

**Municipal  
Engineering  
Foundation Victoria**

## **2010 Overseas Study Tour Report**



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## **Table of Contents**

### **Acknowledgements**

<b>Executive Summary.....</b>	<b>1</b>
<b>1.0 Introduction.....</b>	<b>2</b>
<b>2.0 Observations and key learning outcomes.....</b>	<b>3</b>
<b>2.1 City and County of San Francisco, USA.....</b>	<b>3</b>
<b>2.2 City of Napa, USA.....</b>	<b>7</b>
<b>2.3 City of Toronto, Canada.....</b>	<b>9</b>
<b>2.4 City of Waterloo, Canada.....</b>	<b>12</b>
<b>2.5 Medford City Council, USA.....</b>	<b>14</b>
<b>2.6 Cambridgeshire County Council, UK.....</b>	<b>15</b>
<b>2.7 Leicestershire County Council, UK.....</b>	<b>18</b>
<b>3. 0 Boston Congress – 2010 APWA Congress &amp; Exposition, USA... </b>	<b>19</b>
<b>4. 0 Recommendations.....</b>	<b>21</b>
<b>5.0 Conclusion.....</b>	<b>23</b>
<b>References.....</b>	<b>24</b>

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## **Executive Summary**

The Municipal Engineering Foundation, Victoria (MEFV) selected four local government engineers for the 2010 Overseas Study Tour. These four engineers with a team leader (Foundation member) visited the USA, Canada, and the UK and attended the 2010 APWA International Public Works Congress and Exposition at Boston Ma, USA in August 2010.

My role with Baw Baw Shire Council is to develop and implement climate change programs for both Council and the community. My major objective of the study tour was to learn from the local government programs and initiatives on climate change issues and how these initiatives can be adopted at local levels in Victoria/Australia. My specific areas of interest were green building stocks, water conservation, waste management, renewable energy and sustainable public lighting.

**Local Governments Visited** – During the overseas study tour, the MEFV team visited San Francisco Council, Napa City Council and Medford City Council in USA, Toronto City Council and Waterloo City Council in Canada and Cambridgeshire and Leicestershire County Councils in UK.

**2010 APWA Congress** – The 2010 APWA International Public Works Congress & Exposition at Boston was attended by more than 8,500 delegates from 19 countries. About 650 exhibitors displayed their products and services. The Congress covered a wide range of sessions including environment sustainability, solid waste, stormwater/flood control, fleet services and technology.

**Key Learnings and Recommendations** – All levels of governments in USA, Canada and UK have widely accepted that climate change is real and are in the process of developing programs and policies to minimise the impact of climate change. This report offers key learning outcomes and key recommendations from the meetings with the Local Governments and visits to specific locations to get first hand information on their climate change programs. A summary is as follows:

**Green Buildings** - Green buildings including green roofs offer many environmental, social and economic benefits. Therefore all governments must lead by example to make their existing and new buildings more sustainable.

**Water Conservation**- Local Government may encourage the phase out of natural lawn from household properties and replace with artificial grass, meadow and veggie patches or drought resistance planting.

**Waste/Recycling** - A zero waste approach is one of the fastest, cheapest and most effective strategies to protect our environment. Local Governments should implement programs to minimise food waste going to landfill and introduce a user pay system for waste collection and disposal.

**Renewable Energy** – Government should promote renewable energy in the community and implement a training program to develop renewable energy champions in the community. Closed landfill should be used for the generation of renewable energy (solar and methane gas).

**Sustainable Street Lightings**- There is a potential to minimise public lighting greenhouse emissions to zero by purchasing 10% green power, changing existing globes to energy efficient ones and turning off the lights from 12.00 midnight to 4.00am.

It is also recommended to undertake triple bottom line assessment of all programs and policies to address climate change issues.

**Conclusion** - Local Governments must lead by example to make all their buildings sustainable, reduce their carbon foot print, reduce waste to landfill, save water and promote sustainable living in the community.

MEFV has played an important role by sponsoring local government engineers to undertake the overseas study tour and it is expected that all the tour participants will seek to implement their recommendations in their Councils and assist their communities.

## 1. Introduction

Preparing Victoria for the unavoidable impacts of climate change is imperative and many communities are highly vulnerable to climate change. Local Government has an important role to play in minimising the potential impact of climate change by demonstrating leadership, implementing mitigation programs and assisting communities in adapting to climate change. All levels of governments in USA, Canada and UK have widely accepted that climate change is real and are in process of developing programs and policies to mitigate and adapt the change.

The Municipal Engineering Foundation, Victoria (MEFV) selected four local government engineers for the 2010 Overseas Study Tour. These four engineers with a team leader (Foundation member) visited the USA, Canada, and the UK and attended the 2010 APWA International Public Works Congress and Exposition at Boston Ma, USA in August 2010.

As Environmental Coordinator with Baw Baw Shire Council, my role is to develop and implement the environmental management plan including water conservation, energy efficiency, greenhouse gas emissions reduction, renewable energy, waste minimisation and community education and behaviour change programs on sustainable living.

My study topic was "*Climate Change mitigation and adaptation for Council's infrastructure/property services and building resilient communities*". The main objective of the tour was to study climate change initiatives undertaken by Local Governments in the USA, Canada and UK to assist their communities in adapting to climate change. My specific areas of interest were:

- Green or sustainable building stocks;
- Water conservation and quality;
- Waste management;
- Renewable energy; and
- Sustainable public lighting.

This report offers my observations and key learning outcomes from the meetings with the following Local Governments and visit to specific locations to get first hand information on environmental programs or projects:

- San Francisco Council, USA – 9 August 2010
- Napa City Council, USA – 10 August 2010
- Toronto City Council, Canada – 12 August 2010
- Waterloo City Council, Canada – 13 August 2010
- Medford City Council, USA – 19 August 2010
- Cambridgeshire County Council, UK - 24 August 2010
- Leicestershire County Council, UK - 25 August 2010
- AWPA Congress and Exposition, Boston USA – 15-18 August 2010

Please note that the observations and key learning outcomes made in this report are not limited to meetings with the above local governments but also include research undertaken from their published documents, workshop sessions attended during AWPA Congress, meetings with local people, general observations including streets, buildings, waste bins and street lighting and subsequent follow up with the relevant staff of the governments after the visits.

