

## Background

Cities currently account for about two-thirds of the world's annual energy consumption and about 70 percent of the greenhouse gas (GHG) emissions. In the coming decades, urbanization and income growth in developing countries are expected to push cities' energy consumption and GHG emissions shares even higher, particularly where the vast majority of people remain underserved by basic infrastructure services and where city authorities are under-resourced to shift current trajectories.

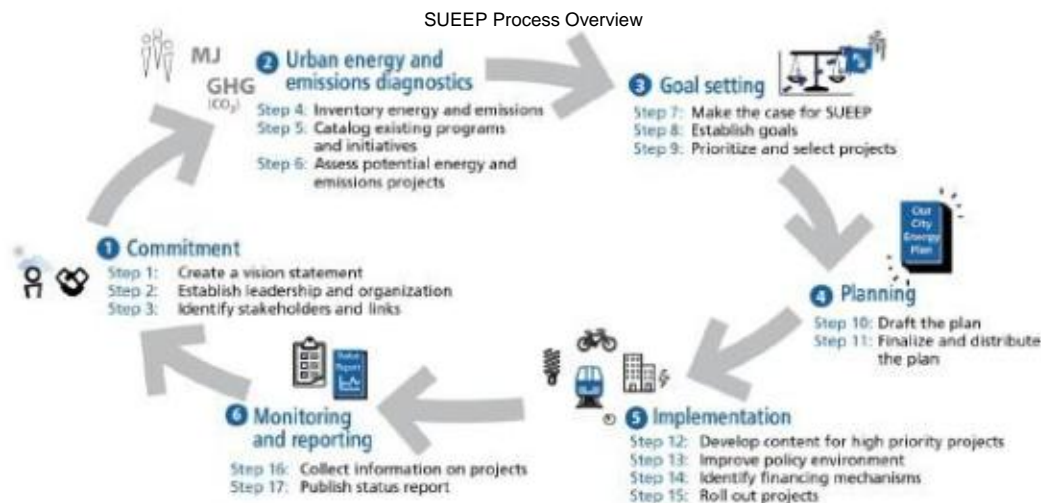
Urban growth is particularly notable in East Asia and Pacific (EAP) region. While EAP is one of the world's least urbanized regions, its urban population is growing at unprecedented rates; almost 2 times faster than the world's urban population.

In an effort to promote solutions that would help delink high levels of carbon-intensive energy use from urban growth the World Bank initiated a regional program—EAP Sustainable Urban Energy and Emissions Planning, or SUEEP—with support from AusAID in January 2011.

development of city's institutional capacity-building programs to maximize energy efficiency across municipal sectors and defines actions the city can take to improve energy and emissions performance.

## What is SUEEP?

SUEEP is a comprehensive framework and a step-by-step guideline to help a city to develop its own energy and emissions plan. Building on the three-city pilot work in Southeast Asia (namely, Da Nang, Vietnam; Cebu, Philippines; and Surabaya, Indonesia) together with best practices in sustainability planning in other cities, the SUEEP Guidebook and Toolkit is designed to facilitate the



### Multi-level Engagement

Given that comprehensive frameworks like SUEEP can be resource-intensive, additional flexibility is, built into the program through a multimulti-level engagement process (see diagram below), with a high-level, rapid assessment as an introduction,level, followed by deeper sectoral engagements in few selected areas, and then, subject to client's demandhen, and program ownership, implementation of the full SUEEP guidelines.

