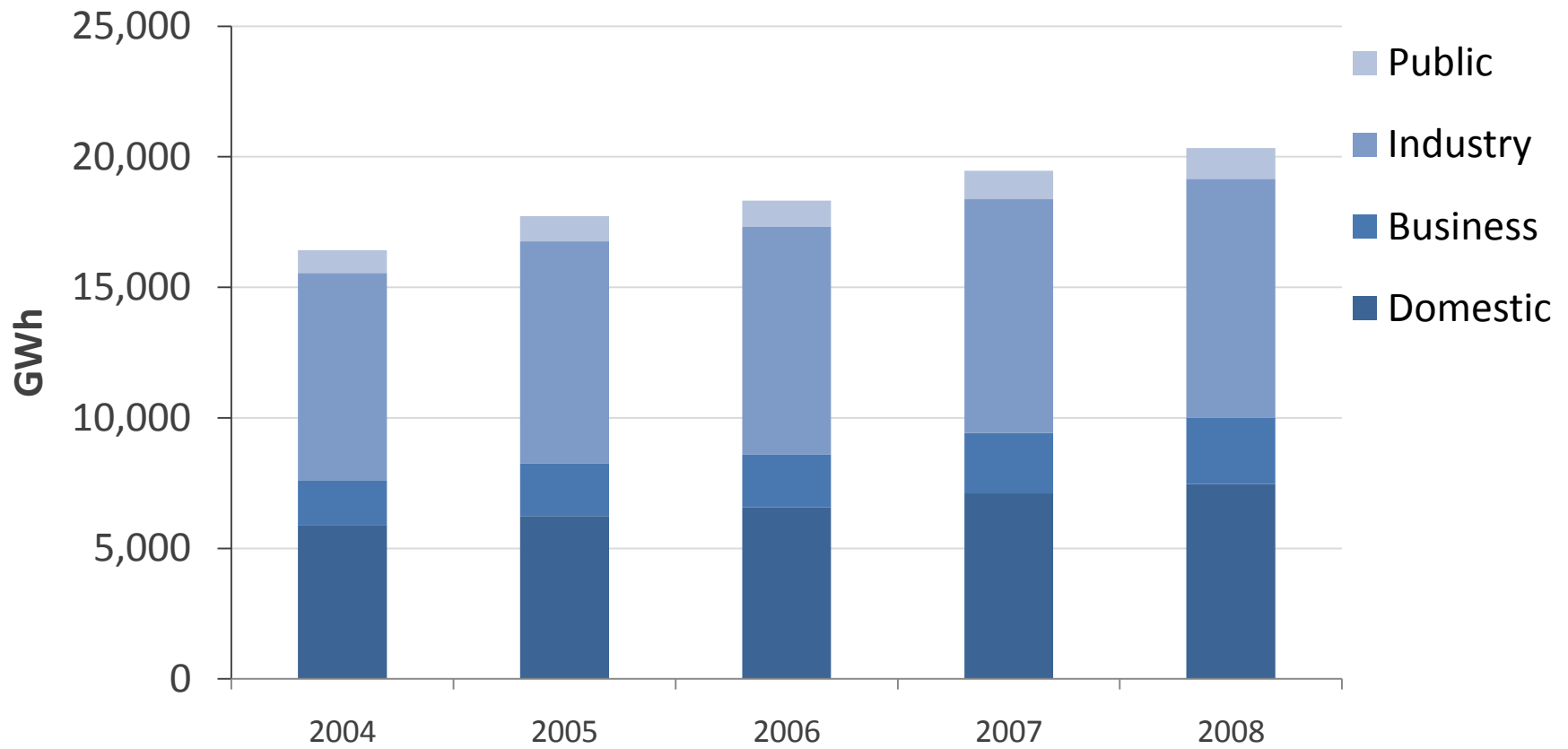
Citywide (Urban Comparisons)



Adapted from UN-HABITAT. 2008. *State of the World Cities 2008/9*. London: Earthscan.

