ENVIRONMENTAL PLANNING & CLIMATE PROTECTION DEPARTMENT

ENERGY OFFICE
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Title: Durban Climate Change Strategy
Sustainable Energy Theme Report: Draft for Public Comment

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The Durban Climate Change Strategy (DCCS) project is funded and lead by the Environmental Planning and Climate Protection Department (EPCPD) and the Energy Office (EO) of eThekwini Municipality.

The EPCPD and EO have commissioned Urban Earth in association with FutureWorks! to assist in the implementation of the project.

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Introduction

The Environmental Planning and Climate Protection Department (EPCPD) and the Energy Office (EO) of eThekwini Municipality have commissioned Urban Earth, in association with FutureWorks!, to develop a city-wide climate change adaptation and mitigation strategy for Durban[1] through an inclusive and participatory process entitled the Durban Climate Change Strategy (DCCS).

During the initial consultation phases of the project seven key themes were identified for the strategy:

1. Biodiversity
2. Health
3. Food Security
4. Water
5. Sustainable Energy
6. Transport
7. Waste and Pollution

Separate public workshops were hosted for each theme to secure stakeholder input on the aims and strategies for each of the themes which will form the basis for the final content of the Durban Climate Change Strategy. In addition seven technical experts were procured by EPCPD and EO to provide expert technical advice on each of themes.

Section one and two of this report provides a summary of the sustainable energy and climate change context for Durban based on an introductory technical report from technical expert Megan Euston-Brown of Sustainable Energy Africa (SEA). The introductory technical report is available for download on the DCCS website. Sections three and four, which outline a vision, aim and strategies for the sustainable energy theme, are based on both the input provided by stakeholders at the energy theme working group meeting held on 7 November 2013 and recommendations by technical expert Megan Euston-Brown. The minutes of the working group meeting can be found in Appendix One of this document.

Interested stakeholders are invited to submit online comments on the report. Comments will be presented at a follow up sustainable energy theme meeting for stakeholders that will be held in 2014. Following that meeting, amendments will be made to the theme report. The sustainable energy theme report will then be combined with the reports from other themes to form a draft climate change strategy document that will also be distributed for comment.

[1]Including the eThekwini Municipal Area.

Section One: Current Status of Sustainable Energy

The energy sector is substantial and lies at the heart of the economy and of society. Energy consumption within the eThekwini Municipal Area contributes some 4.5% to total energy consumption in the country (SEA, 2011). This energy is almost all fossil fuel derived, with high levels of associated carbon emissions. An energy transition involving a significant reduction in fossil fuel consumption is complex. In order to align with levels of emissions 'required by science' to curb catastrophic climate impacts, emissions in Durban would need to be halved from a 'business as usual' growth scenario by 2030 (SEA, 2013).

Table 1: Key sustainable energy indicators and statistics for Durban

Economy	**Indicator**	**Data source**[2]
Total energy demand	191,013,550 GJ	SEA 2013
Energy intensity	1.1 GJ/GVA	GVA: Global Insight, 2013
Environment (global)		
Total energy-related GHG emissions (excl. waste and AFOLU and industrial coal data)	22,952,076 tCO_2e	SEA 2013
Emissions intensity per capita	6.7 tCO_2/capita	SEA, 2013; StatsSA Census 2011
Emissions intensity per unit of economic production	0.1 tCO_2/GVA	GVA: Global Insight, 2013
Renewable energy as share total energy (%)	0.09%	EThekwini GHGEI 2010 source data
Renewable-source electricity as share total electricity consumption	0.4%	eThekwini GHGEI 2010 source data
Renewable-source electricity as share total municipal 'own' electricity consumption	14%	SEA 2013, drawn from GHGEI 2010 source data
Public transport as share of all passenger-km	57%	EThekwini Transport Authority, June 2012
Population density	1,502 persons/km^2	StatsSA, census 2011
Society		
Household access to modern energy (lighting as proxy for electrification)	89.9%	StatsSA, census 2011
Households using 'clean and safe' fuels for cooking (electricity, LPG)	73%	StatsSA, census 2011
Total number households without formal electricity connection	265,000-317,000 households	Municipal Dwelling Count , from eThekwini Electricity Department, 2012
Access to household energy subsidy: total number of households claiming FBE grant (2011/12)	75,000[3] households	Ethekwini Electricity Annual Report 2011-12
Percentage 'extreme indigent' households (income below R 4,800/annum) claiming Free Basic Electricity (FBE) grant	37%	EThekwini Electricity Department Annual Report 2012-2013, StatsSA census 2011

[2] Refer to Appendix Two for data sources

[3] EThekwini Electricity (2012), *Annual Report 2011/12*, Durban. Actual claims for FBE vary month to month, the annual average for 2011/12 is 75,000, increasing from just under 65,000 in the preceding two years.

