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EECI RAF FIELD TESTING AND VALIDATION
FINAL CITY REPORT
30 **APRIL** *2010*

QUEZON CITY ENERGY EFFICIENCY **RAF**

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Contents

Executive Summary

The Quezon City Energy Efficiency Report documents the findings from a two week study of energy use and efficiency opportunities during February 2010. The study was undertaken as part of a wider program of work commissioned by the World Bank's Energy Sector Management Assistance Program (ESMAP) to field test and validate an early version of the Energy Efficient Cities Initiative Rapid Assessment Framework (RAF). The RAF is a novel tool that quickly diagnoses inefficient energy performance across a city's systems and offers a range of potential solutions embedded within implementation guidance and case studies. The study therefore had two objectives: to provide Quezon City Government (QCG) with recommendations to improve energy performance and to validate and test the RAF.

Quezon City's current energy performance across the buildings, public lighting, transport, power and heat, water and waste water, and waste sectors were reviewed against the performance of a range of peer cities through a benchmarking process. This review provided a number of significant findings which helped focus activity during the early part of study and contribute to the definition of priority sectors for further study. Principal findings included: high electricity use per capita; high patronage of public transport, but equally very high energy consumption by public transport, low city-wide energy use on public lighting (although this was later found to be a major component of QCG energy expenditure), and high water consumption per capita.

During the early part of the study, interviews were held with a range of QCG departmental personnel and representatives from a range of city agencies. Information gathered during this period enabled a classification of each sector based upon the degree of control exerted by the QCG, the potential for energy savings in the sector and relative spend on energy in each sector. On the basis of these findings, a sector prioritisation process was undertaken. Although this process is subject to further and ongoing development, the analysis concluded that the transport, buildings and public lighting sectors were priority sectors for further investigation; however, as the study also had the objective of validating the RAF, all sectors were reviewed further during the course of the mission.

The latter part of the study involved further interviews and site visits. These enabled detailed systematic filtering of all of the RAF energy efficiency recommendations currently contained within the RAF to examine their suitability in Quezon City. This process demonstrated that a large number of recommendations were:

- either likely to be technically and/or financially unviable;
- outside of the direct control of the QCG; or
- already being implemented or trialled.

The review established that there is considerable sectoral energy efficiency activity taking place in Quezon City currently. Public lighting programs include audit and retrofit, new design guidance, and the trialling of new lighting technologies. In the buildings sector, a new green building code is in place, and Quezon City is currently undergoing a detailed buildings energy efficiency program sponsored by the World Bank. The privatised water companies seemed particularly adept at managing energy use and considered energy efficiency as a central component of their ongoing efficiency programs. QCG has no jurisdiction over the supply of power and heat and no recommendations were found to be suitable in this sector. In the waste sector, collection and transportation is contracted out to third parties and no financially viable recommendations were considered practicable at this point. Good practice with respect to wastes management was observed with neighbourhood waste recovery taking place at Barangay level and, at the larger scale, a landfill gas capture and energy generation project at the Payatas landfill site. Transport, the major city-wide energy consumer, is proving difficult to control by QCG. Much of the transport sector is either under private ownership (jeepneys and tricycles), licensed by national authorities or in the case of infrastructure,

planned and developed at a metropolitan level.

Most of the activities currently underway in Quezon City were successfully identified by the RAF, although not pursued further due to their ongoing nature.

Of the energy efficiency recommendations currently incorporated into the RAF, eight were deemed a high priority for Quezon City. These covered the water, buildings, and transport sectors, as well as improvements to current procurement processes, investment programs and the administration of energy efficiency activities across QCG departments. These are as follows:

Municipal fleet maintenance program: The fleet maintenance program was selected because there are 850 vehicles owned and maintained directly by Quezon City government and, currently, there is no existing maintenance procedure specifically focused on fuel efficiency.

Engine efficiency improvement program: This program applies to the 17,000 tricycles in Quezon City that would benefit from an engine replacement program. As Quezon City is the sole regulator for franchised tricycles, the Mayor has complete control to legislate and enforce this program. Tricycles with replacement engines will result in lower operational costs for owners and cleaner air for the residents of Quezon City.

Walking / Cycle path development program: The walking and cycle path program was selected due to the high mode split of walking and cycling (21%) and the observed limited number of dedicated cycle lanes. A goal of 10km of new bike paths per year for the next 4 years would be achievable and increase the safety, total length, access to and integration of bike paths.

Procurement guidelines for life cycle costing: This recommendation requires changes to existing procurement processes for buildings and capital equipment to incorporate whole life costing (i.e. capital and operational expenditure) rather than just capital expenditure. The current procurement processes in Quezon City tend to discourage the selection of energy efficient systems installation in new construction and major renovations.

5 year capital planning for energy efficiency retrofits: This requires the development and approval of a five year planning strategy for upgrading existing QCG buildings. This requires incorporation into the annual budget to provide for expenditure on building renovation. Such a long-term plan can be used to attract energy efficiency funding or capital funds to realize the many opportunities Quezon City has for energy efficiency.

Water Infrastructure Planning: This recommendation relates to QCG support to Manila Water and Maynilad to locate critical water infrastructure equipment in the most energy-efficient locations. Electricity costs for pumping water are over 15% of the total operational costs for both Manila Water and Maynilad, which is their second largest operational expense after staff costs.

Energy Efficiency Task Force: The Mayor's Task Force on Energy Efficiency is an important recommendation because it allows for a central driving force to focus the city's efforts on energy efficiency in one team, enabling prioritization of efforts and resources according to the highest opportunity and lowest costs

Advanced Energy Efficiency Procurement: This recommendation requires the introduction of procurement guidelines to support energy performance labelling and standards for smaller purchases such as computers and fax machines.

These energy efficiency proposals are supported by 'Recommendation' sheets providing the requisite information to enable the Quezon City government implement each measure and monitor its progress.

With respect to the second objective of the mission, the field testing and validation of the RAF, the team learned a number of valuable lessons regarding both content and process that be usefully applied in its subsequent further development.

In summary the principal observations were as follows:

Pre-mission: Both data gathering and access to QCG representatives was particularly challenging pre-mission. This was due to a number of factors such as the granting of authorisation to access data, the availability of data, and the willingness of QCG representatives to meet with local consultants. This difficulty highlighted the need in the design and implementation of the RAF to ensure that a clear and prescriptive approach to the pre-mission stage to be defined, with a number of purpose built communications measures and processes to ensure access to data and city authority staff. Equally, the data requirements for the baseline city report should be practical and achievable pre-mission.

Energy Performance Benchmarking: Energy performance benchmarking proved an excellent means to solicit engagement of the QCG representatives in the RAF process. The majority of data required for benchmarking was not available at the start of the mission which meant a restricted range of benchmarks were presented; however, these datasets were in existence and a full set of KPIs were collated during the course of the mission. Equally, the RAF database of city energy performance remains under development. In order to aid its future value it is essential that RAF candidate cities agree to 'add' their city data to the benchmarking database as a prerequisite to their acceptance as a RAF candidate.

Identifying Priority Sectors: The identification of priority sectors for further focus takes place after the consultant has had a brief period in which to assimilate information gathered. The Quezon City mission directed focus on the key factors in determining priorities: technical energy savings potential (gleaned from benchmarking results and the consultants views after site visits and interviews), proportionate use of energy in each sector (city-wide and within the city authority) and the level of control or influence exerted by the city authority. This poses a number of challenges for the further development of the prioritisation process which, inescapably, will rely on quantitative, qualitative and contextual information.

The Quezon City Field test and validation exercise was enormously beneficial to the further development of the RAF process and content. The process was greatly aided by the support of the Mayor and Vice Mayor and the time and effort provided to the consultant team by QCG representatives.

1. Introduction

This Quezon City Energy Efficiency Report is the final output of the World Bank's Rapid Assessment Framework (RAF) field testing and validation work in Quezon City during February 2010. It serves to bring together and build on all key information that was collated over the course of the RAF Team mission and provide direction for continued progress in this area.

The field mission in Quezon City was designed to achieve two complimentary objectives:

1. Field test and validate the RAF process and components; and
2. Identify energy efficiency opportunities across the RAF sectors and propose energy efficiency measures that may be applied or followed by the Quezon City government.

This report concludes the second objective and formalises the recommendations presented to city officials on the final day of the field test. The report provides an overview of the RAF, a summary of the process undertaken and principal findings and decisions made, and detailed recommendations that the Quezon City government can take forward.

The Quezon City Energy Efficiency Report consists of four main sections that coincide with the schedule of activities undertaken before, during and after the field test:

- Current Energy Performance in Quezon City: This section provides an overview of the data that has been collected for Quezon City energy use across the six primary RAF sectors. Quezon City energy data has been compared to a range of other peer cities to provide an indication of relative performance and highlight areas with significant potential for improvement.
- Identifying Priority Sectors: This section details how each sector has been reviewed against other sectors in order to evaluate the relative potential for energy efficiencies in each sector. Sectors are then prioritised accordingly and sectors with minimal energy efficiency opportunity are disregarded. For the purposes of Quezon City field test, sectors have been prioritized, but none has been removed.
- Energy Efficiency Recommendations: The RAF tool contains energy efficiency recommendations for each of the six sectors. Potential energy efficiency recommendations for Quezon City have been reviewed in the light of the comparative performance benchmarking for Quezon City and additional information provided by city officials through interviews and documented information. The final recommendations are based upon this review, filtering out those that are not considered appropriate or workable at this time. The review includes an explanation of how each recommendation was assessed in light of the pre-mission analysis and information gathered during the mission.

Included in the appendix of this report are contained the following:

- Meeting schedule: The final agenda for the 10 day mission.
- RAF Key Performance Indicators: A complete list of all RAF KPI data for Quezon City including source documentation.
- Recommendation Selection Appraisal: A Summary of the retaionale for selecting or rejecting each of the RAF recommendations.

A separate Annex to this main report contants the Background City Report: A pre-field test report compiled using publicly available information relating to the institutional, contextual and energy performance in Quezon City.

2. Background to the EECI Rapid Assessment Framework (RAF) and Field Test in Quezon City

The Energy Efficient Cities Initiative Rapid Assessment Framework

The rapid urbanisation of developing countries over the last fifty years has led to challenges in achieving environmental, social and economic sustainability. While cities in developing countries continue to face significant environmental challenges, they remain the primary engines of economic growth. The challenge is thus to achieve economic growth while minimising it's associated environmental externalities. In this context, improving energy efficiency is essential.

However, the lack of city-specific, disaggregated data has been a major impediment to assessing the overall energy implications of different urbanization patterns and to guiding improved energy, economic and environmental analysis, especially in cities of the developing world.

The Rapid Assessment Framework (RAF) is a central component of the Energy Efficient Cities Initiative (EECI), launched by the Energy Sector Management Assistance Program (ESMAP) in collaboration with the Urban Anchor in 2008.

The purpose of the RAF is to identify technical and institutional measures that will improve the energy efficiency of the municipal infrastructure across the following six sectors:

1. Transport
2. Waste
3. Water and Waste Water
4. Power & Heat
5. Public Lighting
6. Buildings

The organizational management practices of the City Authority (CA) that span all of the sectors above are also considered.

The ultimate aim of the RAF is to identify ways in which energy efficiency can be improved by the CA and therefore reduce their expenditure on energy. However, in some cases it is clear that there are city-wide activities that cut across all sectors. In such instances, the RAF process identifies how these issues may be addressed through engagement, representation and other means.

Background to Field-testing the RAF in Quezon City

At the inaugural workshop session of the EECI in Washington DC in October 2008, the requirement for a city-wide energy efficiency rapid assessment framework was conceived. This workshop was attended by Secretary Enriques, senior advisor to Mayor Belmonte, representing Quezon City. In the spirit of collaboration and a shared wish to move the concept forward, Secretary Enriques signalled his willingness to help develop the RAF by offering the ESMAP team the opportunity to field test the concept framework in Quezon City.