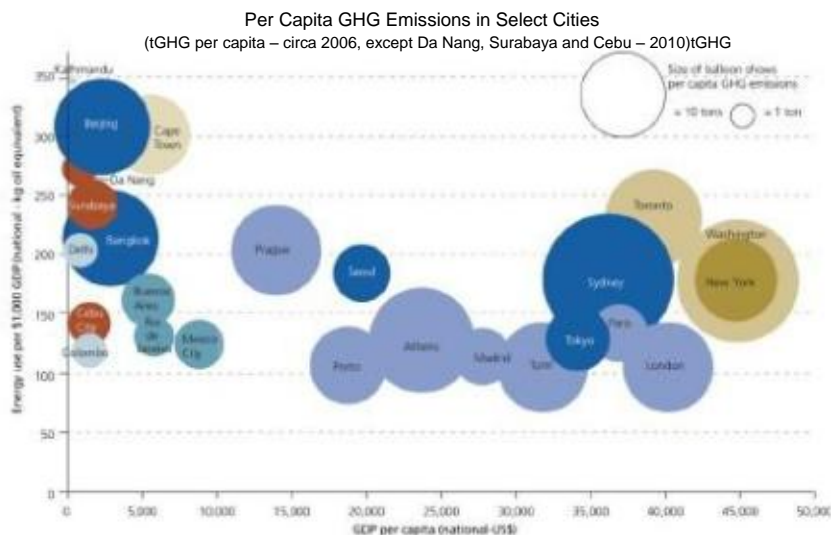


### Target Audience

The SUEEP framework is targeted at mayors and municipal planning agencies in the EAP region, but it is also relevant for government officials who are involved with utility services delivery, transportation, economic development, housing, environmental management, government facilities management, cities government procurement, financial planning, risk assessment and public health.

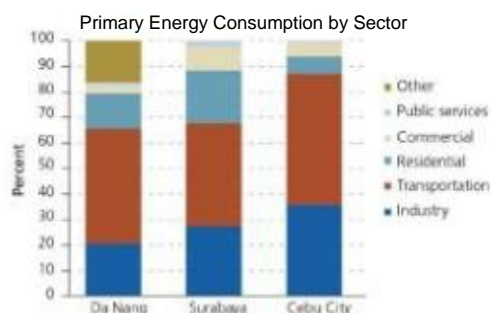
### Understanding Cities: Energy Use & GHG Emissions

The following figure illustrates that most developing cities in Southeast Asia, including all three pilot cities (i.e. Da Nang, Cebu and Surabaya) currently have relatively low energy consumption and GHG emissions per capita when compared to many cities around the world. However, as their GDP per capita increases, the energy consumption and GHG emissions may take different paths as illustrated by other EAP cities such as Bangkok, Seoul and Tokyo. Clearly, the path taken by Seoul and Tokyo offers a greener alternative which calls for significant reduction of energy intensity of economic activities (energy use per GDP) and improvements in energy efficiency. Only Cebu is currently at the level of energy intensity which makes such path relatively straightforward, while Da Nang and Surabaya have a longer path to reduce energy intensity of their economy. The chart below also demonstrates that investments in energy efficiency alone are not



sufficient to keep cities on a sustainable path and that for the most developed cities, GHG emissions per capita may “plateau” or even start increasing with GDP growth unless more comprehensive measures are implemented. Such measures or plans must take into consideration other drivers of energy demand and emissions, for instance land use, public transport, distributed power generation and its mix etc. – which are part of a comprehensive SUEEP.

The rapid population increase and rising standard of living in the three SUEEP pilot cities are driving a considerable increase in energy consumption. In terms of their population size, Surabaya is the largest city with 2.8 million in 2010, and Da Nang being 0.9 million and Cebu 0.8 million. Da Nang is currently experiencing 11.7% yearly rises in energy consumption, which will lead to a doubling of energy demand in 6 years time. The increases in Surabaya and Cebu’s annual energy use are 4.9% and 4.3% respectively, still notably high. Transportation is a key driver of energy demand (see chart below). This sector as well as the building sector presents the largest opportunities for scaling-up energy efficiency at the city level particularly in Da Nang given the city authorities’ high degree of control or influence over these two sectors.



GHG emissions breakdowns roughly match the three cities’ energy use patterns but with some variation. The fuel type for electricity generation is a key factor determining the intensity of GHG emissions from energy uses. In Surabaya, electricity generated mainly from coal-fired power plants dominates the GHG profile and is responsible for 36% of the city’s emissions. Cebu and Da Nang both have significant amount of renewable electricity generation (Cebu has 36% of electricity production from geothermal and hydro, and Da Nang has 16% of electricity produced from hydropower). Because of that, the GHG emissions in Cebu and Da Nang are significantly lower (per capita) and dominated by diesel and gasoline fuels used for transportation and local (diesel-based) electricity generation. The use of

distributed renewable energy production (such as solar PV) is at a very early stage in all three pilot cities. Furthermore, the electricity tariffs and pricing policies (such as subsidies) are outside city control which is one of key tools for the promotion of energy efficiency on the demand side. This shows the importance of close collaboration between the city and national authorities in developing an optimal approach to meet fast growing urban electricity needs in a reliable, efficient and environmentally sound manner.