Percentage 'poor' households (income below R 194,600/annum) claiming Free Basic Electricity (FBE) grant	28%	EThekwini Electricity Department Annual Report 2012-2013, StatsSA census 2011
Energy burden: portion of household income spent on energy amongst the poorest residents	Range 6.4-20%	Independent research: Knox
Non-motorised transport (NMT) as portion total mobility: population that walk/cycle to school or work	39%	StatsSA, Census 2001

Energy demand

A demand-led approach to energy analysis and planning provides an opportunity to identify sector trends and local opportunities for sustainable energy development. Energy consumption in Durban is dominated by the transport sector (69%),[4] followed by the industrial (14%), residential (8%) and commercial (7%) sectors. Local government 'own consumption' and electricity distribution losses account for 1% each of total energy demand. This pattern broadly resembles the pattern seen in other South African metropolitan municipalities.

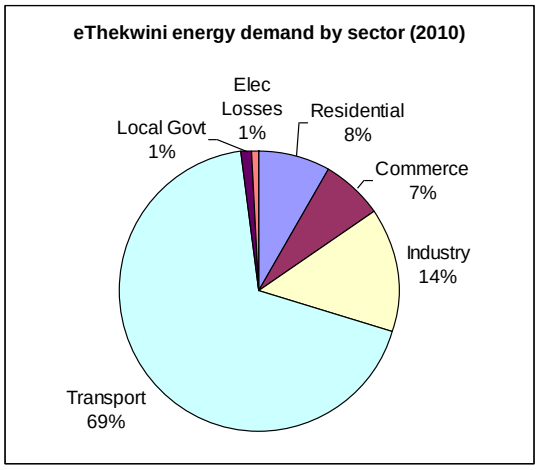

Figure 1: Energy demand by sector, eThekwini Municipal Area, 2010

In terms of energy-related GHG emissions, the transport sector dominates yet again (45%), followed by the industrial (23%), residential (15%) and commercial (13%) sectors. Local government and electricity losses account for 2% of GHG emissions each (4%). When non-energy emissions sources such as landfill gas are included, as in the Greenhouse Gas Emissions Inventory, the figure for local government rises to 6% of emissions. Electricity accounts for proportionally more emissions relative to liquid fuels as it is less efficient (energy is converted and then transferred) and generated from the burning of low-grade South African coal (with low calorific values, i.e. a small portion is converted into energy).

[4] It is worth noting that 'marine and international' fuel, which is purchased in Durban (and some of which will be expended here, particularly aviation fuel), but effectively 'owned' elsewhere, comprise 28% of total fuel consumption.

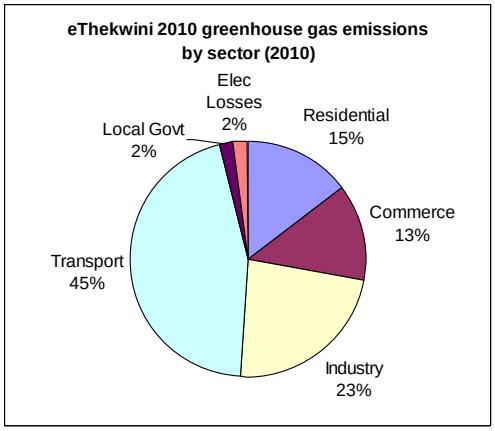

Figure 2: Greenhouse gas emissions by sector, eThekwini Municipal Area, 2010

The energy consumed in Durban is predominantly (approx. 98%) fossil fuel derived.[5] A breakdown of energy consumption by fuel type shows that marine oil (28%), electricity (22%), petrol (19%) and diesel (22%) all contribute close to a quarter of total energy consumption. Noteworthy amongst the remainder is aviation fuel (4%), paraffin (2%) and LPG (1%).

Although residential energy demand constitutes only 8% to total energy demand, it represents 30% of electricity consumed in Durban. It therefore contributes fairly substantially to GHG emissions and is also the sector that most influences 'peak' electricity demand, pushing up the need for installed capacity in the country. Residential 'prepayment' customers, generally low-income households, represent 48% of the total residential customer base, but consume only a quarter (24%) of total residential electricity.

Substantial electrification of households in Durban has taken place.[6] However, backlogs remain due to rapid informal urbanisation. While only 10% of the residential population do not have any access to electricity, some 300,000 households remain without a formal (or legal) electricity connection. The impact is that only 28% of 'poor'[7] Durban households access the government's major social grant related to energy, while they also bear the inconvenience and potential dangers of illegal electricity connections.