The design of the RAF has been in development since September 2009. By February 2010 a well developed approach and many of the technical components had been produced. At this point in the design process a field test or validation offered essential insights that would enable both the RAF process and components to be refined and augmented where necessary.

The field testing process took place over three discrete stages: pre-mission, mission and post-mission.

During the pre-mission phase two local consultants (Raymond Marques and Wilbert Billones) were commissioned to gather essential data and information that would provide an understanding of the institutional framework, energy performance and local context. This work is compiled into a Background City Report and is contained in the Annex to this report. The Background City Report enabled the international consultant, Happold Consulting International, to prepare the schedule and data requirements for meetings over the course of the field visit and undertake energy performance benchmarking.

The RAF field testing lasted two weeks and ran from 22 February 2010 to 5 March 2010. The mission was led by Robert Carr and Byron Stigge of Happold Consulting International. The mission was attended by Dr. Ranjan Bose of ESMAP and was coordinated by Eng. Jet of Quezon City Office of the Building Official. The schedule for the field testing broadly followed the same order as the Report content. The majority of the first week's activity involved workshops, presentations, interviews and information review in order for the Consultant to gain a detailed overview of

energy efficiency activities in each sector. The second week entailed more detailed interviews with personnel with relation to specific recommendations. During the course of the second week, sectors and recommendations were honed down to concentrate on those with greatest potential in Quezon City. Finally, at the end of the field test, a presentation was given by the Consultant to the Vice Mayor Herbert Bautista and senior Quezon City Government (QCG) officials.

The final 'post-mission' component of the RAF process is the culmination of all activities captured within a City Energy Efficiency Report. The submission of this report thus completes the field testing process.

General Impressions of Energy Efficiency in Quezon City

Quezon City Government's commitment to energy efficiency is demonstrated by pockets of high achievement, however this is balanced by other areas in need for improvement. There is a Task Force to improve Street Lighting energy consumption, a Green Building Ordinance currently in development, a QC government building energy audit underway, and energy efficiency pamphlets distributed to QC administrative buildings to educate staff on energy efficient behaviour. The private commercial building sector is generally engaged in energy audits and retrofits. A district cooling plant is designed for the high tech hub in central QC. And CFL blubs are the dominant bulb type for non commercial lighting. Light rail and heavy rail connect some parts of Metro Manila and are powered by electricity.

Best practice design is certainly taking hold in QC, though this has not always been so. Old street lights have erratic spacing and lighting coverage and there still remain some metal halide street lighting lamps. Many office buildings still have very high lighting power density and old, small, inefficient compressor chillers. Some lighting and A/C systems are grossly oversized further reducing their total system efficiency. Building energy efficiency in general can be described more in terms of needing higher quality of service: ventilation, A/C, lighting and computer use are all under-served currently and will inevitably increase in the coming years of economic expansion with a resultant increase in energy demand.

Water and power distribution systems throughout Quezon City did not raise any flags in terms of energy efficiency. Both water companies and the electrical company are privately owned and have extensive influence and interaction with international best practice from Japan, Singapore and the US. Manila Water demonstrated keen attention to energy consumption issues and a pump replacement program. Meralco, the electrical service company, demonstrated energy efficiency programs for commercial buildings and industrial users.

Energy efficiency of transportation is the more extreme area in need of improvement. Although public transportation ridership is very high, the vehicles themselves are incredibly poor. Jeepneys which carry 8 to 12 passengers have low fuel efficiency and contribute significantly to reduced air quality due to poor tailpipe emissions. Tricycles which carry only 1 passenger (sometimes 2) are both noisy and polluting. Both public vehicle types are renowned locally for their 'smoke belching' and collectively contribute to poor air quality. Despite a reasonable federal vehicle emissions standard, public transportation vehicles do not appear to be effectively regulated or at least emissions standards adequately enforced.

Overall energy efficiency is improving in conjunction with general economic development. However, economic development will also bring demand for higher quality of service in buildings (more air conditioning, ventilation, technology), and more private vehicle usage leading inevitably to higher energy consumption. The long term trend of high electricity prices will also provide solid incentive for energy efficiency. Thus the importance of improved energy efficiency standards is critical at this time of development for Quezon City to remain competitive on a global stage.

3. CURRENT ENERGY PERFORMANCE IN QUEZON CITY

Introduction to Energy Performance Benchmarking

The benchmarking component of the RAF tool is intended to assess the energy performance of a city compared to other cities using Key Performance Indicators (KPIs) to match cities with similar characteristics. Examples are population, climate and HDI. This comparison is then used to facilitate sector prioritization in the RAF tool.

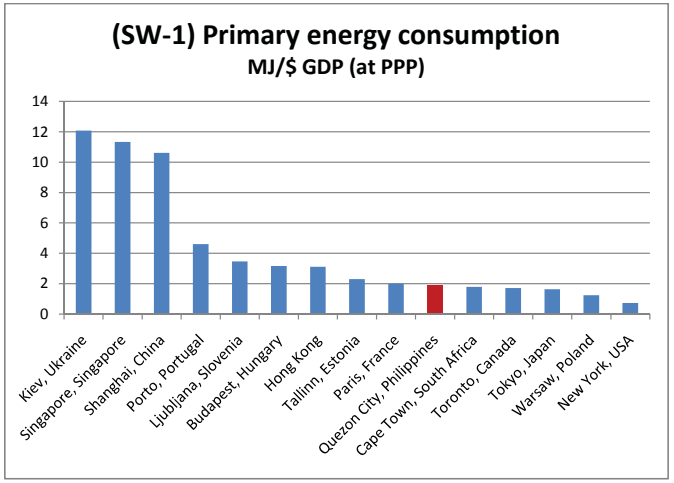
In order to render the RAF tool useful for Quezon City its benchmarking database had to be pre-populated with data gathered from a variety of sources. And as the RAF tool is still under development, the database has not yet been fully populated. Prior to the mission in Quezon City 20% of the City's KPIs had been collected based on available data from Quezon City government's website as well as research from the local consultant team. During the mission the local consultants coordinated and facilitated discussions between the RAF team and many government agencies and utility companies to gather the remaining KPIs and data related to recommendations. The collaboration was effective and 100% of the remaining data was obtained.

The following graphs reflect current data availability, not the gamut of data for all global cities. Missing data can be either favourable or detrimental to Quezon City depending on the KPI data available. The cities used in the benchmarking are in some cases the only cities that data is currently available for; however, where there is choice the most relevant peer cities have been used.

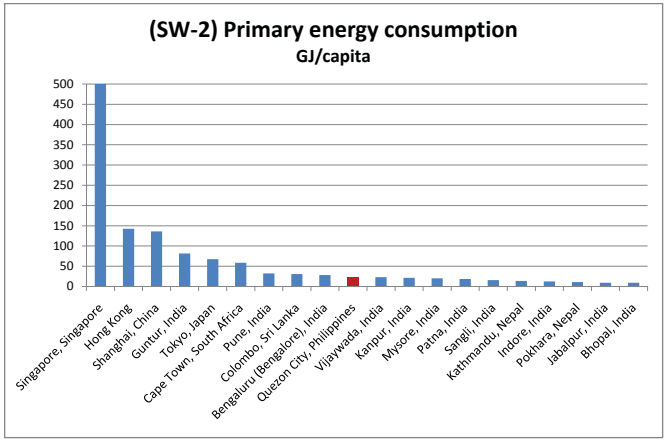
Due to the lack of comparable KPIs, certain sectors are excluded from the graphs and thus do not give a comprehensive overview of all indicators that will be available once the RAF tool is completed.

City Wide Energy Efficiency

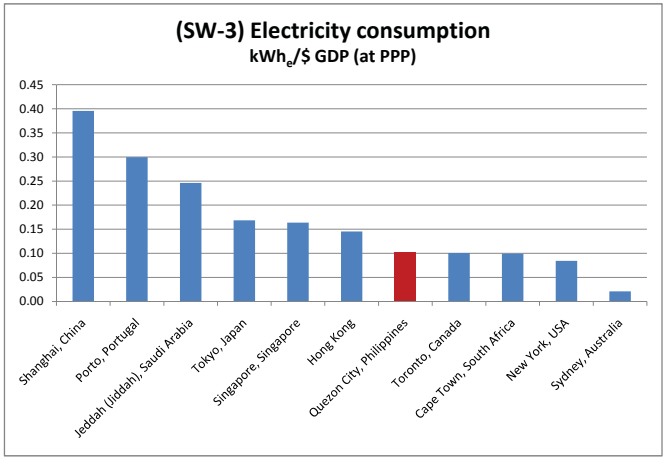
The first four graphs give an overall sense of energy efficiency within the municipal boundary. When energy consumption is normalized by either GDP or population, location towards the lower end of the graph indicates higher energy efficiency city wide.



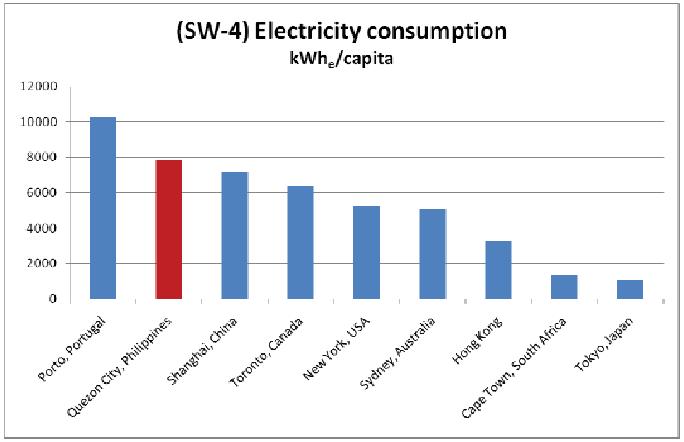
Normalized by Gross Domestic Product, total primary energy consumption in Quezon City is low.



Total primary energy consumption in comparison to cities with similar populations is low in Quezon City. As development progresses, primary energy consumption tends to increase; therefore it is important to implement energy efficiency measures now to prevent excessive energy consumption in the future.

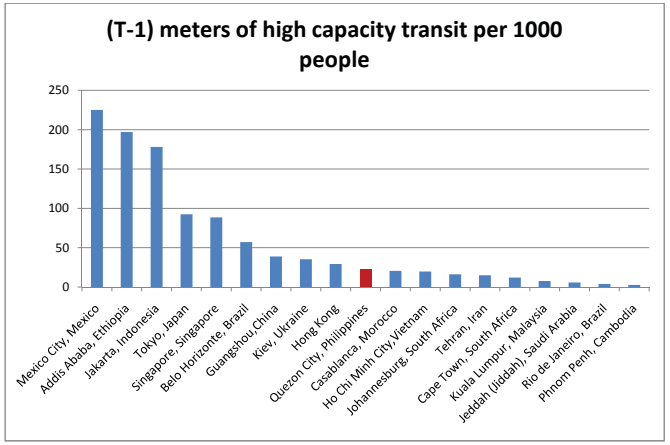


Normalized by Gross Domestric Product, electricity consumption in Quezon City is relatively low.

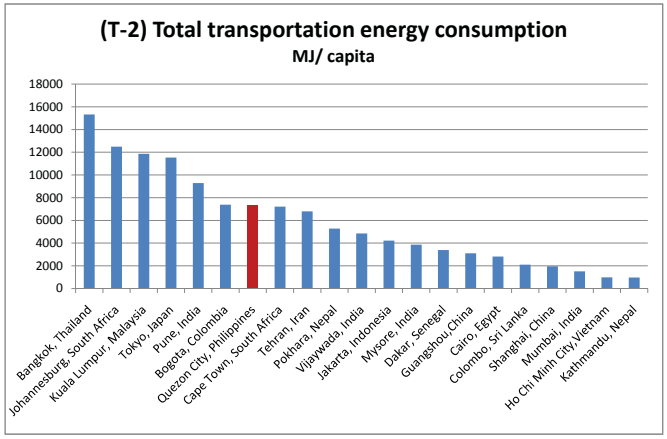


Normalized for population, Quezon City's electircity consumption is relatively high. This is potentially due to Quezon City's energy mix which is heavily dominated by electricity.