I then offer a series of recommendations based on my observations and key learning outcomes. The recommendations also include brief triple bottom line – economic, social and environmental assessment.

## 2.0 Observations and Key Learning Outcomes

### 2.1 City and County of San Francisco, USA

**About San Francisco City-** San Francisco, officially the City and County of San Francisco, is the fourth most populous city in California and the 12th most populous city in the United States of America, with a 2008 estimated population of 808,977. San Francisco is the financial, cultural, and transportation center of the US.

San Francisco's first modern municipal government was created on April 15, 1850 when the state legislature voted to incorporate the City and County Council of San Francisco. It is a huge City County Council with a total operating budget of US\$ 6.6 Billion in 2010.

The City provides a range of services including hospital, mental and community health, education, parks and recreation, family support, police and senior citizens services. In the area of climate change, the City is implementing a number of programs including green buildings, solar energy, change of street lights with LED technology and zero waste to landfill.

**Environmental and Climate Change Initiatives-** The following are my observations relating to green buildings including green roof, storm water issues, waste management, renewable energy and street lighting programs for the City of San Francisco.

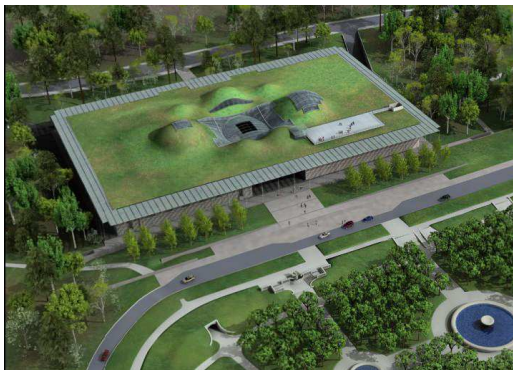
- According to the City of San Francisco, the building sector consumes 45% of energy consumption. Under the Clean Air Act, the City resolved to reduce net energy use in the commercial building sector by 2.5% per year and achieve zero net energy target by 2030 through energy efficiency and generation of clean energy.<sup>1</sup>
- The City has adopted the United States Green Building Council (USGBC) the "Leadership in Energy and Environmental Design" (LEED) standards which provide guidelines and a rating system for green buildings. The rating system is classified as Platinum, Gold and Silver certification.
- San Francisco's private sector green building requirements are the most stringent in the country and by 2012 all new commercial construction over 2,500 m<sup>2</sup> must be certified LEED Gold by the US Green Building Council.<sup>2</sup>
- The concept of green roof or living roof is becoming more popular in the City and many commercial buildings have green roofs or in process of having green roofs which provides significant environmental benefits.
- Currently, use of rainwater is not allowed for storage including toilet flushing and watering plants. For the City, the water conservation is not a top priority and there are no major programs to save water.
- The City of San Francisco has 36 municipal green building projects that are in varying stages of obtaining LEED certifications from USGBC. The total project cost is more than \$3.2 billion with the area of 457,709 m<sup>2</sup>. The project will certify 5 Platinum, 15 Gold and 16 Silver LEED ratings for various council buildings.
- A visit to San Francisco Hospital was made. The new hospital, which is an extension of the existing hospital, will have a LEED Gold rating including green roof. The following figures below highlight the green buildings:



**Figure 1 - San Francisco City Building**



**Figure 2 - San Francisco Hospital**



**Figure 3 - California Academy of Sciences**



**Figure 4 - San Francisco History Museum**

- In the City, all the runoff from stormwater is combined with the sewer system. This means that when it rains, the sewers are flooded with peak volumes of runoff. The combination of sewage and stormwater overwhelms the sewer system and flows into the bay. In order to minimise the incidence of overflow, the city is now implementing a project, “4 miles replacement of sewerage” line per year for 200 years.<sup>3</sup>
- San Francisco City embraced a “zero waste” goal by 2020 and an interim 75% diversion goal by 2010. It is estimated that 90% of the city’s municipal solid waste could be recycled and composted under its existing infrastructure and programme. The average waste generated per person in the city is about 927 Kilograms per year which is significantly higher (566Kilogram) in comparison to Australia.<sup>4</sup>
- San Francisco City introduced a three bin systems “Fantastic Three” for disposal of waste, recycling and green organic to reduce waste going to landfill. It is to be noted that the City has no landfill and all the collected waste is transported to another state for land filling. Manual handling is commonly used for waste collection from residential, commercial and public places.
- One of the methods introduced by the City, “pay as you throw trash” or unit price mechanism for collection and disposal of waste has been proven to increase recycling and reduce the amount of waste disposed.
- San Francisco is responsible for about 9.7 million tonnes of greenhouse gas emissions per year and has now committed to an emission reduction goal of 20% below 1990 levels by 2012. The City has committed to implement a renewable energy program including solar, wind and biomass technologies.<sup>5</sup>

- Many City buildings have installed small scale solar power systems. These buildings include schools, libraries, health facilities, police and fire stations. These sites have high educational value, high visibility in the surrounding neighbourhood and are therefore valuable as demonstration sites.
- San Francisco promotes and provides new subsidies and tax incentives to residents and commercial properties for installation of a solar power system. The City incentives are up to \$4,000 for residents and \$10,000 for commercial properties. The Federal Government also provide tax credits of up to 30% of the cost of solar system and the State Government provides the up front incentive payment based on expected performance of the solar system.
- One of the programs being implemented by the City is to develop solar energy champions in neighbourhoods. The City provides training for the interested citizens and they help spread the word about solar energy in the community. This program encourages residents to take up a solar power program and minimise the environmental impact.
- San Francisco is in the process of changing all public lightings to energy efficient lighting including LED technology. The city is expected to reduce its greenhouse gas emissions by more than 50% from the street lightings.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. The benefits of building green include cost savings attributed to reduce energy, water, waste, low operations and maintenance costs hence enhancement of occupant's productivity and health. Table 1 shows that the total financial benefits of green buildings are over 10 times the average initial investment required to design and construct a green building.<sup>6</sup> In Victoria, the Melbourne City Council 6 star green building CH2 has well established the environmental and productivity benefits as provided in an independent report prepared by CSIRO in March 2008.