City Electricity Consumption (KWh/year)

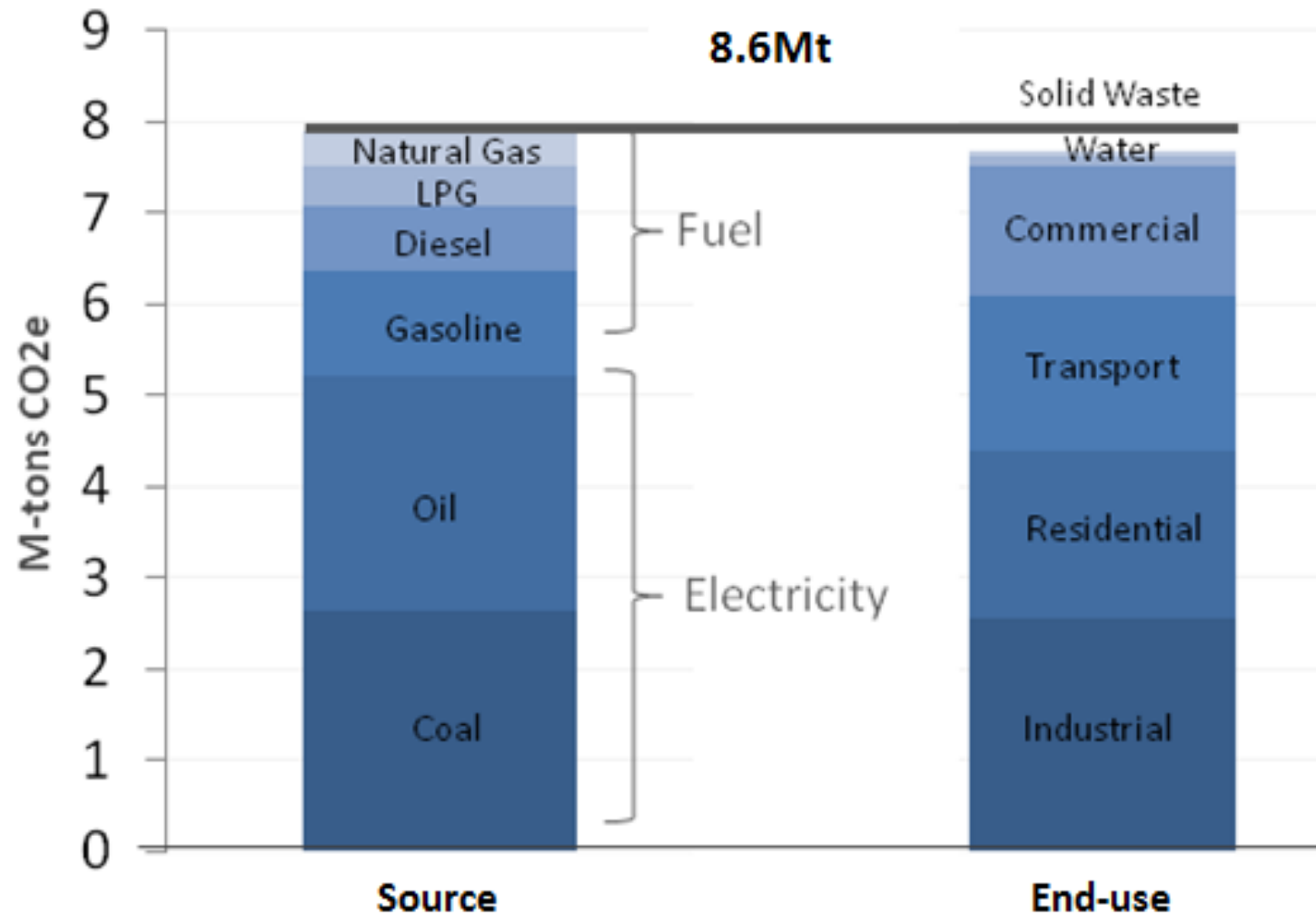
East Java



Reproduced from JICA. 2009. *Study for Spatial Planning for GKS Zone*. p.7-9.