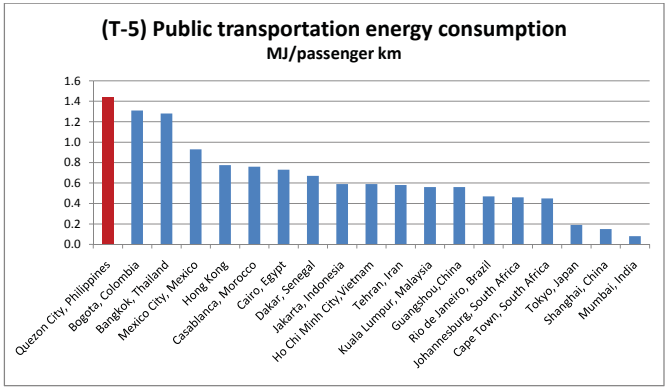
Transportation sector



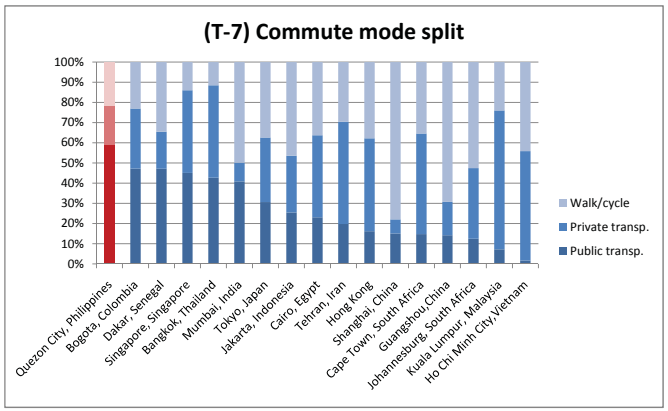
The length of Quezon City's transit routes reserved for public tranport indicate Quezon City is in line with an average city.



Normalized for population, fuel consumption in Quezon City is marginally high compared to other cities.



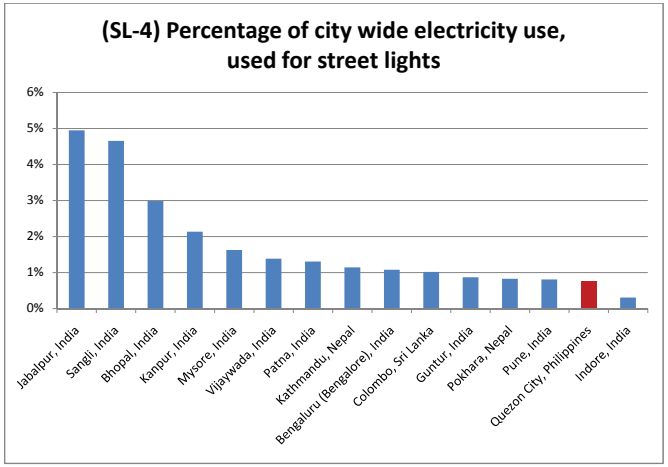
Quezon City has very high energy consumption per passenger kilometer. This is likely due to the poor efficiency of tricycle and jeepney engines.



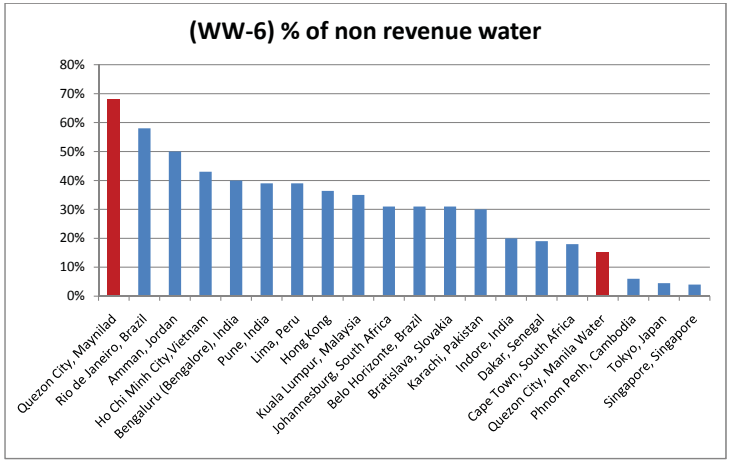
Quezon City has the highest public transportation use of all the cities analyzed.

Based on the analysis shown in the graphs, it is clear that there is great opportunity for energy efficiency improvements in the public transportation sector. However, transport services are generally outsourced in Quezon City and are subject to State Law which means that city officials have very limited control over the sector.

Public Lighting

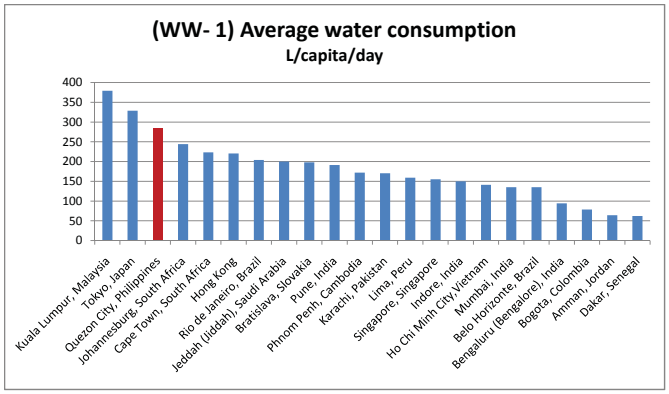


The above graph shows that public lighting in Quezon City is a relatively low energy user compared to other cities. Quezon City has already addressed energy efficiency in this sector through the establishment of a Public Lighting Energy Efficiency Task Force.



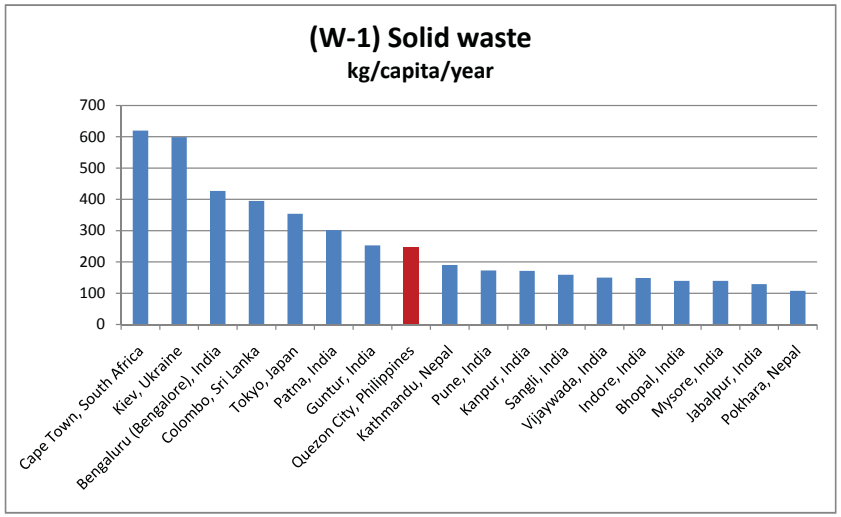
'Non revenue water' refers to composition of non metered costumers and losses in the distribution system. In Quezon City there are two privately owned and operated water utilities and their operations vary significantly in terms of non revenue water.

Water and Wastewater

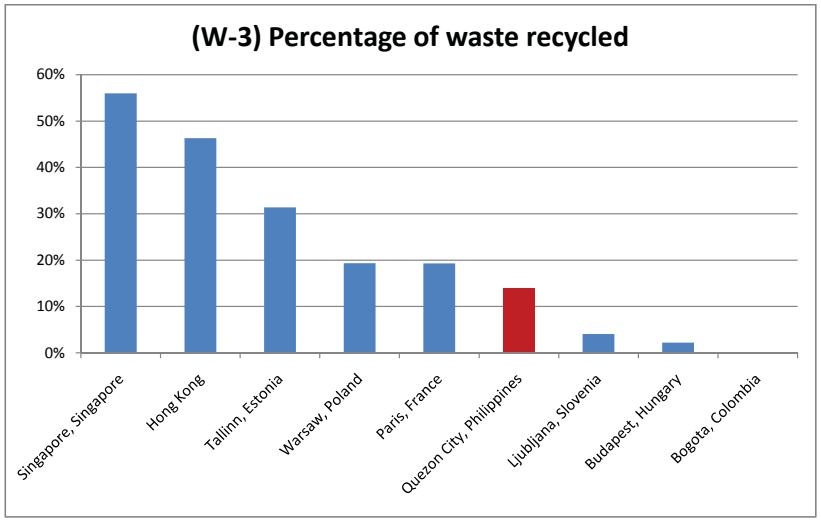


Quezon City has very high water consumption relative to its peers.

Solid Waste



Compared to its peer cities, Quezon City has average amount of solid waste per capita.



Although Quezon City has a low percentage of waste recycled it is still not far from average western levels

4. Identifying Priority Sectors

The nature and purpose of the RAF is to rapidly assess energy use in a city in order to identify and prioritise sectors, and suggest specific energy efficiency interventions. It is necessary, therefore, to distinguish at an early stage which sectors are most likely to offer energy efficiency savings which are practical and financially justifiable.

In the early part of the mission, the consultant had the opportunity to review each sector covered by the RAF through interviews, site visits and review of information provided. This process is designed to provide the consultant with a robust overview of energy use and potential efficiencies in each sector. This information is used alongside the results of the benchmarking data to assess which of the six sectors should be focused upon during the remaining part of the mission, ultimately leading to specific energy efficiency recommendations.

At this point, therefore, certain sectors are set aside and not pursued further. This does not necessarily mean that no energy efficiencies are to be developed in these sectors. It simply indicates that, when compared to other sectors, they are unlikely to produce as compelling energy efficiency savings potential.

The process for identifying priority sectors considers three main issues:

- The proportionate spend on, and city-wide use of, energy;
- The energy savings potential for the sector, based upon the results of the benchmarking exercise and the consultant's professional opinion having reviewed each sector.
- The degree of control that the Quezon City government has over each sector, or components of a particular sector; in this respect budgetary control is considered the most important;

The prioritisation process in Quezon City was aided considerably by both the availability of data and a willingness of government representatives to share this information.

Note that, at this stage, spend by QCG on energy is distinguished from city-wide energy use. The latter includes private and commercial energy consumption, whereas the former relates to energy consumption that is completely inside the control of QCG.

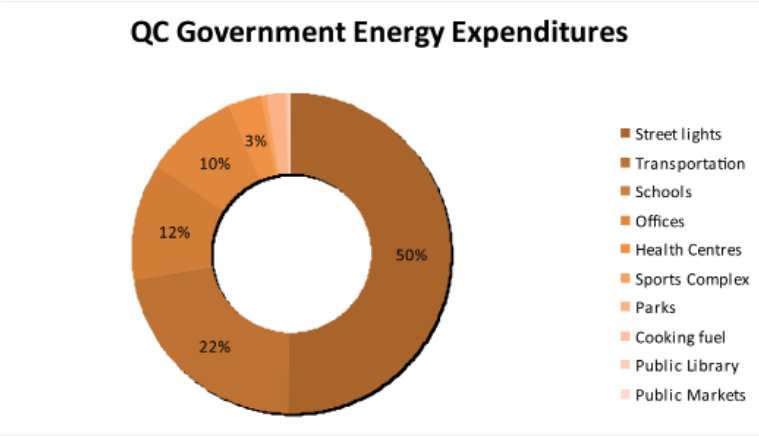
Prioritisation of sectors was achieved using the framework and information contained in the tables shown on the next two pages. On the basis of this information, the consultant identified three sectors that would have been pursued during the course of a typical RAF assignment. As the principal purpose of the mission to Quezon City was to trial and enhance the design of the RAF, efforts were made to ensure that all sectors were further reviewed (to the extent this was possible) during the course of the mission. Hence, final recommendations include suggested activities that cover a number of sectors.