**Table 1- Green Building Benefits per square metre**

Category	20 Year Net present value
Energy Savings	\$62
Emissions Savings	\$13
Water Savings	\$5
Operation and Maintenance Savings	\$91
Productivity and Health Benefits	\$397
<b>Sub - total</b>	<b>\$569</b>
Avg. extra cost of building green	\$54
<b>Total 20 year Net benefit</b>	<b>\$516</b>

2. Green roofs provide many environmental and health benefits such as improved air quality, storm water quality and quantity, reduced heat load, reduced greenhouse gas emissions and added biodiversity and create habitat in the urban environment.
3. Local Governments should lead by example and demonstrate environmental consciousness in all its operations, including existing and new buildings, achieving a high level of green building standards such as the LEED ratings.
4. All communities are interested in renewable energy technology to protect their environment and expect local government to play a leadership role in promoting renewable energy. Local Government can form a partnership with their



communities to develop community climate change champions to promote renewable energy technology and sustainable living.

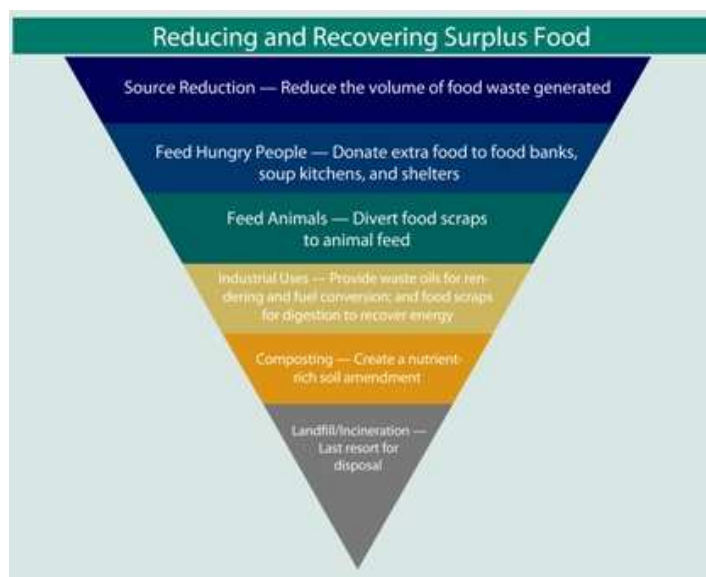
5. A zero waste approach is one of the fastest, cheapest and most effective strategies one can use to protect the environment. Food and organic waste to landfill is a significant issue and it should be minimised on an urgent basis. Organic waste in landfill generates methane gas which is very harmful. Table 2 presents the amount of food waste per capita and its impact of greenhouse gas emissions.<sup>7</sup>

**Table 2 – Food Waste per Capita and Greenhouse Emissions**

Country/State	Food Waste MT/Year	Food waste-\$Billion	Food waste per capita - Kg	GHG Emissions MT/Year
US	45.30	\$100	146	172
UK	8.30	\$10	134	32
Canada	7.00	\$15	210	38
Australia	3.00	\$5.2	134	11
Victoria	0.70	\$1.2	140	2.6

*Note:- MT – Million Tonne, KG - Kilograms*

6. Food waste should be minimised using the following hierarchy:<sup>7</sup>
  - **Feed the hungry community:** Donate extra food to various charitable organisations.
  - **Feed animals:** Divert food scraps to animal feed.
  - **Industrial use:** Use waste oils for fuel conversion/renewable energy.
  - **Composting:** Create a nutrient rich soil amendment.
  - **Landfill:** Last resort for disposal.



**Figure 5 - Food waste minimisation hierarchy**

7. To make the kerbside waste management system fair and equitable for households, “pay as you throw” or a user pay system or a unit price of waste by weight or volume approach could significantly reduce waste to landfill.
8. Energy efficient public lighting has the potential to reduce greenhouse gas emissions by more than 60%. Generally, public lightings represent 35-40% of greenhouse gas emissions from Victorian council operations.

## 2.2 City of Napa, USA

**About City of Napa** - Napa is a principal city of the Napa County in the state of California. The city has a total population of 72,585. The area was settled in the 1830s. It was incorporated as a city in 1872. The area grows some of the finest wines in the USA.

Compared with many other California cities, the City of Napa is less impacted by the economic downturn. The City budget is US \$65 Million which covers a wide of services including infrastructure, public safety, road repairs, long term planning for housing and climate change programs. Currently, the priority of the city is the “Napa Flood Project” which received the stimulus funds. The project will not only protect the community from the flood but also strengthen the local economy and preserve the Napa River.

**Environmental and Climate Change Initiatives** – The following are my observations relating to green buildings including green roof, storm water issues, waste management, renewable energy and street lighting at the City of Napa.

- The City of Napa uses the Leadership in Energy and Environmental Design (LEED) ratings to improve the performance of buildings.
- More than half of Napa's potable water is used for outdoor activities and the majority of that water is wasted in overwatering lawns and gardens. The City encourages their residents to save water by selecting appropriate plants, mulching and frequently adjusting irrigation.
- The City offers incentives to replace natural lawns with water-efficient landscaping. It offers 50 cents per square foot to replace eligible lawn areas with low-water-use, climate-appropriate plants or artificial grass. Maximum rebate is \$500 for a residential property and \$2,500 for multi- story/commercial properties.<sup>8</sup>



**Photo 1 - Landscaping - Lawn**

- The City offers an annual water wise landscaping workshop for residents interested in saving on water bills while beautifying their properties.
- The City of Napa offers a free service to help residents and commercial properties save water and reduce their water bills. The City employs a water expert who visits homes and businesses to check leaks, toilet flush volumes, showerhead flow rates, irrigation system and appliances. The city also provides free water saving fixtures and advice.
- The City of Napa also offers \$100 rebate on water and energy efficient clothes washers and changing the toilet flushing system from 16 to 4.6 Litres per flush.
- Under the Napa Municipal code, all new developments completely offset its water requirements by installing ultra low flush toilets which use no more than 1.6 Gallons (7.4 Lit per flush) which must meet performance standards established by the American Society of Mechanical Engineers Standards.<sup>9</sup>