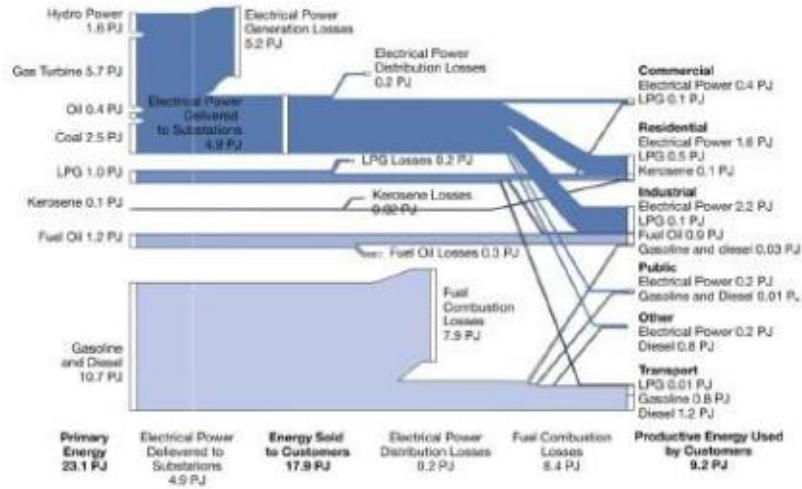
## Da Nang, Vietnam

Da Nang is a major harbor city and the largest urban center in central Vietnam. With the fourth largest seaport in the country, Da Nang is an important gateway city to the Central Highlands of Vietnam, the Lao People’s Democratic Republic, Cambodia, Thailand, and Myanmar. After relatively slow population growth (1.7% annually) between 2000 and 2007, Da Nang appears poised for a significant increase in the next 10 years with a population of about 1.65 million by 2020.

### Energy Balance

Energy balance of Da Nang as shown below illustrates the city’s energy flows and profile. In 2010, city used roughly 17.9 PJ of energy in various forms. About 45% of the city’s energy use involved various fuels used for transport applications, while industry was responsible for 21% of the city’s energy use. Residential energy use accounts for 13% of all energy consumed, while commercial and government services currently use only a very small fraction of the city’s energy. The remaining 16% of energy is consumed in other sectors.

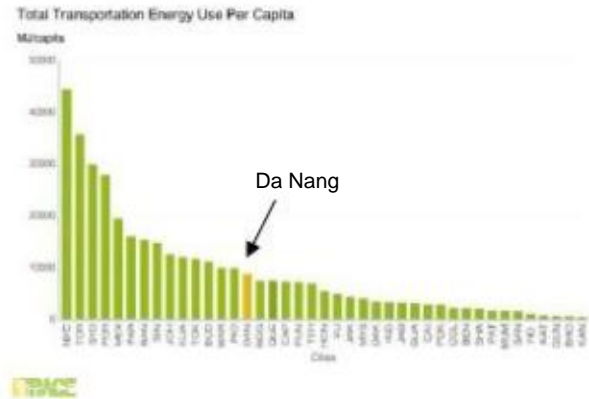
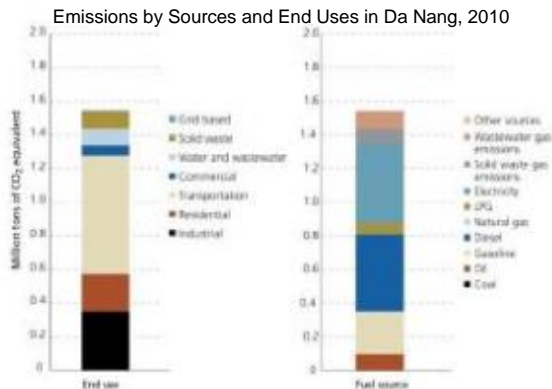
Da Nang's City Wide Energy Balance Sankey Diagram, 2010



GHG Emissions Inventory

GHG emissions tell a similar story. A total of 1.51.54 million tons of CO<sub>2</sub> equivalent were emitted by all sectors in Da Nang in 2010. Transport fuels are responsible for 46% of citywide GHG emissions, 6% while the city's electric supply is responsible for 33% of local emissions. These figures point to a need for the Da Nang People's Committee to ramp up its already impressive focus on energy to tackle transport-related growing energy use and emissions.

Da Nang would like to see a Bus Rapid Transit (BRT) system deployed in one or more parts of the city by 2016.