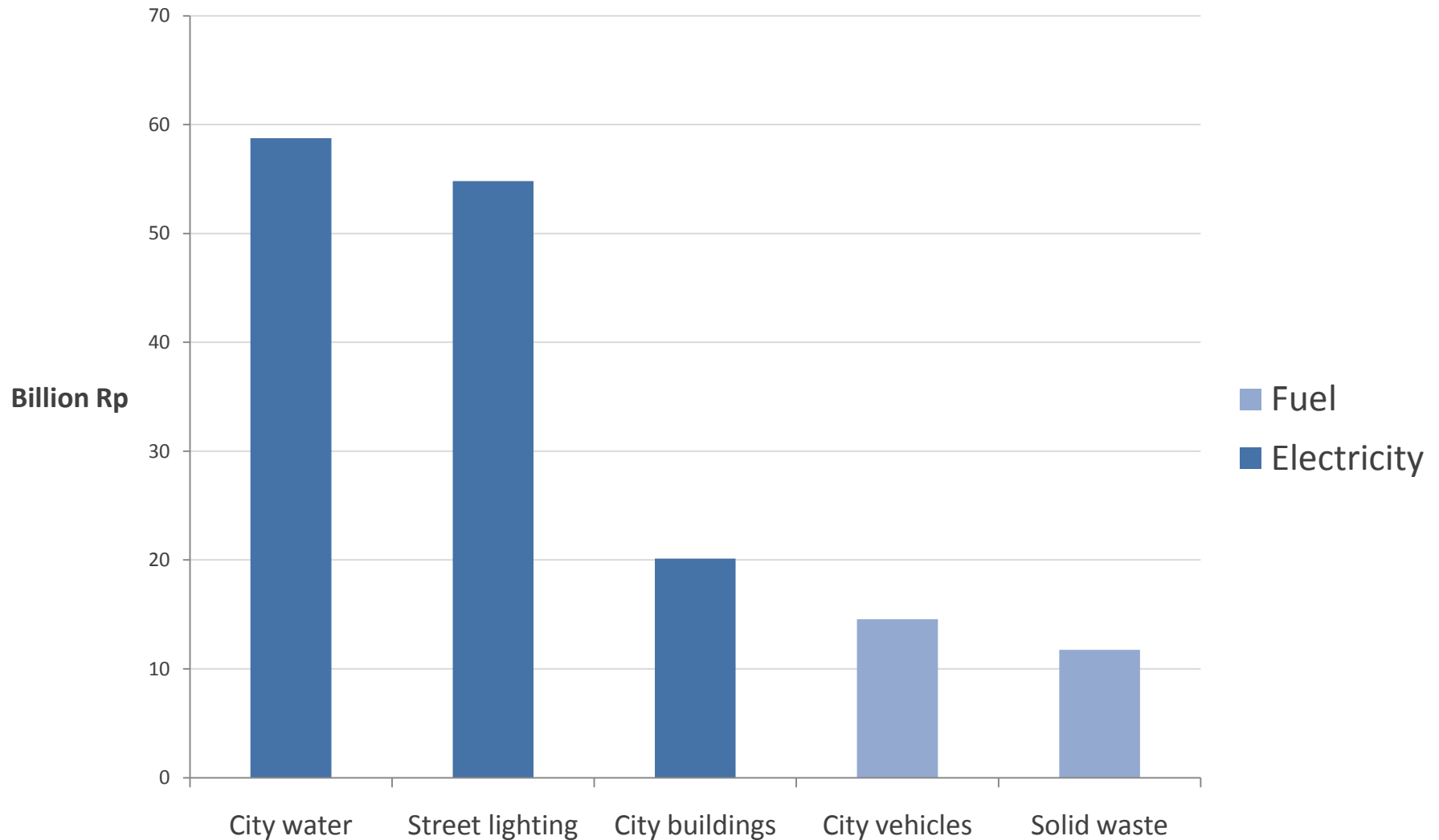
Carbon Footprint by Source and by Sector

Citywide



City Energy Expenditures (2010)