- The City is at the forefront of recycling and is achieving more than a 50% recycling rate from its kerbside garbage collection service. The City has a three bin system and residents are required to pay for their garbage collection service depending on the size of the bin they choose but not for the recycling and green waste bin collection service. Residents are required to pay monthly bills to a contractor not the City council.
- Residents are encouraged to downsize their bin size to minimise the disposal cost. The garbage bin size is 20, 35, 65 and 95 gallons (92, 160, 300 and 435 Litres). The garbage charge rate is based on the size of the bin residents prefer.
- About two years ago, the City introduced the three bin system, previously a single bin system. The introduction of a three bin system put additional burden on local road repairs and maintenance budget which increased three fold.
- It is compulsory to recycle during major events and event organisers are required to demonstrate how much waste was generated and the quantity of waste recycled. One major incentive is that organisers need to pay only for garbage disposal and recycling is free. The City of Napa also organises free of charge e-waste and motor oil collections.
- For street lighting, the City conducted some trials with LED technology and all traffic lights have been replaced with LED technology.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. It is important to save water from outdoor activities by understanding the basic principles of water wise landscaping and irrigation scheduling
2. Consider alternatives to lawn such as low meadow, drought tolerant plants, artificial grass and any other options which avoid lawn mowing and use of pesticides or weed killer. This could save money (by not using a lawn mower and water) and greenhouse gas emissions. The green lawns culture in the USA is becoming "out of fashion". According to article published in USA Today, 17/8/2010, lawn care data USA is:<sup>10</sup>
  - Lawn area in USA = 21 Million acres
  - Use of pesticides = 74 Million pounds or 34 Million Kilograms to control weeds
  - Water irrigation = 45,000 Litres per year per lawn on top of rainwater
  - Use of fuel for lawn = Not available + impact on greenhouse gas emissions
  - Time required = 1.6 hours including garden care (always short supply)
  - Money saving = about \$60 per month per home due to water saving alone
3. Residents and commercial properties should be offered incentives such as water saving rebates, information and education sessions to save water.
4. To minimise the contamination in the recycling stream, community education and information is vital and some times "face to face" meetings between the recycling company and residents is required to ensure the recycling bin is not contaminated.
5. At all major events, recycling should be made mandatory and event organisers should be given incentives for recycling. This can promote benefits of recycling in the community.

## 2.3 City of Toronto, Canada

**About City of Toronto** - Toronto is the largest city in Canada and the provincial capital of Ontario. It is located in Southern Ontario on the northwestern shore of Lake Ontario. With over 2.5 million residents, it is the most populous municipality in Canada. Toronto is one of the top financial centers in the world.

Toronto City Council consists of the Mayor and 44 City Councillors, one representing each of the city's wards. The Council is the main governing and legislative body for the city. City councillors also sit on committees and on community councils in the area where they have been elected. The Toronto City Council approved a 2010 operating budget of \$9.2 Billion. The budget reflects the 24-hour / seven-day role that City government plays in protecting residents and delivering services.

The City has committed to take actions against climate change by implementing the climate change and clean air action plan and Toronto's sustainable energy plan. The plans have received support from the public, environment groups, industry and academic experts. The City has planned to use more than \$1 Billion for such implementation actions.

**Environmental and Climate Change Initiatives-** Followings are my observations relating to green buildings, storm water issues, waste management and renewable energy at the City of Toronto.

- Toronto has a long history of leadership on climate change. The City retrofits program has carried out \$30 million worth of energy related projects in the city facilities. The City is also using the LEED rating system to improve the performance of the buildings.<sup>11</sup>
- The City will spend over \$1billion over the next 10 years to undertake various projects to reduce greenhouse gas emissions under the Climate Change, Clean Air and Sustainable Energy Action Plan.
- One of the innovative programs the City has implemented is deep lake water cooling for heating and cooling of the Council building.
- The City provides incentives to developers to achieve green standards. Under the standard, Tier-1 and Tier-2 require a minimum of 25% and 35% energy efficiency improvement over and above the model National Energy Code for all new buildings. The program offers financial incentives and a refund of 20% of the development charges paid for Tier-2 buildings.<sup>12</sup>
- The City provides incentives to residents under the Home Energy Assistance Toronto (HEAT) program. The offer is \$1,000 for new insulation and improves home energy & water efficiencies.<sup>13</sup>
- The City also offers a free "Live green Toronto membership card" to its residents to help the community to shop green and live green.
- Toronto is the first City in Canada to have a bylaw requiring and governing the construction of green roofs for all residential, commercial and industrial development. This has been effective from Jan 2010.<sup>14</sup>



**Photo 2 - Toronto City Council Building**



**Photo 3 - Green Roof (Toronto City Council)**



**Photo 4 - Green Roof (Toronto City Council)**

- The majority of the water quality improvement program was limited to decreasing stormwater runoff by increasing street tree planting. The City set the target to increase the tree canopy from 17% to 34% by 2050.<sup>11</sup>
- The City of Toronto achieved 44% residential waste diversion in 2009 with total waste collected from households = 834,270 tonne, waste to landfill = 470,379 tonne and recycling = 363,891 tonne.<sup>15</sup>
- The recycling includes comingled recycling, green waste, free collection days at the depot, hard waste, hazardous chemicals, electronic and deposit return and stewardship program. The actual diversion rate would have been 46% but it could not be achieved due to 39 days of labour disruption.
- There is no dedicated hard waste collection service for residents and hard waste is collected during normal kerbside collection service.
- The City also runs a “Cut it Out Toronto” program. Under the program, residents are encouraged to drop off their lawn mower or trimmer at one of the tyre stores and get a \$25 bonus card.
- The City discourages residents from using biodegradable plastic packaging/bags in their recycling or green waste bins as it creates a problem during the separation process.
- The City has plans to make Toronto a leader in local renewable energy production including solar, wind, landfill gas and geothermal. Under the Toronto Atmospheric

Fund, the City is working on wind, solar, hydrogen and tri-generation facilities at various buildings.