Sector Diagnostics: Identifying Opportunities

**Transport:** Despite the fact that a majority of Da Nang's overall energy use and carbon emissions is transport-related, Da Nang currently consumes less per capita energy on transportation than many other cities in the TRACE database shown below. Nonetheless, considering the rate at which private motor vehicle ownership is growing in the city, it is a priority area for improvement.

**Municipal Buildings:** Energy consumption in Da Nang's municipality buildings is relatively low (97 kWh/m<sup>2</sup>) in the TRACE database. However, database electricity use in municipal buildings is on the rise. A number of efforts in the city's municipal buildings have been undertaken to improve energy performance, such as lighting replacement programs and the implementation of air conditioning schedules. However, replacing old air conditioning units and other inefficient appliances, and improving

the design and construction of building envelopes, provide additional opportunities for energy performance improvement. The Da Nang People's Committee is reportedly planning to build a tall office tower that would bring together into a single building the local government departments currently dispersed across the city. By constructing a model green building that achieves LOTUS (a Vietnam-specific green building rating system) or other preeminent building performance standards, the People's Committee would send a powerful message to others of the importance of this type of design and its viability in Da Nang's economic environment and climatic conditions.

**Solid Waste:** Waste generation in Da Nang is approximately 0.68 kg/person/day, which ranks in the middle of cities in the TRACE database. The landfill in Da Nang is not currently set up to capture methane gas (thus missing an opportunity to make use of this resource), and is expected to reach full capacity by 2025 to 2030. Most landfills experience peak gas availability 5-10 years after the facility is closed and capped; gas levels then decline over time until the point is reached when the quantity of gas recovered is too low to support power generation or the quality of gas declines to a point whereby it begins to degrade the power generation equipment.

**Water:** Per capita water use in Da Nang totals approximately 118 liters/day, which is on the low end of cities in TRACE database. However, water losses from the system were approximately 25 percent in 2011. The sector faces numerous challenges, including high leakage rates, lack of city-scale infrastructure, and low demand side efficiency awareness. On the demand side, lack of awareness is a major challenge.

**Power:** Current peak power demand in Da Nang is approximately 250 MW; this is a significant increase from 2007, when peak demand totalled just 176 MW. Within the power sector the number of directly city driven interventions to affect

energy efficiency performance is limited to the demand side and provision of decentralized renewable generation, underscoring the necessity for cities to systematically leverage their influence at the national level to impact on this sector.

**Public Lighting:** Da Nang has relatively low electricity consumption per light pole (416 kWh/pole) when compared to other cities in TRACE database. This is due to the use of low energy fixtures and various dimming regimes implemented throughout the city.

It is important to consider the speed with which Da Nang is growing and quality of life improving. It is likely that lighting preferences will change in the future, putting more demand on the system to provide higher levels of lighting in more areas. Da Nang can prepare for this shift by continuing its excellent efficiency programs and pushing them even further.

#### Governance

Da Nang City government has already undertaken an impressive amount of work on energy matters that serve as a foundation for future efforts. This work has already slowed the rate of energy demand growth, although given anticipated population changes in the next 10-20 years, much more action is necessary. Utility stakeholders in the water, waste, and power sectors have done an excellent job at identifying opportunities for energy efficiency improvements, in addition to exploring ways to potentially capture energy from different renewable sources. These efforts clearly show the considerable talent the city can bring to bear on future energy policy and planning initiatives.

## Looking Ahead

Moving forward, the World Bank is working with pilot cities to determine appropriate levels of SUEEP engagement, by preparing and implementing a comprehensive demand-driven dissemination plan for the SUEEP. The dissemination plan will include a launch of the study, presentation of study results at a regional forum and follow-up dialogue with the pilot cities. Upon testing of the SUEEP framework by the pilot cities, the guideline will be refined to support region-wide replication.

The World Bank also will reach out to interested donors and development partners, as well as the private sector, to leverage on-going efforts to scale-up green financing in support of investment projects generated by SUEEP.

### Principal Findings for Da Nang

1. Electricity demand in Da Nang will double in the next 6 years.
2. Transport and Buildings sector are responsible for the vast majority of energy demand and GHG emissions.
3. Currently, acceptance of public transport is very low due to heavy reliance on motorcycles. Public transportation development is undoubtedly a medium to long term priority.