In time the prioritisation process will be developed further to provide a quantitative appraisal of each sector to provide a ranking that identifies priority sectors. This component remains in development; however, the RAF team collectively view the quantitative approach to sector ranking as an initial step which must be contextualised further by both the professional opinion of the consultant and discussion with city government leadership.

Sector Prioritisation Tables for Quezon City

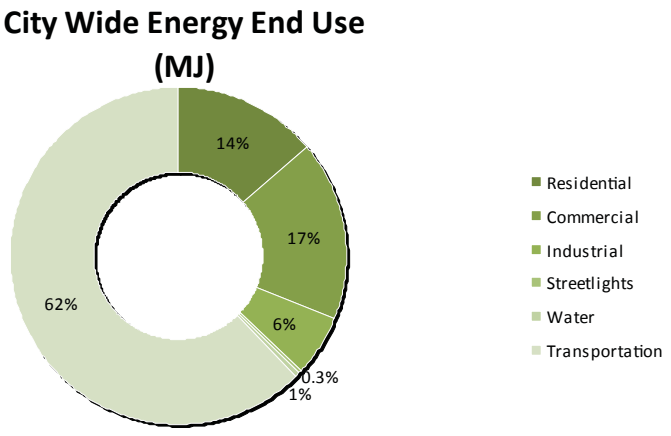
Quezon City Government: Energy Spend

Annual Budget	**9.4 Billion Pesos**
Energy Spend	**495 Million Pesos**
Energy Spend as percentage of Annual budget	**5.10%**



Sector	Description	Spend (million Pesos)	Energy Savings Potential*	Comments
Public Lighting	51,000 poles	255	High (20-40%)	52% of total city government energy spend
Buildings	265 city buildings	130	Med (10-20%)	27% of total city government's energy spend
Transport	850 fleet vehicles	110	Low (5-10%)	QC Government own a fleet of 850 light vehicles
Solid waste	Contracted to 5 private corps	-	-	Transport energy use is only indirectly controlled through annual waste contracts.
Water	265 city buildings' water bills	30	Low (5-10%)	Spend relates to water not energy use. QC government has not direct control over water treatment and distribution or waste water collection and treatment
Power Generation	(Meralco / IPP)	-	-	QC government does not generate electricity, or use energy to power district heating or cooling schemes

Quezon City-wide Energy Use



Sector	Mayor's Influence	% of city energy use	Energy Savings Potential*	Comments
Transport	Low	51%	High (20-40%)	200,000 motorcycles and tricylces regulated by QC.
Buildings	Med	40%	Low (5-10%)	Second highest energy using sector
Water	Low	0.70%	Med (10-20%)	Spend relates to water not energy use. QC government has no direct control over water treatment and distribution or waste water collection and treatment
Waste	Med	-	-	Low utilisation of energy in waste management other than in transportation
Public Lighting	High	0.40%	High (20-40%)	60% roads lit: 45,000 lamps
Power Generation	V. Low	-	Low (5-10%)	QC government does not generate electricity, or use energy to power district heating or cooling schemes

Review of Sectors

Transport

The transport sector is responsible for the majority (51%) of city-wide energy use, and is therefore of particular interest to the mission. However, QCG has limited control and influence as city-wide transport infrastructure is planned by the MMDA at a metropolitan level and fuel efficiency standards for private vehicles are regulated at the national level. Nevertheless, QCG directly controls a fleet of 850 light vehicles, and undertakes a role in regulating the considerable number of motorcycles and tricycles in the city. The city has the opportunity and the mandate to lead by example.

Buildings

Buildings are responsible for 40% of city-wide energy use, and 27% ofQCG spend on energy. Municipal buildings including schools, hospitals and administrative buildings are all under the direct control of the city government. Limited energy efficiency activities have taken place in the recent past. School and Health Centre buildings have limited energy consuming services (e.g. air conditioning, appliances, sufficient lighting), however administrative buildings have significant potential for energy saving retro-fit programmes. Work has commenced in this area with both the Green Building Ordinance and the World Bank Energy Efficient Buildings audit and retrofit program with the QCG.

Water

Water treatment and distribution and waste water collection and treatment services in Quezon City are provided by two privately owned companies, Manila Water and Maynilad, while they are publicly regulated by MSWW. Both organisations understand their respective energy use in operations and have active plans to seek efficiencies in their energy use. QCG has minimal influence and no control over urban water supply and waste water treatment other than at a strategic planning level. Demand reduction activities at a building level are covered under the 'Buildings' sector.

Waste

Principal activities using energy in waste management relate to collection and transit to landfill. This activity is contracted by the QCG to a number of contractors on an annual basis. Whilst the city government exerts considerable control over the contractors, energy efficiency savings through contractual changes may not necessarily produce financial savings for the city as contractors are likely to roll costs of vehicle upgrades into annual bids. Waste minimisation activities at the Barangay level are already taking place, and this is to be further encouraged.

Public Lighting

Public lighting forms the majority of QCG energy spend (51%) and is fully controlled by the municipality. Potential exists for energy efficiency savings in street lighting by replacing metal halide and HPS fixtures with LED, Induction or dimmable fixtures. The Street Lighting Task Force has installed a number of demonstration lamps with limited success as retrofits must provide similar light distribution while reusing existing poles. However the principal mandate for the task force is to expand the coverage of street lighting. Energy Efficiency work in this sector is well underway as the World Bank is directly working with the QCG on a street lighting retrofit programme coupled with programmatic CDM carbon finance.

Power Generation

Electrical distribution in Manila is provided by the privately owned company, Meralco, and power generation is provided by privately owned Independent Power Providers. Policies to guide electricity primary fuel type are national policy issues, thus QCG has minimal influence and no control over the supply of energy, other than at a strategic planning level. There are no co-generation or district cooling schemes in places that are owned and run by the city government. This sector offers minimal potential for energy efficiency savings that the government can control or influence.

On the basis of the prioritisation process and summary findings outlined above, the following sectors are deemed to be priorities in Quezon City, and are highlighted in orange in the tables shown on pages 17 and 18:

- Transportation
- Buildings
- Public Lighting

5. Energy Efficiency Recommendations

The RAF (currently) contains 56 energy efficiency recommendations applicable across the six individual sectors. Following on from the sector prioritization process, each individual recommendation was reviewed to establish its applicability in the Quezon City context. This review or filtering process is necessary so that, time is spent effectively, focusing on those recommendations that are both viable and practicable. Where recommendations were not progressed the predominant reasons were that:

- QCG has already engaged in work in that area;
- Technically minimal savings were available in the area; or
- Savings in the area would not be financially viable.

Of the 56 recommendations, eight stood out as particularly relevant opportunities for significant energy savings in the Quezon City context. It should be noted however, that this list purposely excludes the many programs currently underway, and other programs which are relevant, but do not seem to offer significant energy savings opportunities. A concentrated focus into each of the eight recommendations was conducted during the second week of the mission by gathering specific data to assess the viability of each recommendation.

The recommendations are not prioritized as the RAF model deems all eight to be a high priority. Additionally, many of the recommendations work together to develop synergies and a culture of energy efficiency throughout the administration that create savings well beyond the goals set out below.

The implementation and attributes of each of the recommendation is presented in detail in the next section. The rationale for selecting specific energy efficiency recommendations is summarised below. A full list of all RAF recommendations alongside the rationale for their selection or rejection is provided in the Appendix.

T-1: Municipal fleet maintenance program - HIGHLY recommended

The fleet maintenance program was selected because there are 850 vehicles owned and maintained directly by Quezon City government and, currently there is no existing maintenance procedure specifically focused on for fuel efficiency.

Maintenance programs with fuel-efficiency focused procedures have been shown to save 10%-20% of fuel consumption. With an annual expenditure of 110M pesos on transportation fuel, we estimate that Quezon City government may be able to save a minimum of 11M pesos per year in fuel costs. Some of these savings would need to be allocated to additional staff to perform, teach and check the new maintenance procedures, and some savings will be allocated to additional equipment costs.

This program includes technical maintenance procedures such as tire pressure checking, engine tune-ups, fuel additives for combustion chamber cleaning, and other simple technical fixes. However, this program must also include behavioral change for fuel efficiency such as acceleration/deceleration rates, maximum time for engine idling, maximum speeds and other minor behaviors that have significant fuel efficiency impacts.

T-4: Engine efficiency improvement program - HIGHLY recommended

The engine replacement program from 2-stroke to 4-stroke was selected due to the high number of motorcycles and tricycles still running on 2-stroke engines (17,000). 2-stroke engines are both fuel inefficient and highly polluting as they do not completely burn the fuel in the combustion chamber and provide fresh combustion air for the next combustion cycle. Quezon City is the sole regulator for franchised tricycles, so the Mayor has complete control to legislate and enforce this program. Tricycles are a mode of transportation that should be encouraged as they are more efficient than private automobiles and jeepneys. Tricycles with 4-stroke engines will result in lower operational costs for owners and cleaner air for the residents of Quezon City.

Neighboring cities have implemented a 4-stroke engine replacement program via both incentives and mandates. The more effective programs are incentive-based as these programs cover the costs for nearly all of the cost of replacement; however, these programs require significant funding from external sources. Further investigation into the implementation route for this recommendation, be it a mandate or an incentive, would be advisable.

T-11: Walking / Cycle path development program - HIGHLY recommended

The walking and cycle path program was selected due to the high mode split of walking and cycling (21%) and the observed limited number of dedicated cycle lanes. Cycling through Quezon City is potentially very dangerous as cyclists often ride in the middle of busy roads. Walking and cycling are the lowest energy mode of transport and provide exercise for an ever increasingly sedentary urban population.

By increasing the safety, total length, access to and integration of bike paths, increasing numbers of riders will utilize walking and cycling in favor of private vehicle transportation. A goal of 25% to 30% of mode split from cycling would be an aggressive goal since private vehicle usage is increasing annually as wealth and access to vehicles increases.

Neighbouring communities have been developing dedicated cycle paths through river and stream corridors. Allocating a 1m right of way for cycles on each side of the road with physical separation from pedestrians and automobiles via curbs, trees or bollards is the key to safe cycle paths in urban areas. Funding of bike paths is most efficient when the path design and construction is integrated into a major road renovation and construction is ongoing for larger reasons. A goal of 10km of new bike paths per year for the next 4 years would be an aggressive goal.

B-2: Procurement guidelines for life cycle costing - HIGHLY recommended

The institutional change to include life cycle costing into building design and construction was identified as a major procedural gap in encouraging and allowing energy efficient systems to be installed in new construction and major renovations. Studies in Europe have shown that the capital cost of new commercial property is generally less than 10% of the whole lifecycle cost.

Procurement procedures are rigorous in Quezon City and rules are strictly enforced to guarantee competition in the bidding process; however, the current procurement process does not consider operational expenditure to enable the value of long term savings from efficient plant and consumables such as energy efficient lights, pumps, air conditioning and appliances.

This recommendation requires an additional evaluation factor to be included in the process of selecting any item of equipment in a building that consumes electricity. Not only must the product meet the specifications, it must also be considered on the basis of its running cost and replacement cycles, not just capital expenditure.

It is particularly difficult to estimate energy savings potential of procurement guidelines for future buildings because the amount of future building construction over the next 5 years has not been planned in a long-term capital planning (see B-4). However, energy savings can be predicted on the basis of a comparison against business as usual scenarios, that is procurement on the basis of capital cost alone, for each new development. This recommendation should be implemented along with Advanced EE Procurement recommendation (CC-2).

B-4: 5 year capital planning for energy efficiency retrofits - HIGHLY recommended

This recommendation requires the development and approval of a five year planning strategy for upgrading all of the existing building stock for Quezon City government buildings. This recommendation requires that a new 'line item' be incorporated into the annual budget that provides for expenditure on building renovation.