Government expenditures



Sector Analyses

Sector Analysis Process

Overview

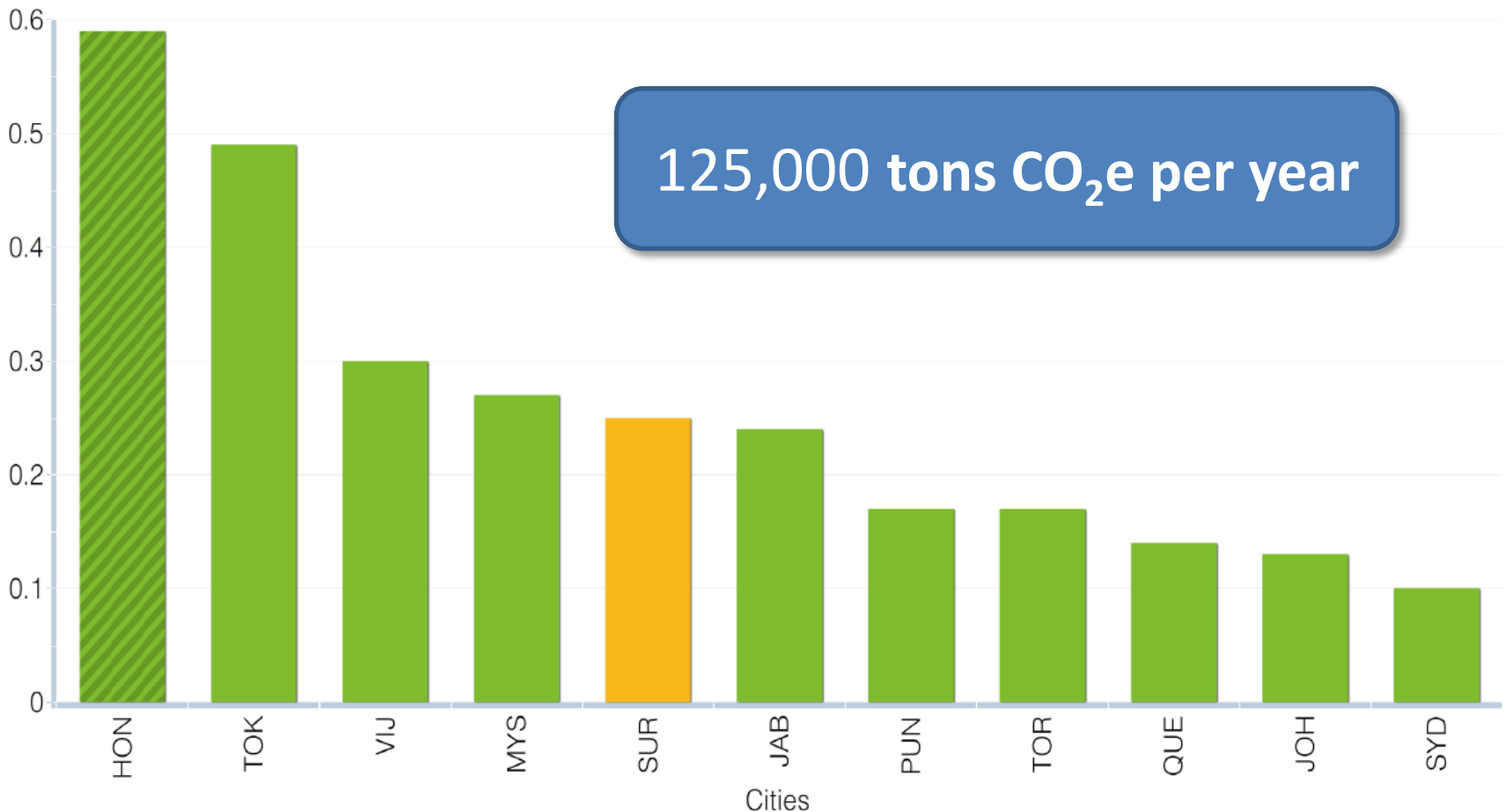
1. Energy consumption and emissions profile
2. Review of previous efficiency and emissions mitigation activities
3. Review of on-going and planned activities
4. Identification of sector-specific challenges and constraints (institutional, regulatory, financial, technical capacity)
5. Identification of opportunities and potential for synergies across sectors

Sector Analysis: Potable Water

Energy and Emissions Profile

kWhe/m3

125,000 tons CO₂e per year



Sector Analysis: Potable Water

Previous and On-Going Initiatives

- PDAM proposal to hire contractor to identify leaks and repair the water distribution network under a performance based contract (significant funding requirement)
- Improvements to the network pressure under implementation (includes additional reservoirs across the network and in-line lift stations)
- No demand reduction programs or on-going pump maintenance and replacement programs have been identified.