- The City has adopted a climate change adaptation strategy for both city services and the larger Toronto community. It is designed to help protect the health of Torontonians, introduce measures to strengthen infrastructure and building stock, help protect the natural environment from the negative effects of climate change and support a resilient economy.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. In a sustainable city, a clean green environment goes hand in hand with strong community engagement, a thriving economy and access and opportunity for all communities.
2. To promote building green standards, developers should be provided with financial incentives. The green development standards could assist developers to achieve a set of performance targets for the design and construction of new buildings. The standards increase energy efficiency of buildings, reduce greenhouse gas emissions, reduce the urban heat load, conserve water, reduce stormwater runoff and enhance neighbourhood green space.
3. To decrease stormwater runoff by increasing tree canopy cover in parkland and open space will not only assist with a clean and green image of the area but also reduce greenhouse gas emissions and reduce use of fossil fuels for maintenance of cut grass.
4. The climate change strategy has two broad complementary strategies – mitigation and adaptation. Mitigation has been called “the globally responsible thing to do” which focuses on actions which reduce greenhouse gas emissions that contribute to climate change. Adaptation has been “the locally responsible thing to do”. It focuses on actions that minimise or prevent the negative impacts of unavoidable climate change. Therefore, both mitigation and adaptation go hand in hand in development of climate change strategy as shown in the diagram below.



**Figure 6 - Climate change mitigation and adaptation model**

## 2.4 The City of Waterloo, Canada

**About City of Waterloo** - Waterloo is a city in Southern Ontario, Canada. It is the smallest of the three cities in the Regional Municipality of Waterloo. The reported population for the city can vary depending on how temporary residents at Waterloo's two universities are counted. At the time of the 2006 census, Waterloo had a population of 97,475. The city is famous for the manufacture of BlackBerry smart phones used by millions of people around the world.

Waterloo city council consists of seven councilors, each representing a ward. The City is responsible for fire protection, libraries, parks and recreation, and secondary streets. Many municipal services are provided through the Regional Municipality of Waterloo (often referred to as Waterloo Region or the Region of Waterloo). Regional responsibilities include social welfare, community health, and policing through the Waterloo Regional Police Service.

The City of Waterloo is committed to demonstrating leadership in healthy and safe community, economic vitality, environment and partnership and collaborations.

**Environmental and Climate Change Initiatives** – The following are my observations relating to green buildings including green roof, storm water issues, waste management, and renewable energy at the City of Waterloo.

- The City of Waterloo has resolved that all public buildings designed and built in the city must meet a minimum of LEED silver requirements and develop a green building policy.
- The region has adopted an environmental sustainability strategy which states that the region will embrace environmental consideration in its entire decision making and will foster community stewardship of the natural environment.
- The region of Waterloo consumes on average of 132,000MWh of electricity and 8,000,000 cubic metres of natural gas per annum to operate its facilities such as administrative buildings, childcare centres, medical centres, libraries, police stations, senior citizen centres, traffic signals, water services and regional airport. The City has planned to reduce greenhouse gas emissions using solar PV, solar thermal and geothermal technology.<sup>16</sup>
- A visit to the Grey Silo Golf Course was made. The golf course presents golfers with 18 holes of championship golf. The golf course has gained an outstanding reputation and respect from players for its environmental considerations. The golf course uses stormwater for irrigation and encourages various habitat growths.



*Photo 5 - Waterloo – Grey Silo Golf Course*

- The City is promoting water efficiency programs for the region which includes a toilet replacement program, outdoor water conservation programs, water conservation by laws, public education and teacher's curriculum, water conservation studies and a water efficient technologies (WET) program for business.
- The City has achieved more than 50% residential waste diversion using a three bin system for collection of waste. Waste bins are picked up manually by a driver. Manual handling may be an issue but more emphasis is given on community education to improve recycling and minimise contamination in recycling bins.
- The City works with regional councils to collect and dispose of waste from the residents and business. This program was joined by seven councils – city of Cambridge, City of Kitchener, City of Waterloo, North Dumfries Township, Wellesley Township, Wilmont Township and Woolwich Township.
- The City also organises a household chemical collection to protect the environment. The program is similar to Sustainability Victoria's "Detox your Home" program.
- The City is moving towards wind energy to reduce greenhouse gas emissions. The city has formed a partnership between the regions of Waterloo and the University of Waterloo, for the installation of two wind towers to measure the wind regime. The wind data will be collected to work out viability of a wind power system.
- The city runs an ECOFest event ever year which is an interactive community program full of fun, learning, music and a variety of exhibitors that deliver environmental products and services throughout the region.
- The City also runs annual autumn leaf collection program to minimise green organic waste entering stormwater system and keep the households clean and tidy. The program runs for about four weeks.
- The City is receiving millions of dollars from the provincial and federal governments' economic stimulus funds to help get shovel-ready projects off the ground including climate change action projects.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. Local government should run events on a regular basis to educate and motivate the public to take action to lessen their impact on the environment. It could cover energy conservation, renewable energy, water conservation, travel wise, clean air, eat local food, grow locally and waste minimisation.
2. To promote building green standards, developers should be provided with a financial incentive. The green development standards could assist developers to achieve a set of performance targets for the design and construction of new developments. The standards could increase energy efficiency of buildings, reduce greenhouse gas emissions, reduce the urban heat island, conserve water, reduce stormwater runoff and enhance neighbourhood green space.
3. Regional approach for waste collection and disposal provides the best environmental, social and economical outcomes for the community, instead of single councils.



## **2.5 Medford City Council, USA**

**Medford City Council-** Medford is a city in Middlesex County, Massachusetts, in the United States, on the Mystic River, five miles northwest of downtown Boston. In the 2000 census, Medford's population was 55,765. It is the home of Tufts University. The song "jingle bells" originated from Medford.

The City budget is \$123 Million which includes Municipal budget of \$81 Million and School budget of \$42 Million. The City supports the school education and the climate change programs.