During the RAF mission a sample of building walk-through reviews uncovered two principal findings: firstly most of the older buildings with central air conditioning systems were still operating old, inefficient chillers, fans and lighting; secondly, many buildings such as the school buildings and health clinics did not have sufficient lighting, ventilation or air conditioning and were under-serviced in terms of quality. Consequently, in time older buildings should be upgraded to include efficient new lighting and mechanical systems and the under-served buildings should be upgraded to internationally accepted standards for lighting, ventilation and cooling.

With a 5 or 10-year capital planning campaign, proposals for building retrofits and upgrades can be brought to the Building Department, General Services Office or the Mayor's Energy EfficiencyTask Force (see CC-1) and projects with the greatest energy saving potential can be prioritized and executed as soon as financially possible. Such a long-term plan can be used to attract energy efficiency funding or capital funds to realize the many opportunities Quezon City has for energy efficiency.

WW-1: Land provision for reservoirs at high elevation - HIGHLY recommended

This recommendation is for the city administration to support Manila Water and Maynilad to locate critical water infrastructure equipment in the most energy-efficient locations. Both water companies identified the need for additional storage reservoirs and sewage treatment plants throughout their service territory, but they also identified a lack of available land in desirable locations. Electricity costs for pumping water are over 15% of the total operational costs for both Manila Water and Maynilad, which is their second largest operational expense after staff costs.

For the potable water networks, bringing water into the city from the Angat and Ipo Dams in the Sierra Madre mountains via gravity storage is the current method for transmission. However, distribution throughout the city is currently performed via a pressurized pumped network, which could be improved by developing a network of storage tanks located in hydraulically efficient locations. Some sewage treatment plants (STP) in Quezon City currently flow using an all-gravity network, but these STPs only serve 9% of the population. More STPs will be required in the future, and these will have significant land requirements. Neither water company estimated the level of savings potential for increasing the gravity distribution and collection networks, but they both ranked this issue at the top of their list of things the Mayor could do to help improve energy efficiency in their water networks.

CC-1: Energy Efficiency Task Force - HIGHLY recommended

The Mayor's Task Force on Energy Efficiency is an important recommendation because it allows for a central driving force to focus the city's efforts on energy efficiency in one team, enabling prioritization of efforts and resources according to the highest opportunity and lowest costs. This recommendation suggests a 3 to 10 person Task Force with the purpose of coordinating and motivating action on energy efficiency projects for the city government.

It was clear during the RAF mission that there was no one individual in the city government who was responsible for looking for energy efficiency opportunities or who would be responsible for poor energy performance.

The group's performance would be measured on the annual increase in energy efficiency of the city government (e.g QCG spend on energy/capita served).

CC-2: Advanced Energy Efficiency Procurement - HIGHLY recommended

This recommendation is an overarching institutional change to include life cycle costing into procurement of any equipment the city purchases which consumes electricity or fuel. The process of procurement was identified as a major procedural gap in encouraging and allowing energy efficient equipment to be considered on a level playing field with lower capital, but higher operational cost equipment.

Procurement procedures may be guided by national and international requirements and labelling schemes, such as the US Energy Star label. This approach could radically reduce the whole life costs associated with such consumables and equipment as energy efficient light bulbs, fans, computers, copiers, refrigerators, street lights and many other items the city government procures for daily operations.

This recommendation requires an additional evaluation factor to be included in the process of selecting any item that consumes electricity. Not only must the product meet the specifications, it must also have the lowest 'life-cycle cost', not just 'capital cost'.

It is not possible to estimate energy savings potential of procurement guidelines for the myriad items of equipment the city purchases, as it depends upon a variety of factors such as the standard adopted, incremental capital cost, operational hours and the change in energy consumption between the item selected and the 'business as usual' item. This recommendation should be implemented along with Building Procurement guidelines for Life Cycle Costing (B-2).

6. Implementing Energy Efficiency Recommendations

In this section, the principal attributes of each recommendation are summarized to enable QCG to prioritze next steps on the basis of preferred attributes. Following the summary table, each recommendation is explored in a separate 'Recommendation Sheet.' This provides an overview of the recommendation, its principal attributes, key implementaiton steps, and case studies of similar activities carred out by other City Authorites. Guidance on how energy efficeincy services may be procured is provide in the Appendix.

Recommendation	Sector	Financing	Term	Energy Savings Potential	Project Timeframe	Co-Benefits
Engine Efficiency Program	Transport	n/a	1 - 3 years	35% / vehicle / year	2 years mobilization	Carbon Reduction, Operational Energy Savings, Air Quality, Public Safety & Health
Municipal Fleet Maintenance Program	Transport	Ongoing program	< 1 year	n/a	2 months mobilization	Carbon Reduction, Operational Energy Savings
Walking, Cycle Path Program	Transport	Capital Expenditure	< 1 year	n/a	2 months mobilization	Carbon Reduction, Air Quality, Reduced Travel Time, Public Safety & Health
Water Infrastructure Planning	Water	n/a	< 1 year	n/a	1 month - 1 year establishment	Operational Energy Savings, Public Safety & Health
Procurement Guidelines for Life Cycle Costing	Buildings	n/a	< 1 year	10%	2 months mobilization	Carbon Reduction, Operational Energy Savings
Capital Planning for EE Retrofits	Buildings	Budget allocation, rolling fund, or other	< 1 year	Technical savings assicoatie with each project can be calculated.	2 months mobilization	Carbon Reduction, Operational Energy Savings
Energy Efficiency Task Force	Organizational Management	Budget allocation	< 1 year	Dependent on level of effort	2 months mobilization	Carbon Reduction, Operational Energy Savings
Advanced Energy Efficiency Procurement	Organizational Management	n/a	< 1 year	10% - 20%	3 months mobilization	Carbon Reduction, Operational Energy Savings

7. Findings / Lessons Learned from the Quezon City Mission

General Observations

Quezon City is possibly too advanced, on the basis of existing energy efficiency programs, to be a typical candidate for the application of the RAF. It already has a number of programs in place assisted by both the World Bank and the Asian Development Bank. As such data was possibly easier to obtain, and recommendations less technical, as many of the major opportunities such as public lighting retro-fits and building energy efficiency measures are already being pursued.

The use of local consultants is highly beneficial, but many doors remain closed to them. The international consultant fared much better, but it was the presence of World Bank staff that seemed to ensure that both arrangements and access was guaranteed. Future RAF missions must take account of the importance of these observations and try to ensure that representation from the funder is available.

Pre-mission

During the pre-mission information gathering stage, the international and local consultant found difficulty in communicating effectively with Quezon City officials. Both parties found that access to both representatives of the QCG and background energy use data difficult to obtain. This was largely because:

- QCG representatives wished to deal directly with the World Bank rather than the International Consultant; and
- the local consultant did manage to obtain written authorization (requested by the International Consultant and the World Bank) ahead of the mission, making it impossible for the local consultant to gather essential data.

Allied to this, there was the possibility for confusion amongst QCG representatives as to the exact nature of the study as at least two other World Bank funded programs with similar energy efficiency aims were underway concurrently.

This challenge highlighted the need in the design and implementation of the RAF to ensure that a clear and prescriptive approach to the pre-mission stage be defined. This should include a pre-mission information pack introducing the RAF and the exact nature of the data and information requirements to the city authority; pre-assignment of representatives in the city authority to aid data gathering in specific areas; mayoral endorsement of the project and written authorization to galvanize support for the local and international consultant. In addition, it is suggested that a longer schedule of six weeks is allowed for to enable information gathering to take place. The consultant has also reconsidered and pared-back the range and depth of information required pre-mission to concentrate on those elements that are absolutely essential to both city-specific context and the benchmarking process.

Energy Performance Benchmarking

Whilst there were challenges, initially, to obtaining energy performance data, enough information was obtained to enable performance comparisons across each of the six sectors (largely due to publicly available information provided on the QCG website). In practice the consultant found that the presentation of performance data in a context that compared 'home' performance to those of peer cities to be a particularly effective means of engaging QCG representatives. They were keen to review and understand more about benchmarking (where data was derived from, boundaries etc) and its presentation was of evident interest.

Although energy performance benchmarking is a very useful process that provides a high level indication of where, in the context of the RAF, further effort and focus should be applied, the results should be interpreted with caution due to the relative scarcity of principal datasets currently. Whilst the database of energy performance in cities is developing it will, during the initial phases of the RAF implementation, provide a mosaic of data. The application of the RAF must therefore ensure that candidate cities agree to the incorporation of their data into the RAF database so that accurate and reliable data is available to grow the database as time moves on.

The response to energy performance benchmarking by QCG representatives leads

the consultant to believe that the presentation of energy performance must be carefully considered prior to the delivery of any message to a wider audience. There are potentially significant implications to a demeaning of city performance which may be counterproductive in the remaining phases of the RAF mission. Benchmarking must, therefore, both engage the city authority and garner their support to make the mission productive through the positive and constructive communication.

Identifying Priority Sectors

The identification of priority sectors is required after the consultant has had approximately 4 to 5 days to interview representatives across all six sectors, and assimilated information and observations. Whilst prioritizing sectors can be aided by quantitative information such as 'city spend', in practice there is not a straightforward and empirically based formula for deciding upon priority sectors.

During the course of the Quezon City mission, it was clear that the principal factors in prioritization were:

- energy saving potential (i.e. by what sort of percentage could energy demand be reduced across the sector);
- the City Authority's ability to control or influence the issue; and
- spend or proportionate energy use.

Difficulties were experienced in effectively ranking between energy use under the direct purview of the city authority (i.e. QCG government spend) and city-wide energy use.

The Quezon City mission has benefited the consultant by focusing attention on the challenges of:

- linking energy performance benchmarking results to the sector prioritization process;
- the definition of levels of control or influence that a city authority may exercise over a particular issue; and
- the aggregation and relative comparison of two quite separate, but intrinsically linked, components of city energy use: whole city energy use and city authority energy use.

This challenge has been taken-up post mission, and the consultant is working through a number of options to define a logical process that may be consistently applied. This process will assimilate contextual, quantitative and qualitative information to derive a sound means for identifying priority sectors.

In Quezon City, it was apparent that the RAF sector prioritization results were no surprise to QCG representatives. This was beneficial insofar as it served to confirm both their actions and prior assumptions, although Quezon City had not compared all the sectors together in the way the RAF compared them on a quantifiable basis.

DESCRIPTION

Overview of recommendation	Adapt or formulate guidelines for the City Authority capital plan to allow for energy efficiency upgrades.
Examples	Allow capital to upgrade the cooling system in a municipal hospital.

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor announces and leads, 2. City Finance department, and 3. Department of Engineering: Project Development.
Level of Effort	1. Minimal, requires commitment from leadership and buy-in from key budget decision makers.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of use
Rulemaking	N	Capital expenditure should be allowed for in the city budget.
Regulatory oversight	N	
Direct expenditures / procurement	Y	
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	N	

KEY IMPLEMENTATION INFORMATION

Step 1	Engage mayor and relevant departments
Step 2	Determine funding target for energy efficiency projects
Step 3	Establish methodology for setting aside fund, e.g. revolving fund from budget, part of yearly city budget, etc.
Step 4	Establish which energy efficiency project will be funded by the capital fund, i.e., through a study conducted and reviewed by a committee, overarching city plan, etc.
Monitoring	Quantification of percentage of budget allocated to energy efficiency upgrades and percentage allocated to each sector.
Good Practice Tips	Explore all funding options – the city does not necessarily have to set aside a set percentage of the budget every year. It is also possible to establish different ways of funding energy efficiency retrofits in buildings such as a rolling fund and other financial mechanisms.

ATTRIBUTES

Sector
Buildings

Financing
Percentage of city budget or fund, rolling fund, or similar

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Energy Savings Potential
Technical savings associated with each project can be calculated.

Project Timeframe
2 months mobilization, depending on the budget cycle, thereafter ongoing to maintain funds.