Sector Analysis: Potable Water

Challenges and Opportunities

Key Challenges:

- Contamination of water supply from septic tank seepage, landfill leachate, and treatment of wastewater sludge.

Key Opportunities:

- Surabaya city government is in control of the water supply company, which is neither privatized, nor a nationally run utility.
- Large leakage rates and low water pressures in the east and north network sectors pose opportunities to greatly reduce non-revenue water losses.

Sector Analysis: Potable Water

Illustrative Recommendations

	Recommendations	Energy Savings Potential	Capital Investment	Speed	Co-Benefits
WATER		kWh per annum	USD (\$)	Years	
1	Pump Replacement Program	>200,000	100,000-1,000,000	1-2	Reduced carbon emissions Efficient water use Enhanced public health & safety Increased employment opportunities Financial savings Security of supply
2	Active Leak Detection and Pressure Management Program	100,000-200,000	100,000-1,000,000	1-2	Reduced carbon emissions Efficient water use Enhanced public health & safety Increased employment opportunities Financial savings Security of supply
6	Water Awareness Program	<100,000	<100,000	<1	Reduced carbon emissions Efficient water use Financial savings Security of supply

Broader Actions and High-Level Planning

Institutional and Cross-Sector Actions

Overview

- Energy Governance (City Energy Task Force)
- Integration of City Planning and Infrastructure Planning
- Procurement Policy
- Capital Investment Planning
- Data Management / Inventory

Prioritization of Actions

Process Overview

- **Target Setting**
- **Sector Prioritization**
 - Greatest Potential for Improvement
 - Current energy expenditures on a given sector (municipal and estimated citywide expenditures)
 - Energy saving potential (based on benchmarking work conducted as a part of the study)
 - Scope of Influence
- **Action Prioritization**
 - Resource Constraints
 - Compatibility with Other Development Goals
 - Timing

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Sector Prioritization

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

**6 of 9**

selected

City Authority Sector Ranking

Rank	Sector	REI%	Spending CA (US \$) Control	Score	Check to Select
1	Street Lighting	80.6	6,089,737 0.91	4,467,431	<input checked="" type="checkbox"/>
2	Private Vehicles	0.0	1,617,840 0.02	0	<input type="checkbox"/>
3	Municipal Buildings	0.0	2,237,297 0.99	0	<input checked="" type="checkbox"/>

City Wide Sector Ranking

Rank	Sector	REI%	Spending CA (US \$) Control	Score	Check to Select
1	Potable Water	36.6	6,528,490 0.96	2,298,028	<input checked="" type="checkbox"/>
2	Public Transportation	0.0	68,889,467 0.88	0	<input checked="" type="checkbox"/>
3	Power	32.1	0 0.04	0	<input type="checkbox"/>
4	District Heating	0.0	0 0.01	0	<input type="checkbox"/>
5	Wastewater	0.0	0 0.76	0	<input checked="" type="checkbox"/>
6	Solid Waste	0.0	1,306,397 0.87	0	<input checked="" type="checkbox"/>