**Environmental and Climate Change Initiatives-** The followings are my observations relating to renewable energy and the schools program at the City of Medford.

- In February 2009, the Energy and Environment Office of Medford City Council and the Medford Clean Energy Committee installed a 100 KW wind turbine at McGlynn and Andrews School complex as part of Medford Energy Independence project. The total cost of the project was \$645,490 with a payback of 10 years.<sup>17</sup>



*Photo 6 - Wind power*



*Photo 7- Medford Mayor with MEFV team*

- The wind power system provides a valuable interactive educational tool to more than 2000 students who attend the above school and also provides the city with a leadership role in encouraging other municipalities in prompting renewable energy projects.
- The City has implemented a number of actions to conserve energy in municipal buildings in accordance with the Medford Climate Action Plan.
- The wind power project at the school promotes an energy independence theme and is a highly visible symbol of Medford's commitments to renewable energy.
- The City has also joined the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection campaign similar to many Australian Councils.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. Local schools can play an important role in prompting renewable energy in the community.
2. Local Government should assist and provide resources to develop and implement environmental programs including water and energy efficiency projects, recycling collections, large scale composting and litter reduction.

## 2.6 Cambridgeshire County Council, UK

**About Cambridgeshire-** Cambridgeshire County Council was first formed in 1889 as a result of the Local Government Act 1888, as one of two county councils covering Cambridgeshire; the other was the Isle of Ely County Council. In 1965 the two councils were merged to form Cambridgeshire and Isle of Ely County Council.

Cambridgeshire County Council is the county council of Cambridgeshire, England. The council currently consists of 69 councillors, representing 60 electoral divisions. The Conservative Party has a majority on the council, having gained control in the 1997 local elections. Council is committed to reduce waste and improve recycling practices.

The Council has recognised that climate change will bring hotter, drier summers; warmer, wetter winters; more storms and downpours. Therefore, Council is now implementing a program to minimise the impact of climate change.

**Environmental and Climate Change Initiatives-** The following are my observations relating to green buildings including green roof, storm water issues, waste management, renewable energy and street lighting at the Cambridgeshire.

- Council is working on a program to ensure all new council buildings and major refurbishment projects, especially schools, are energy efficient and resilient to climate change and make progress towards carbon zero public buildings by 2018 and carbon zero schools by 2016.<sup>18</sup>
- Council is also working on staff environmental behaviour change, increased office recycling, purchasing green products, an e- induction training program, reducing business and commuter mileage and minimisation of energy use.
- The Waste Management Service at the County Council works together with its partners to provide cost effective, environmentally responsible waste management for Cambridgeshire's communities. The following figures are for waste management in Cambridgeshire for 2008/2009:<sup>19</sup>
  - Total household waste produced: 293,081 tonnes
  - Household waste produced per capita: 497.1 kg
  - Percentage of household waste recycled or composted: 51.36%
  - Household waste landfilled per household: 569.5 kg
  - Cost of waste management - £20 million per annum. Landfilling waste currently costs £40 per tonne and is going up by £8 per tonne annually. These rising costs strengthen the argument for diverting more waste from landfill through waste prevention, re-use, recycling and composting.
- The centre piece of the waste contract is a Mechanical Biological Treatment (MBT) plant, opened in Autumn 2009 and fully operational by 2010. This plant will sort "black bag rubbish", removing resources like metals, glass and plastics for recycling, before treating the remaining waste biologically to produce a compost-like material.



**Photo 8 - Cambridgeshire – MBT plants**



**Photo 9 - MBT Plant & Machinery**



**Photo 10 - MBT Plant & Machinery in operation**

- Last year, the County Council signed a £730 million Waste PFI contract with local company Donarbon Waste Management Ltd, to help meet challenging landfill diversion targets by composting and recycling thousands of tonnes of waste. This 28-year contract will allow them to use the latest technology to manage waste from Cambridgeshire's growing population.<sup>19</sup>
- New MBT plant is not seen as an alternative to recycling as recycling is collected by a kerbside waste collection service. The plant deals with the waste that is left over after reduced, re-used and recycled.
- A purpose built education centre has been developed alongside the MBT plant for schools and community groups.
- Currently, Cambridgeshire recycle 51% of waste. However, there is potential to recycle more by community education and a behavioural change program.
- The re-use and recycling of waste electrical and electronic equipment (WEEE) is essential as it is a growing waste type and often contains a significant amount of hazardous material. In 2008, the County Council collected 3,774 tonnes of this material including mobile phones, fridges and TVs.<sup>20</sup>
- Council is in the process of changing 60,000 street lights as 44,000 lights in the County are at or beyond the design life of 25 years. The project started in April

2010 and is expected to be completed within 5 years. As part of the street lighting replacement program, the council will be installing energy efficient lamps first followed by LED technology when it becomes economical.<sup>21</sup>

- Government offers private finance initiative (PFI) credits as additional funding to address the backlog to all councils whose business case is approved by Treasury.
- One of the innovations being introduced for street lighting is to turn off the lights from 12.00 midnight to 4.00am to achieve higher energy savings. This initiative has been supported by a major independent survey to ensure community safety is not compromised.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. Local Government should set the target to become carbon zero for its own buildings. It is possible to achieve zero carbon, zero waste and zero net emissions.
2. Mechanical separation and biological treatment of waste is now feasible and it can significantly reduce organic waste going to landfill.
3. Private Finance Initiative credits to fund environmental projects can achieve a win - win outcome for both government and community.
4. Use of efficient street light technology and reducing the operation hours without compromising the community safety can achieve zero greenhouse emissions reduction targets. For example, Table 3 highlights how zero emission targets can be achieved in Baw Baw Shire and Victoria from street lighting.