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☐ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

APPRAISAL

Initial Assessment	
Does the city have a single set of procurement guidelines or procurement guidelines for different departments?	No.
If so, what were the successes and failures of the measure?	n/a
Information Requirements	
What is the current budget for the city and what, if any, are the budgetary shortfalls / excesses?	9.4 billion Pesos, balanced budget.
What potential energy efficiency upgrade projects are there in municipal buildings?	Cooling, lighting.
Does the city currently consider municpal buildings and what energy efficiency upgrades are required?	No, refits based on end-of-life.
Data Requirements	
How much money can the city provide on a yearly basis for energy efficiency upgrades in buildings?	Mayor to decide.
How much money does the city currently provide for energy efficiency retrofits in municipal buildings?	Currently no budget allowance.

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Capital budget set aside for energy efficiency upgrades.	
Possible impact if energy efficiency funds are established.	

CASE STUDIES

Example	Reference
Toronto Atmospheric Fund, Toronto, Canada	www.toronto.ca/taf/index.htm
Municipal Energy Fund, Ann Arbor, USA	UN Habitat, ICLEI, Sustainable Urban Energy Planningwww.a2gov.org/government/ublicservices/systems_planning/energy/Pages/EnergyFund.aspx

ADVANCED ENERGY EFFICIENCY PROCUREMENT

DESCRIPTION

Overview of recommendation	Energy labelling for energy consuming products to show how efficient the product is when comparted to 'best in class' energy consumption of similar products.
Examples	U.S. Energy Star - applied to most office proudcts such as computers, printers, photocopiers, etc (www.energystar.gov).

INSTITUTIONAL REQUIREMENTS

Key Actors	1. Mayor's Office, 2. Procurement / Buying Office.
Level of Effort	Very low.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of use
Rulemaking	N	Advanced procurement guidelines.
Regulatory oversight	N	
Direct expenditures / procurement	Y	
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	N	

ATTRIBUTES

Sector
Organizational Management

Financing
Unquantifiable

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Energy Savings Potential
10% - 20%

Project Timeframe
3 months for mobilization, ongoing to carry out effort.

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☐ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

KEY IMPLEMENTATION INFORMATION

Step 1	Identify key office engaged in establishing procurement rules and guidelines.
Step 2	Establish range of energy consuming office equipment.
Step 3	Identify energy labelling schemes operating in country (see below).
Step 4	Establish standar, e.g., Energy Star, or rating, e.g., EU 'A' Rating, to be applied for each type of office equipment.
Monitoring	Number of appliances / major equipment procured using the new standards.
Good Practice Tips	For an overview of international schemes, see www.energylabel.org.tw/index_en.asp.

APPRAISAL

Initial Assessment	
Has a similar initiative already been implemented?	No.
If so, how was it implemented and were there any key success / failure factors identified?	n/a
Information Requirements	
Are there existing standards for energy labelling in the country?	Yes, fridges and air conditioners are labelled.
Is there access to products with internationally accepted energy performance standards?	Yes

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Procurement of appliances.	Energy efficient applicances may incur higher capital costs.
Cost savings during operation.	Energy efficient appliances will have energy cost savings depending on the level of energy efficiency improvement.

CASE STUDIES

Example	Reference
U.S. Energy Star	www.energystar.gov
E.U. Energy Label	www.energy.eu/focus/energy-label.php
The Philippines Energy Label	projects.wri.org/sd-pams-database/phillipines/energy-label-requirement
Japan Energy Label	http://www.eccj.or.jp/eng/e3202energy_saving.html

PROCUREMENT GUIDELINES FOR LIFE CYCLE COSTING

DESCRIPTION

Overview of recommendation	Capital cost may be a small component of the life whole life cost of energy consuming equipment. Adopting whole life costing enables a comparison of all costs and expenses associated with the purchase ond operation of euqipment. It is recommended that Quezon City develop and implement procurement guidelines that reuqire Life Cycle Costing to analyse the full cost of each option under consideration.
Examples	Energy using plan, machinery, fixtures, and equipment can all be analysed using Life Cycle Costing.

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor announces and leads, 2. All departemnts involved in procurement, especially the Bidding + Awards Committee.
Level of Effort	Low - requires initial establishment of guidelines and protocol to disseminate across city departments, depending on needs.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of use
Rulemaking	N	Will require new procurement guidelines and possible additional expenditure on captal where LCC indicates whole lifecycle savings could be made.
Regulatory oversight	N	
Direct expenditures / procurement	Y	
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	N	

ATTRIBUTES

Sector
Buildings

Financing
n/a

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
10%

Project Timeframe
2 months mobilization, ongoing thereafter to maintain program.

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☐ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

KEY IMPLEMENTATION INFORMATION

Step 1	Engage the Mayor and relevant departments.
Step 2	Determine how the guidelines should be developed: centrally or separately for each relavant department. Standard calculations should be devised that consider: capital cost, maintenance costs, replacement parts / consumables, energy costs, total lifespan of equipment.
Step 3	Appoint a responsible party for the guidelines and establish a timeframe for their completion and implementation.

Step 4	Distribute to relevant parties and provide any necessary training / education required for their use.
Monitoring	Quantification of life cycle savings from analysis undertaken, e.g., comparison of capital cost savings versus life cycle savings.
Good Practice Tips	Provide guidance to all relevat parties deetailing how life cycle costing should be carried out.

APPRAISAL

Initial Assessment	
Does the city have a single set of procurement guidelins or procurement guidelines for different departments?	Yes, the Singh National Standard, Government Procurement Policy Board Resolution 03-2009.
Has a similar initiative already been implemented?	No.
If so, how was it implemented and were there any key success / failure factors identified?	n/a
Is there opportunity to establish prcurement guidelines that consider life cycle costing in light of any previously attempted similar initiatives?	Yes.
Information Requirements	
Who should develop the guidelines?	Bidding + Awards Committee
To which departments should the guidelines apply?	10% Annually

FINANCIAL IMPLICATIONS

Implication	**Impact in Quezon City**
There is potentially an additional 10%-15% captial cost premium on municiaplity procured equipment.	10% - 15%
There is a potential 10% annual cost savings on municipally procureed equipment.	10% annually.

CASE STUDIES

Example	**Reference**
The Mayor of London's Green Procurement Code	www.greenprocurementcode.co.uk/?q=node/42
Lille, France - training municipal purchasers to buy green	ec.europa.eu/environment/gpp/pdf/press_en.pdf
Procurement policy of Pori, Finland	www3.iclei.org/egpis/egpc-061.html
Procurement policy of Richmond, Canada	www.city.richmond.bc.ca/webnews/city/0629_purchasing.htm

ENERGY EFFICIENCY TASK FORCE

DESCRIPTION

Overview of recommendation	Establish an Energy Efficiency Task Force to identify and pursue energy saving opportunities within the city.
Examples	Energy Efficiency Task Force establishes education program to encourage energy efficient practices within municipal departments.

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor announces and leads, 2. Appointed department or departments, or new department, as appropriate.
Level of Effort	Low - requires initial establishment of guidelines and protocol to disseminate across city departments.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of use
Rulemaking	N	Yes, Task Force will need to be established and suggested measures may require funding.
Regulatory oversight	N	
Direct expenditures / procurement	Y	
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	N	

ATTRIBUTES

Sector
Oranizational Management

Financing
Some of city budget likely to be required to establish Task Force and carry out recommendations

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
Dependent on level of effort

Project Timeframe
2 months to 1 year mobilization

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☐ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

KEY IMPLEMENTATION INFORMATION

Step 1	Engage mayor and relevant departments.
Step 2	Determine an appropriate funding target for the establishment of the Task Force and its jurisdiction.
Step 3	Gather all relevant parties and lay out a plan and goals for the Task Force, including the likely types of energy efficiency projects to be pursued by the Task Force.
Step 4 the	Set out a protocol for accountability of the Task Force, e.g., the achievement of specific goals set at beginning of each year.
Monitoring	Quantification of number of institutional and technical programs established along with their potential energy savings.
Good Practice Tips	Explore all options for successful collaboration and ensure that all bodies that should be involved are.

APPRAISAL

Initial Assessment	
Has a similar initiative already been implemented?	No.
If so, how was it implemented and were there any key success / failure factors identified?	n/a
Is there an existing department / task force that lends itself to the establishment of an energy efficiency task force?	Department of GSO / Engineering
Information Requirements	
What is the appropriate protocol for establishing an energy efficiency task force within the City Authority?	Unknown if protocol exists.
What is the existing skill set within the City Authority? Is there the capacity to build the task force from existing personnel or would recruitment be required?	Existing personnel and local consultants as required.
What decision-making power is appropriate to pass on to the task force? Will there be a separate budget?	Minimal, the Task Force will facilitate, advise, guide, and sponsor energy efficiency activities.

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Budget to fund agency	Existing staff plus an allowance for local consultants.
Possible budget requirements to enact energy efficiency measures established by the agency	Project dependent.
Possible financial savings accrued from energy efficiency measures.	Dependent upon the activity / project.

CASE STUDIES

Example	Reference
Osoman Asmal, South Africa, Cape Town	Sustainable Energy Africa. 2006. State of Energy in South African Cities. SEA.
The Barcelona Energy Agency, Barcelona, Spain	www.barcelonaenergia.cat/homeeng.htm

WATER INFRASTRUCTURE PLANNING

DESCRIPTION

Overview of recommendation	Establish planning guidelines to emphasize the provision of land for reservoirs at high elevations and STPs at low elevations.
Examples	Provision of land for a new STP that is gravity fed and near the receiving water body.

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor buys into the program and establishes it as an objective; 2. Planning department takes on responsibility for implementation.
Level of Effort	1. Minimal, requires commitment from leadership and buy-in and long-term commitment from Planning Authority.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of use
Rulemaking	N	
Regulatory oversight	N	
Direct expenditures / procurement	Y	Planning Department will be responsible for ensuring that planning requirements are followed.
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	N	

KEY IMPLEMENTATION INFORMATION

Step 1	Engage mayor and Planning Department.
Step 2	Establish time-frame goals for establishment of planning requirements.
Step 3	Survey existing water system and highlight opportunities ` and potential synergies with other industries.
Step 4	Enact appropriate planning requirements.
Monitoring	Quantification of current energy use on water distribution per capita versus after upgrade energy use on water distribution per capita. This is a long term measure but can be addressed in the interim by engineering calculations and modeling.
Good Practice Tips	Be sure to explore potential synergies with other utilities and developments. Offer developers incentives such as density bonuses if they can contribute to the overall city water distribution efficiency plan.

ATTRIBUTES

Sector
Water

Financing
Very little required, establishment of planning guidelines

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
Depends on scope of infrastructure upgrades

Project Timeframe
1 month – 1 year required for establishment of planning guidelines, long-term commitment required from planning department for infrastructure development.

Co-benefits
- ☐ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☑ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

APPRAISAL

Initial Assessment	
Has a similar initiative already been implemented?	No.
If so, how was it implemented and were there any key success / failure factors identified?	
Information Requirements	
Are there existing sites that can be targeted for reservoirs and STPs?	To be decided.
Are there existing planning incentives that can be applied to this initiative to encourage developers to help develop an energy efficient water infrastructure?	Unknown.
Data Requirements	
What is the current energy use per capita to distribute water?	
How much of this is due to pumping?	

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Minimal financial implication, some possible cost to establish planning guidelines.	

CASE STUDIES

Example	Reference
n/a	n/a

MUNICIPAL FLEET MAINTENANCE PROGRAM

DESCRIPTION

Overview of recommendation	Program to improve fuel efficiency of Quezon City's vehicle fleet of 850 vehicles
Examples	WB Bangalore design note (link).

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor's office 2. General Services Office (GSO)
Level of Effort	Medium, requires ongoing training and potentially additional staff
Other	A responsible party must be appointed at GSO to oversee the program.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (✓/)×	Description of Comments
Rulemaking	×	Planning Department will be responsible for ensuring that planning requirements are followed.
Regulatory oversight	×	
Direct expenditures / procurement	✓	
Financial incentives	×	
Information gathering and dissemination, convening / facilitation and advocacy	?	