Recommendation Sheet Reference	Recommendation	0-6 months	6-12 months	Year 2	Year 3	Initial Step	Champion	Contributors
Institutional capacity								
CA_1	Energy Efficiency Municipal Task Force					Identify lead champion to organise and coordinate champions in all stakeholder departments and agencies. Set up structure and scheduling.	BAPEKKO	Dept of Transport, DKP, Mayor
CA_2	Energy Efficiency Strategy and Action Plan					Outline city vision for energy efficiency and performance, review SUEP project recommendations, and identify the desired actions.	Mayor	BAPEKKO, DKP, Dept of Transport
CA_4	Purchasing and Service Contracts					Set up working group to research and formulate the required changed for energy performance oriented revision of procurement policy.	Financial Management	E-procurement agency
Policy development								
No sheet available	Transportation Authority					Set up working group to identify all stakeholders involved in public transportation and instigate dialogue on appropriate structure.	Dept of Transport	BAPEKKO
No sheet available	Transportation Data Collection Program					Identify champion to consolidate existing in-house data collection processes and co-ordinate with BRT teams on required data sets.	Dept of Transport	BAPEKKO, SAMSAT
WW_06	Educational Water Efficiency Measures					Translate national level policy into city-level programs, e.g. by adopting and promoting national rainwater harvesting campaigns.	PDAM	BAPEKKO
No sheet available	Distributed energy Generation Program					Identify champion to coordinate pilot studies and demonstration projects to promote the potential of distributed generation.	BAPEKKO	PGN, PLN
B_09	Building Energy Code for New Buildings					Set up working group to assess local context and evaluate other regional/global guidelines to identify the most relevant strategies	Dept of Spatial Planning	BAPEKKO
Projects								
W_01	Waste Vehicle Maintenance Program					Set mandatory fleet fuel efficiency standards, and a regular maintenance and testing schedule.	DKP	Dept of Transport
W_02	Waste Collection Route Optimization					Switch transfer trucks to high-volume capacity; compile data on truck volumes, waste volumes, truck routes, etc into GIS platform.	DKP	Dept of Spatial Planning
W_04	Waste Composting Program					Expand existing composting program to all waste transfer facilities.	DKP	BAPEKKO
W_05	Landfill Gas Capture Program					Perform in-depth study to identify details of barriers previously encountered and outline existing financing options.	DKP	BAPEKKO
WW_01	Pump Replacement Program					Establish annual budget for high efficiency pump replacement program.	PDAM	Local Revenue and Financial Management
WW_02	Active Leak Detection and Pressure Management Program					Pursue a long-term performance contract for meter installation and leak reduction program.	PDAM	BAPEKKO
SL_01	Integrated Public Lighting Assessment Program					Establish inventory of streetlight numbers, luminary types, lamp wattage and lumen output.	DKP	BAPEKKPO
No sheet available	Public Lighting R&D Program					Establish an overall R&D program to coordinate testing and demonstration of solar cells, LEDs, motion sensors, and sensor dimming.	DKP	BAPEKKO
B_07	Computer PowerSave Project					Identify champion to collect data on existing computer inventory and usage levels to inform the compiling of an appropriate program.	Regional Secretariat	BAPEKKO

Monitoring Energy and Emissions

Tracking success

City-wide Indicators					
<i>Indicator</i>	<i>Baseline Year</i>	<i>Baseline</i>	<i>Units</i>	<i>Source</i>	<i>Desired Trend</i>
Total Primary Energy Consumption	2010	37.67	GJ/capita	TRACE mission. 2011.	Same or Downwards
Primary Energy Consumption per GDP	2010	6.1	MJ/\$GDP	TRACE mission. 2011.	Downwards
Annual Increase in Electricity Consumption	2008-2009	4.5	%	PLN	Downwards
Total Greenhouse Gas Emissions	2010	8,625,000	Tonnes CO ₂ e	Various (see Appendix 2) & PLN	Downwards
Greenhouse Gas Emissions per Unit of GDP	2010	0.41	KgCO ₂ e/\$GDP	Various (see Appendix 2) & PLN	Downwards
Greenhouse Gas Emissions per Capita	2010	3.12	TCO ₂ e/capita	Various (see Appendix 2) & PLN	Downwards

Next Steps...

Phase I Outputs and Next Steps

- Phase I Outputs

- Baseline emissions and energy consumption that can be used as a basis for identifying priority improvement areas, as well as for benchmarking annual performance.
- GHG inventory can be used for exploring carbon finance possibilities
- Practical and specific recommendations on EE improvements

- Next Steps

- Three Pilot City Joint Workshop in Jakarta on October 21.
 - Wrap up Phase I: review/finalize city reports
 - Kick off Phase II: discuss draft Energy and Emissions Sustainability Plan (EESP) for 3 Cities
- Detailed energy and emissions plans for each city
- EAP SUEP Guidelines and toolkits by December 2011.
- Regional workshop in January 2012

Thank you!



The Team expresses its sincere gratitude to the **Surabaya Government, Happold Consulting, and Prof. Rulli Setiwan** for their tremendous effort and support in implementing this program.