**Table 3- Street lighting zero emissions target** <sup>22</sup>

	Baw Baw Shire	Victoria	Australia
<b>No of street lights – 80W</b>	2,430	330,000	1,360,000
<b>GHG emissions – tonne /annum</b>	<b>924</b>	<b>132,000</b>	<b>537,000</b>
<b>1. GHG Reduction - 10% Green Power</b>	92	13,200	53,700
<b>2. GHG Reduction – Replace lights</b>	554	79,200	322,200
<b>3. GHG Reduction – Reduce hours</b>	277	39,600	161,100
<b>GHG Reduction per annum 1+2+3</b>	<b>-924</b>	<b>-132,000</b>	<b>-537,000</b>



**Photo 11 - Sustainable - Street Lighting**



**Photo 12 - LED - Street Lighting**

## **2.7 Leicestershire County Council, UK**

**About Leicestershire County** - Leicestershire is the county council for the English non-metropolitan county of Leicestershire. It was originally formed in 1889 by the Local Government Act 1888. Leicestershire has three tiers of local government. These tiers are the county council, seven district or borough councils and parish councils.

Leicestershire County Council provides a wide range of services to over 600,000 local people. The council has 55 members and the political composition of the council is 36 Conservatives, 14 Liberal Democrats, 4 Labour and 1 BNP. The County Council has had its current administrative boundaries since 1997, when Leicester City and Rutland both became unitary authorities.

**Environmental and Climate Change Initiatives-** The following are my observations relating to green buildings including green roof, storm water issues, waste management, renewable energy and street lighting at Leicestershire County.

- The Council has prepared a carbon management plan to reduce greenhouse gas emissions from council buildings and make them more sustainable.<sup>23</sup>
- The Council has recognised that saving water is important because there is limited supply and shortages in many parts of the UK. The Council is providing tips and information on saving water to residents and business.
- It is estimated that every Leicestershire household throws away between \$10 -\$15 of food each week or \$30,000 to \$50,000 in a lifetime. The Council is promoting the "Love Food Hate Waste" campaign to minimise the food waste and also provide information on some easy ways to make the most of our food.<sup>24</sup>
- Leicestershire residents currently recycle, compost and reuse 52% of household waste, making Leicestershire the best performing county area nationally. The council has committed to reaching a recycling and composting rate of 58% by 2010 and is encouraging residents to reduce, reuse, recycle and compost waste.
- The Council is also selling compost bins at subsidised rates and provides information on how to make successful composting.<sup>25</sup>
- The Council is also working on a Mechanical Biological Treatment (MBT) plant similar to Cambridgeshire.
- The Council is encouraging residents to use and generate renewable energy such as wind, solar, solar thermal and biomass.
- For street lighting, the Council is working on a similar program as being implemented by Cambridgeshire.

**Key Learning Outcomes-** The following are my key learning outcomes:

1. Saving water is important in order to avoid future shortages.
2. Food waste is a huge area of concern for all developed counties. Minimisation of food waste should be a top priority for all levels of government. This will not only save cost but reduce impact on our environment. Consider the use of fertiliser, soil health, transport and whole life cycle analysis of food waste.

### **3. Boston Congress – 2010 APWA Congress & Exposition, US**

**About APWA Congress-** The 2010 APWA International Public Works Congress held from 15 -18 August 2010 in Boston, Massachusetts, was attended by more than 8,500 delegates from 19 countries. The Congress conducted a number of interactive sessions. The Congress also organised an Exposition which was represented by 650 exhibitors. The exposition provided an opportunity to see cutting edge information on products or services addressing the needs of the public works industry.

**Sessions of interest** - I attended a range of sessions for my personal and professional development, and some of them are highlighted below:

- Leadership in changing times;
- Mastering the power of change;
- Revolutionizing fleet and facilities operations for sustainability;
- How to conserve fuel, save money, reduce carbon for free;
- Solar systems- providing more than just electricity;
- Innovative approaches for sustainable energy management;
- Cash in trash;
- Emerging trends in solid waste; and
- What I learned on summer vacation – water management challenges in Australia.

All the above sessions were very informative, however one session – “What I learned on summer vacation – water management challenges in Australia” impressed me the most. The session presenter was Catherine Chertudi, Public Works Department, City of Boise, USA. She highlighted the Australian leadership position on water conservation issues and shared her experience in meeting with Victorian Councils – Mornington Peninsula Council and Baw Baw Shire Council. She also shared her experience working with Jindivick Primary school’s solar program, carbon neutral school target, bush fire recovery program and the Labertouche community.

One of my observations in USA and Canada is that there is no switch to plug point. It means the stand by power for appliances such as computers and electronic goods remain on which is a huge waste of power.

One of the exhibitors, HDR Limited, designs & commissions an array of solar panels on top of geo-membrane for closed landfill sites which help protect the environment and also generate revenue in the form of renewable energy – methane gas and solar energy generation. It means a closed landfill has the potential to generate renewable energy from both methane gas and solar system. The concept can reduce greenhouse gas emissions and create economic benefits.



*Photo 13- Geo-membrane solar cap for landfill, US*

One of the innovative things I saw at Boson was the use of a solar compactor bin in the commercial area. Solar energy is used to compact the waste in the bin so that frequent emptying the bin is prevented. Refer to photo below.



**Photo 14 - Street bin with solar compactor**

A company Big Bags, USA has designed a flood barriers system which provides lightning fast flood protection at very low cost. As part of climate change risk control – flood barriers could assist in reducing loss of life, economic and property damage as well as agricultural losses.



**Photo 15- Big Bags USA (Flood Control Bags)**

During my stay at Washington DC for two days, I visited my old classmate's home and obtained his latest electricity and gas bills. After reading his bills and discussing his life style, I realised why the USA is one of highest generators of greenhouse emissions per capita. Table 4 highlights the greenhouse gas emissions from a typical home in Washington DC and the average consumption in my home and the Baw Baw Shire.

**Table 4- GHG emissions: Typical home in US and Baw Baw and my home<sup>26</sup>**

	<i>Washington DC – typical home</i>	<i>Baw Baw Shire – Avg home</i>	<i>My home</i>
<b>Electricity KWh per day</b>	<b>75</b>	<b>19</b>	<b>5</b>
<b>Gas use MJ per day</b>	<b>968</b>	<b>104</b>	<b>95</b>
<b>Electricity KWh per year</b>	<b>23,375</b>	<b>7,000</b>	<b>1825</b>
<b>Gas use MJ per year</b>	<b>353,600</b>	<b>38,000</b>	<b>34,675</b>
<b>GHG Emissions tonne/year</b>	<b>56</b>	<b>11</b>	<b>4.4</b>

In conclusion, the AWPW Congress and Exhibition was quite beneficial in terms of meeting and networking with the public works engineers from other countries, sharing information and how the local governments in those countries are meeting the challenge of climate change.