KEY IMPLEMENTATION INFORMATION

Step 1	Engage mayor and GSO with case studies of similar maintenance programs.
Step 2	Inventory of existing fleet vehicle types and fuel efficiency maintenance needs (tune ups, tire pressure, fuel type, optimal driving behavior).
Step 3	Set a target for fuel use reduction and establish standards for vehicle fleet.
Step 4	Develop a plan to achieve fuel use reduction targets and upgrade municipal vehicle fleet to achieve standards.
Monitoring	Fuel use monitoring can be carried out by the City Authority's fleet managers or through tracking fuel car usage and expense or mileage claims.
Good Practice Tips	1. Identify maintenance capability within city. 2. Identify easily targeted upgrades that are locally achievable using available supplies.

ATTRIBUTES

Sector
Transport

Financing
Very little required, establishment of planning guidelines

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
Depends on scope of program

Project Timeframe
1 month – 1 year required for establishment of planning guidelines, long-term commitment required from planning department for infrastructure development.

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☐ Air Quality
- ☐ Reduced Travel Time
- ☐ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

APPRAISAL

Initial Assessment	
Does the city authority run a municipal vehicle fleet?	Yes
Has a similar initiative been implemented in the past?	No
Is there an existing target for fuel reduction?	No
Are any vehicles currently using alternative fuels?	No
Is training provided on economical driving techniques?	No
Information Requirements	
What are the types of vehicles in the municipality owned / leased fleet?	850 (breakdown unknown)
Data Requirements	
Size, mileage, fuel use of fleet (vehicles owned or leased by city authority)	unknown
Optimum efficiency of vehicles included in fleet	unknown

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Capital expenditure on upgrades	Where appropriate, upgrades may be required to existing vehicles or vehicle replacement may be recommended.
Maintenance / inspection personnel salaries	Expenditure will be required to hire maintenance / inspection personnel long term.
Expenditure on training	If appropriate, funding should be set aside for training of maintenance / inspection personnel and city drivers.

CASE STUDIES

Example	Reference
Energy Saving Trust, UK	http://www.energysavingtrust.org.uk/business/Business/Transport-advice

WALKING AND CYCLE PATH PROGRAM

DESCRIPTION

Overview of recommendation	Implement a program to designate walking and cycle path network and include new paths in new developments.
Examples	(city to north of QC which has a lot of new cycle paths)

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor's Office 2. MMDA 3. City Planning 4. Parks Department
Level of Effort	Medium, requires ongoing commitment
Other	A coordinating body must be established by the City Authority or within one of the participating departments.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of Comments
Rulemaking	Y	Planning requirements
Regulatory oversight	Y	Planning review
Direct expenditures / procurement	Y	Identification of potential bicycle and pedestrian routes and installation of required infrastructure.
Financial incentives	N	
Information gathering and dissemination, convening / facilitation, and advocacy	Y	Widespread public education program: benefits of walking and cycling, route maps, planned new cycle ways etc. convening / facilitation and advocacy

KEY IMPLEMENTATION INFORMATION

Step 1	Engage mayor and relevant departments.
Step 2	Take stock of existing pedestrian and bicycle paths.
Step 3	Set a target for pedestrian and cycle paths in conjunction with mayor and relevant departments.
Step 4	Establish a coordinating body to carry out the program.
Step 5	Monitor progress and set timeframe goals. Plan for periodic progress checks to ensure progress is being made.
Monitoring	Quantify total length of miles of bicycle lanes and pedestrian routes to compare to initial conditions and against targets.

ATTRIBUTES

Sector
Transport

Financing
Capital expenditure on infrastructure and planning enforcement

Term
- ☑ < 1 year
- ☐ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
Unquantifiable

Project Timeframe
2 months mobilization, ongoing after establishment

Co-benefits
- ☑ Carbon Reduction
- ☐ Operational Energy Savings
- ☑ Air Quality
- ☑ Reduced Travel Time
- ☑ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

APPRAISAL

Initial Assessment	
Has a similar initiative already been implemented?	Not in QC
Does the City Authority have a planning department with capacity to oversee and carry out this recommendation?	Yes
Are there already sufficient pedestrian and cycle routes?	No
Information Requirements	
Does the city have appropriate land provision and infrastructure potential to implement this measure?	Yes
Planning rationale, if any, supporting current locations of pedestrian, cycle paths.	Yes
Data Requirements	
Total length of existing pedestrian and cycle paths.	unknown (minimal)
Location of existing pedestrian and cycle paths.	unknown

FINANCIAL IMPLICATIONS

Implication	Impact in Quezon City
Capital expenditure on new routes	Varies dependent upon land ownership, scheme design, extent of network, and effort given to promition.
Expenditure on maintenance personnel	
Expenditure on training / education	

CASE STUDIES

Example	Reference
Reducing vehicular volume and GHG emissions in Baguio City, Philippines.	UN Habitat, ICLEI – Sustainable Urban Energy Planning Case Study 48.Business/Transport-advice
Pedestrian ordinance in Busan, Korea.	UN Habitat, ICLEI – Sustainable Urban Energy Planning Case Study 49.

ENGINE EFFICIENCY PROGRAM

GENERAL INFORMATION

Overview of recommendation	Implement a program to designate walking and cycle path network and include new paths in new developments.
Examples	Puerto Princesa, Bangkok, Manila City,

INSTITUTIONAL REQUIREMENTS

Key Actors	1. The Mayor announces and leads, 2. LTFRB or LTO to run the program, 3. Funding to be allocated by special project budget
Level of Effort	Medium, requires significant commitment for two years.
Other	There must be integration between the mayor's office and LTO/LTFRB to execute the project.

CATEGORY OF INFLUENCE / CAPACITY TO ACT

Which of the below will the municipality need to enact this recommendation? For each one selected, give a brief description of what is involved.

Lever	Required (Y/N)	Description of Comments
Rulemaking	Y	City of Manila already has regulations in place requiring tricycle drivers to upgrade from 2-stroke to 4-stroke engines. This program is intended to assist tricycle drivers comply with regulations. This is a mandatory program Program publicity will be required.
Regulatory oversight	Y	
Direct expenditures / procurement	N	
Financial incentives	N	
Information gathering and dissemination, convening / facilitation and advocacy	Y	

ATTRIBUTES

Sector
Transport

Financing
n/a

Term
- ☐ < 1 year
- ☑ 1 – 3 years
- ☐ 3 – 5 years
- ☐ 5 – 10 years

Sector Energy Savings Potential
35%/vehicle/year

Project Timeframe
2 years mobilization, thereafter ongoing monitoring and support

Co-benefits
- ☑ Carbon Reduction
- ☑ Operational Energy Savings
- ☑ Air Quality
- ☐ Reduced Travel Time
- ☑ Public Safety & Health
- ☐ Employment
- ☐ Waste Reduction
- ☐ Water Use Reduction
- ☐ Consistency of Energy Supply
- ☐ Access to Energy

KEY IMPLEMENTATION INFORMATION

Step 1	Develop a 'Retrofit Team' composed of members of the mayor's office and LTO/LTFRB .
Step 2	Review other engine upgrade programs in Metro Manila region and throughout SouthEast Asia.
Step 3	Develop a retrofit plan based on lessons learned from regional examples.
Step 4	Roll out enforcement through the course of 2 years.
Monitoring	Utilize existing 'smog check' system to track retrofitted tricycles and record petrol usage and pollution.
Good Practice Tips	n/a

APPRAISAL

Initial Assessment	
Has a similar initiative been implemented in the past?	Not in Quezon City
Is there an existing department with the capability to carry out this program?	17,000 tricycle owners
Information Requirements	
How many individuals / organizations own vehicles and what type of engagement is most effective with them?	Yes
Planning rationale, if any, supporting current locations of pedestrian, cycle paths.	Yes
Data Requirements	
Number of 2-stroke vehicles	17,000 tricycles
Average fuel consumption of 2-stroke engine pre-upgrade and post-upgrade	
Average daily travel distance of tricycles	

FINANCIAL IMPLICATIONS

Example	**Reference**
Capital expenditure on upgrade kits, if applicable	The City Authority has the option to provide retrofit engines for free, charge, or franchise.
Retrofit Team salaries	Expenditure will be required to establish a 'Retrofit Team' to assist tricycle drivers with the new 4-stroke engine legislation.
Expenditure on training	If appropriate, funding should be set aside for training of personnel on how to use the retrofit kits or implement the assistance program.

CASE STUDIES

Example	**Reference**
Puerto Princesa 2-stroke engine retrofits.	http://www.cleanenergyawards.com/top-navigation/nominees-projects/nominee-detail/project/37/?cHash=18d4807a49

Appendix

Quezon City Meeting Schedule

Monday, February 22, 2010	9:30 AM	ESMAP and Country Team Meeting
Tuesday, February 23, 2010	10:00 AM	ESMAP Workshop with Vice Mayor Herbert Bautista
	1:00 PM	Meeting with QC Mayor Feliciano Belmonte
Wednesday, February 24, 2010	9:00 AM	Department of Building Official
	11:00 AM	City Planning and Development Office
	1:00 AM	Budget Office
	3:00 PM	General Services Office
Thursday, February 25, 2010	10:00 AM	Manila Water
	2:00 PM	Land Transportation Franchising and Regulatory Board
Friday, February 26, 2010	9:00 AM	Parks Development Office
	10:00 AM	Street Lighting Task Force
	11:00 AM	Procurement
	1:00 PM	Environmental Protection and Waste Management Office
	2:00 PM	Department of Engineering
	4:00 PM	Accounting Office
Monday, March 01, 2010	10:00 AM	WB Office Coordination
	12:00 PM	QC Hospital, Toro Hills Elementary, Health Clinic
	7:00 PM	Street lighting tour
	8:00 AM	Meralco customer relations
Tuesday, March 02, 2010	9:00 AM	Land Transportation Office
	12:00 PM	Metro Manila Development Authority
	2:00 PM	Meralco Energy Efficiency group
Wednesday, March 03, 2010	9:00 AM	Univ of Philippines - National Center for Transport Studies
	10:00 AM	Maynilad
	1:00 PM	Metropolitan Waterworks and Sewerage System
	2:00 PM	QC departments data follow up
	4:00 PM	UUPCRS upgrading project site visit
Thursday, March 04, 2010	10:00 AM	WB prep session for Friday presentation
Friday, March 05, 2010	10:00 AM	Presentation to QC Officials and Staff

Quezon City Key Performance Indicators

KPI	Name	Metric	Description	Quezon City	Source
CW-1	Total primary energy consumption	MJ/$GDP	Total primary energy consumption (including renewable and non renewable energy) divided by the $GDP at PPP of the city	1.90	Electricity consumption: City Report, Fuel consumption: DOE. Metro Manila region but normalized for the population of Quezon City
CW-2	Total primary energy consumption	GJ/capita	Total primary energy consumption (including renewable and non renewable energy) divided by the total population of the city	24.46	Electricity consumption: City Report, Fuel consumption: DOE. Metro Manila region but normalized for the population of Quezon City
CW-3	Electricity consumption	kWhe/$GDP	Total electricity consumption divided by the $GDP at PPP of the city	0.102	Report: Quezon city: The envisioned city of Quezon
CW-4	Electricity consumption	kWhe/capita	Total electricity consumption divided by the total population of the city	1,317	Report: Quezon city: The envisioned city of Quezon
CW-5	$GDP/capita	$ GDP at PPPs / population	Gross domestic product at purchasing power parity divided by total population of the city	12,897	PWC 2008 Metro Manila GDP and Metro Manila population 2008
CW-6	Urban density	people/hectare	Indicates how densely populated the city is. Total population divided by total city land area	166.3	Quezon city report: The envisioned city of Quezon
CW-7	Heating Degree Days	HDD	Measure of how much (in degrees), and for how long (in days), outside air temperature was lower than 65°F.	1	www.degreedays.net
CW-8	Cooling Degree Days	CDD	Measure of how much (in degrees), and for how long (in days), outside air temperature was higher than 75°F.	2755	www.degreedays.net