## 4. Recommendations

Local Government in Victoria can play a vital role in response to climate change and lead by example by implementing simple and practical actions to minimise the potential impact of climate change. I would like to offer simple and practical recommendations based on my key learning outcomes. I have also offered triple bottom line assessment - economic, social and environmental for these recommendations.

I will seek to progress these recommendations in my Council and promote them within other councils, community networks and relevant organisations.

1. As highlighted in Table1, the benefits of green buildings are over 10 times the average initial investment cost. Therefore all governments must lead by example to make their existing and new buildings more sustainable and achieve a five star rating.
2. Green roofs offer many environmental benefits and it is mandatory in Toronto for all new high rise residential and commercial buildings to have a green roof. Develop a green roof program for all new commercial buildings and offer financial incentives to developers for constructing green roofs.
3. Develop and train climate community champions in the local community to promote green living. Support individuals, community groups, business, climate change networks and other neighborhood agencies to take actions on energy efficiency, renewable energy, local food production/community gardens, water conservation, tree planting, sustainable lighting and the use of growing native trees.
4. To improve the quality of urban storm water, tree canopies in urban areas can play an important role. Establish the existing tree canopy in urban areas and develop partnerships with local community groups, schools and volunteers to expand tree canopy including maintenance and care of trees. This should be done in a reasonable timeframe.
5. Waste food has a big impact on climate change. The best way to reduce food waste is to educate the community about quick and easy ways to make the most out of food including such tips as freezing food, shopping habits and making the right amount of food. Run "Love Food Hate Waste" campaigns in the community.
6. A zero waste approach is one of the fastest, cheapest and most effective strategies to protect our environment. Landfilling of food scraps or organic waste should be stopped immediately to prevent direct emissions of methane gas from landfill. Methane gas is 72 times more potent than carbon dioxide over a 20 year time frame.
7. There will always be "rubbish" in our society, but how much of this becomes waste is a matter of choice. Use of proven and established technology such as mechanical and biological treatment of waste should be encouraged to minimise waste.
8. To bring equity and fairness in the kerbside waste collection and disposal system, local government should adopt "pay as you throw fees" or user pay system or unit price mechanism for residents. This mechanism will not only provide fair cost of waste to the household but also improve recycling.
9. Australia has been recognised as a world leader in water conservation and to enhance our leadership position, we need to come up with innovative ways of water saving. One of the ways is to phase out natural lawn from household properties and replace with artificial grass, meadow and veggie patches or drought resistance planting.



10. Local Government should encourage capacity building in the community to achieve innovative solutions to climate change issues. This is essential to re-orient the way we live and work and make Australia a sustainable society.
11. Develop renewable energy or climate change champions in neighborhoods whose role is to promote renewable energy and educate the community about sustainable living.
12. Local Government should use its landfill assets and infrastructure for productive purpose after the closure of the landfill. Consider renewable energy generation from methane gas as well solar power from landfill.
13. There is a potential to minimise public lighting greenhouse emissions to zero as highlighted in Table 4. Identify the barriers such as uptake of energy efficient technology, green power for public lighting, cost implications and community safety.
14. Local Government should recognise climate change is occurring and will have significant effects on its own operations and the community, especially vulnerable populations. Therefore, all local governments should develop and implement a climate change adaptation strategy including actions, budget costs and stakeholders consultations.
15. Support schools and provide resources to develop and implement environmental programs including water & energy efficiency, recycling collections, large scale composting and rainwater tanks.

**Triple Bottom Line Assessment** - Based on key learning outcomes, I offer triple bottom line assessment of the recommended actions:

**Economical-** Both council and the community will have an opportunity for local economic development in providing the goods and services required by the community to respond to climate change. This also fosters new technology and new investment.

For example, under the Melbourne's "City Switch" program, 1200 buildings will be retrofitted to make them more efficient and achieve 4.5 star ratings. The program will bring \$1.3 Million investment and 800 jobs in the green building sector. Similarly, street light program will bring \$120 Million investment and green jobs in Victoria under the Green light program. Food waste minimisation will save more than \$1.2 Billion per annum and improve recycling rates.

**Social-** These programs have the opportunity to create a number of green jobs and develop community champions to promote sustainable living in the community. Engaging the community in climate change adaptation issues can not only minimise the risk but also provides a variety of positive social and other wellbeing outcomes.

**Environmental-** The recommended actions will contribute to positive environmental outcomes in terms of reduction in greenhouse gas emissions from sustainable green buildings including green roofs, renewable energy, recycling of waste and use of efficient technology for public lighting.

For example, under the Melbourne's "City Switch" program, it is expected that 700,000 tonnes of greenhouse gas emissions per annum will be reduced. Similarly, street light program will save 132,000 tonne of greenhouse gas emissions per annum and food waste minimisation can save 2.6 Million tonne of greenhouse emissions per annum. There are a number of environmental benefits that can be achieved from water conservation and renewable energy programs.

## 5. Conclusion

Local Governments have an important role to play in minimising and adapting to climate change by taking simple and meaningful actions. Local Government must lead by example and assist communities to adopt green building standards, reduce waste to landfill, save water and promote renewable energy technology.

MEFV has played an important role by sponsoring local government engineers to undertake overseas study tours and I am sure all the participants gained significant personal and professional benefits from the exposure to these countries. I am also confident that all participants will not only seek to implement their recommendations in their Councils but also assist their communities to improve standard of living.

I would suggest all tour participants to encourage their colleagues working in the public works engineering services to apply for the future Municipal Engineering Foundation Victoria overseas study tours positions and attend the APWA Congress in USA. The overseas tour not only provides benefits to the individual but also assist the local government industry and the community to meet the challenges of the future.

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