CW-9	Climate	-	Classified according to the five main groups in Köppen climate classification scheme (Tropical, Arid, Temperate and Continental)	Tropical	CIA World factbook
CW-10	Human Development Index (by country)	HDI		0.751	Human Development Report 2009, UNDP
CW-11	Population within the municipal boundaries	-	Number of people within the municipal boundary of the city	2,767,515	Quezon city indicators 2008
T-1	m of high capacity transit/1000 people	-	This is public transit that has an exclusive right of way	5.78	UITP database 1995
T-2	Transport MJ/capita	MJ/capita	Energy (fuel and electricity) used in the transportation divided by the total population of the city	7,356	DOE 2008 numbers for Metro Manila, normalized for Quezon City
T-3	Transportation public MJ/ vehicle km	MJ/ve.km	Energy (fuel and electricity) consumed in the public transportation sector divided by the kilometers driven in that sector in a year	4.87	UITP database 1995
T-4	Transportation private MJ/ vehicle km	MJ/ve.km	Energy (fuel and electricity) consumed in the private transportation sector divided by the kilometers driven in that sector in a year	3.58	UITP database 1995
T-5	Public transportation MJ/ passenger km	MJ/pass.km	Energy (at source) consumed in the public transportation sector divided by the total number of kilometers traveled by all people in a year	1.44	UITP database 1995
T-6	Private Transportation MJ/ passenger km	MJ/pass.km	Energy (at source) consumed by privat vehicles divided by the total number of kilometers traveled by all people in a year	1.44	UITP database 1995

T-7	% commuter mode split	Walk/cycle	The number of total trips in each commuting category (non motorized, private, public) divided by the total number of trips in all categories	21%	UITP database 1995
		public motorized		59%	UITP database 1995
		private motorized		20%	UITP database 1995
T-8	Number of cars /1000 people	units/1000 people	Supply of cars	82.44	UITP database 1995
T-9	Number of motor cycles/1000 people	units/1000 people	Supply of motor cycles	7.73	UITP database 1995
B-1	Total primary energy consumption in municipal buildings	MJ	Total primary energy consumption (including renewable and non renewable energy)	177,600,000	Calculated from building expenditure and electric rate
B-2	Total energy expenditure for municipal buildings	US $	Amount of money spent on energy in Municipal Buildings converted to USD for equivalent year	$ 3,183,145	QC Budget Office
B-3	Percent of total city budget spent on municipal buildings	%	Amount of money spent on energy in Municipal Buildings divided by total city expenditures	2%	QC Budget Office
B-4	Electricity consumption in municipal buildings	kWhe/m2	kWh of electricity consumed in Municipal Buildings divided by the total gross floor area of Municipal Buildings		Raymond to provide case study data points, floor area numbers missing
B-5	Heating fuel use sin municipal buildings	MJ/m2	Total primary energy consumed in Municipal Buildings divided by the total gross floor area of Municipal Buildings	0.0	No heating fuel in this climate for Municipal Buildings
B-6	Residential building energy use split	0	Energy end use breakdown for residential Buildings		Raymond searching for relevant data

B-7	Commercial building energy use split	Heating	Energy end use breakdown for Commercial Buildings	0%	DOE survey conducted 2009
		Cooling		62%	DOE survey conducted 2009
		Lighting		16%	DOE survey conducted 2009
		Equipment/ Appliances		5%	DOE survey conducted 2009
		Other		17%	DOE survey conducted 2009
SL-1	Total electricity consumption for street lights	kWhe	Electricity consumed by street lights	26,500,000	QC Budget Office Utility bills
SL-2	Percent of city Government budget used for street lighting	%	Losses from transmission and distribution	3%	QC Budget Office Utility bills
SL-3	Price of electricity for street lighting	US $/ kWhe	Amount of money spent on energy for street lighting converted to USD for equivalent year divided by total energy consumed by street lights	0.22	QC Budget Street Lighting Task Force inventory
SL-4	Percent of total city energy consumption used for street lights	%	Energy used for street lights divided by total energy consumption in the city	1%	QC Budget Office Utility bills
SL-5	Electricity consumed per km of lit roads	kWhe/km	Electricity used by street lights (in kWh) divided by length of road that are lit (in km)	21082	QC Street Lighting Task Force inventory (2008)
SL-6	Percent of lit roads in the city	%	Length of roads with street lights divided by total length of roads	60%	QC Street Lighting Task Force inventory (2008)
PH-1	Percent non technical T&D losses (non metered customers)	%	Amount of energy that goes to non metered customers divided by the total energy supplied to the grid (both expressed in kWh)		Raymond contact MERALCO
PH-2	Percent technical T&D losses	%	Amount of energy lost in transmission and distribution divided by the total energy supplied to the grid (both expressed in kWh)		Raymond contact MERALCO

PH-3	Percent of electric generation that is cogeneration	%	Amount of electric energy produced in cogeneration plants divided by the total electrical energy produced (both expressed in kWh)	0%	MERALCO annual report
PH-4	Percent of population with authorized electrical service	%	Number of people that have legal grid connection divided by total population	97%	MERALCO
PH-5	Residential electric rates	US $ / kWhe	Price of electricity for residential customers	$ 0.19	MERALCO (average approximation)
PH-6	Commercial electric rates	US $ / kWhe	Price of electricity for commercial customers	$ 0.22	MERALCO (average approximation)
WW-1	Average water consumption	L/capita/day	Total amount of water that is sold on a year basis divided by the total population divided by numbers of days in a year	285	Manila Water
WW-2	Electricity consumed to produce potable water	kWhe/m^3	Energy consumed to generate all sold water divided by the quantity in m^3 of water sold	0.14	Manila Water numbers from QC mission
WW-3	Electricity consumed to treat sewage	kWhe/m^3	Energy consumed to treat wastewater divided by the quantity in m^3 of wastewater treated	0.4	Manila Water numbers from QC mission
WW-4	Percent of city population with potable water service	%	Number of people with potable water service divided by the total population	100%	Manila Water numbers from QC mission / IBNET 2004 for Maynilad
WW-5	Percent of city population connected to sewage system	%	Number of people connected to the sewage system divided by the total population	16%	Manila Water numbers from QC mission
WW-6	Percent of non revenue water	%	Water sold divided by water produced, both expressed in m^3/year	15%	Manila Water numbers from QC mission

WW-7	Percent of total operating cost that is electricity cost	%	Shows how big percentage of total operating cost is spent on electricity for water treatment both potable and waste water	15%	IBNET 2004 for both Manila Water & Maynilad
WW-8	Average water electricity rates	US $/m^3	Price of water for the water utilities	$ 0.65	Manila Water
W-1	Average waste per capita	kg/capita	Total solid waste generated on a yearly basis in kg divided by the total population	249.0	Dep. Env. accomplishment report 2009 - solid waste
W-2	Percent of waste captured	%	Amount of solid waste (kg) that is captured divided by the total amount of solid waste generated (kg)	99%	Dep. Env. accomplishment report 2009 - solid waste
W-3	Percent of waste recycled	%	Amount of solid waste (kg) that is recycled divided by the total amount of waste generated (kg)	14%	Dep. Env. accomplishment report 2009 - solid waste
W-4	Percent of waste that goes to landfill	%	Amount of solid waste (kg) that goes to landfill divided by the total amount of waste generated (kg)	64%	Dep. Env. accomplishment report 2009 - solid waste
W-5	Percent of capped landfills	%	Number of landfills that has methane capture divided by total number of landfills	100%	Dep. Env. accomplishment report 2009 - solid waste

Recommendation Selection Appraisal

Public Lighting

City Government

Recommendation	Appraisal
PL-1: Street lights audit and retrofit program	Ongoing project
PL-2: Design guidelines for new street lighting	Ongoing project
PL-3: Demonstration installations new technology	Ongoing project
PL-4: Street light timing program	NOT recommended Technical – many streets already underlit, so dimming not recommended
PL-5: Park light audit and retrofit program	NOT recommended

Transportation

City Government

T-1: Municipal fleet maintenance program	HIGHLY recommended
T-2: Green travel plan for city employees	NOT recommended Technical – most employees already taking public transit
T-3: Procurement for new fuel efficient	Recommended Develop EE standards for all new vehicle types: cars, light trucks, heavy trucks

City Wide

T-4: Engine efficiency improvement program	HIGHLY recommended
T-5: Enforce emissions testing	Recommended Develop an enforcement team to improve lax testing centers
T-6: Advanced Bus programs (BRT)	Recommended Ongoing discussions with MMDA, and some progress is being made
T-7: Land allocation to support public transit	Ongoing project
T-8: License plate driving ban	Ongoing project
T-9: Eco driving education program	NOT recommended EE driving would be a major cultural shift in QC
T-10: Green taxi program	Ongoing project
T-11: Walking / Cycle path development program	HIGHLY recommended
T-12: Introduce parking charges	NOT recommended Economic burden not appropriate for QC

Buildings

City Government

B-1: Energy audit and retrofit program	Ongoing project
B-2: Procurement guidelines for life cycle costing	HIGHLY recommended
B-3: Energy reporting database for all city buildings	Recommended
B-4: 5 year capital planning for EE retrofits	HIGHLY recommended
B-5: Employee education program for EE at work	Ongoing project
B-6: Solar hot water, photovoltaic program	NOT recommended SHW no demand in QC, PV poor economics

City Wide

Green building code	Ongoing project
Involvement with local green building council	Recommended

Water

City Government

WW-1: Land provision for reservoirs at high elevation	HIGHLY recommended
WW-2: Demand reduction campaign	Ongoing project

City Wide

WW-3: Pump replacement program	Ongoing project
WW-4: Rationalization of gravity-fed network	Ongoing project
WW-5: Leak detection program	Ongoing project
WW-6: Water metering	Ongoing project
WW-7: Regulation of private wells	Ongoing project
WW-8: Non-technical loss reduction program	Ongoing project
WW-9: Biogas from sludge	Recommended Manila Water is currently studying creating methane from STP sludge

Power and Heat

City Wide

PH-1: Non-technical loss reduction program	Recommended
PH-2: Power sector energy efficiency study	NOT recommended Meralco jurisdiction
PH-3: Transformer upgrade program	NOT recommended Meralco jurisdiction
PH-4: Power factor retrofit program	NOT recommended Meralco jurisdiction
PH-5: District cogen network	NOT recommended Minimal savings in tropical climate
PH-6: Turbine retrofit program	NOT recommended Meralco jurisdiction
PH-7: Boiler and turbine upgrade program	NOT recommended Meralco jurisdiction
PH-8: Boiler and turbine maintenance program	NOT recommended Meralco jurisdiction

Waste

City Wide

W-1: Landfill gas capture	Ongoing project
W-2: Local waste recovery program	Ongoing project
W-3: Waste management hauling efficiency program	NOT recommended Out of control of CA
W-4: Waste vehicle audit and retrofit program	NOT recommended Out of control of CA
W-5: Waste vehicle fuel efficiency standards	Recommended Create EE procurement standards for new waste hauling contracts
W-6: Waste compactor & loader fuel efficiency	NOT recommended Out of control of CA
W-7: Sorting at transfer facilities	NOT recommended Out of control of CA
W-8: Waste to Energy program	NOT recommended Out of control of CA

Cost Cutting

City Government

CC-1: Energy Efficiency Task Force	HIGHLY recommended
CC-2: Advanced EE Procurement	HIGHLY recommended
CC-3: Collaborate with national & int'l EE programs	Ongoing project
CC-4: EE education program for employees	Ongoing project

City Wide

CC-5: Support market development for ESCO	Recommended Be a pilot project for WB and IFC upcoming ESCO projects
CC-6: Public education campaign for energy efficiency	Recommended Develop EE campaign for CFL switch-out, A/C turn down, lights, etc.

Happold Consulting Ltd.
17 Newman Street
London, W1T 1PD
United Kingdom

T +44 (0) 207 927 9700
F +44 (0) 2007 0787 4145
robert.carr@happoldconsulting.com

For further information please contact
Robert Carr
www.happoldconsulting.com