There is limited information on the use of energy by poor households, but indications are that these households spend between 6-20% of their income on meeting energy needs (Knox, 2012). Persistent use of paraffin and wood for cooking results in the additional burden of indoor air pollution and related health and safety impacts, though the use of these fuels is on the decline in Durban households (StatsSA, 2011). The eThekwini Municipality Electricity

[5] Currently no sizeable portion of renewable energy is contained within then national mix, though this is set to change with the first round of renewable energy starting to come on line.
[6] Annual Report 2012/13 eThekwini Electricity Department; also 2004/5: by the end of the 2011 financial year residential legal connections stood at 630,021 (off a base of 325,379 in 1994)
[7] This figure based on the number of households claiming FBE grants each month, as published in the eThekwini Electricity Department Annual Report 2012-2013, relative to the StatsSA census 2011 figure of households below R19 600/annum in eThekwini.

Department attempts to design tariff structures that shield the poor from the full impact of the electricity price hikes (eThekwini Electricity Annual Report, 2012/13).

Commercial sector energy consumption is predominantly serviced through electricity. Consumption in this sector constitutes nearly a third of all electricity consumption in Durban. Refinery gas is the dominant fuel within the industrial sector (at 35% of energy consumed), followed by electricity (32%) and coal (estimated at 20%).[8] Electricity demand from this sector constitutes 43% of total electricity demand in Durban (eThekwini Electricity Annual Report, 2012/13). The largest energy consuming industrial sectors are, in order of size: refineries, pulp and paper, food and beverage and chemicals.

Local government consumption contributes only 1% to total energy demand in Durban and 2% to energy-related GHG emissions (773,241 tCO2e, including emissions related to electricity losses). However it is the largest single consumer of power in the municipal area, controls a substantial public budget, employs more than 20,000 permanent staff members and thus has an extremely important role to play in leading the way in sustainable energy practices.

The transport sector is the dominant sector with regard to energy consumption and emissions. While this is touched on in broad strokes within this report, it is not substantially addressed as this sector is covered within a separate Theme report focussed on transport.

Energy supply

Liquid fuel provides for the majority (75%) of energy needs in Durban. Two of the largest refineries (out of total four in the country) are based in Durban.[9] Government regulates the price of petrol and diesel and has introduced 'cleaner' fuel requirements in recent years. The price of paraffin is regulated up to the point of wholesale and government thereafter provides a recommended retail price at a maximum of 40% mark-up. Paraffin is VAT-exempt to subsidise poor households. LPG is unregulated. Its expansion to poorer households through the establishment of small outlets is hindered by outlet safety requirements, the need for new appliances, and the weight and cost of containers.

Electricity comprises 22% of energy consumed in Durban. Apart from a small amount of embedded generation (0.5% of total electricity), the electricity supply for Durban comes from the national 'mix' - 90% coal, 5% nuclear and 5% hydro.

The distribution grid in Durban is largely owned and controlled by eThekwini Municipality, with just over 2% of total electricity distributed directly from Eskom to customers. The Municipal Electricity department currently supplies 675,059 customers via five in-feed stations.

[8] EThekwini Municipality State of Energy 2006.
[9] Ethekwini State of Energy, 2006: Engen (capacity 135,000 bpd, annual usage 6,400,000 toe) and SAPREF (180,000 bpd, annual usage 8,500,000 toe).

eThekwini Municipality has pioneered the development of municipal landfill gas to electricity. This power contributes 0.5% to total supply, or 15% to the total electricity consumed by the Municipality for own operations.

Coal has been deregulated; hence it is extremely difficult to obtain supply- or demand-side data. This is a general problem for cities around the country. However, the indications are that this could account for as much as 4-7% of energy consumption in Durban (Mercer 2006, SEA 2013).

An analysis of **renewable energy** potential in the Durban area indicates that Durban does not have strong competitive advantages in wind or solar relative to other areas in South Africa, but solar does offer *significant local opportunity* (PV and solar thermal). Biofuel may represent an important opportunity and waste (from paper and wood industries, landfill, sewage and wastewater) also has potential (Marbek, 2007, Strategic Planning Resources, 2013).

Section Two: Key Climate Change Challenges for Sustainable Energy Theme in Durban

2.1 The substantial fossil fuel dependence (well over 90%)

A modelling exercise undertaken for the eThekwini Municipality Energy Office shows that if current energy use patterns and growth trends persist (a 'business as usual' scenario), energy consumption in Durban will increase by 70% and GHG emissions will grow by 42% by 2030.[10] This would place Durban far above a 'Peak Plateau Decline' trajectory, as mapped out by national government and approved by the South African cabinet in 2008, to meet emission levels 'required by science' to avert runaway, catastrophic climate change.[11]Very recent trends in electricity consumption, following price increases from 2008/9, in fact indicate that Durban's *electricity* consumption has already departed from a 'BAU' trend, and is showing a flattening in growth associated with an energy efficiency path (rather than a decline in economic activity), which is exciting (the impact of this on total energy consumption and growth scenarios has yet to be established)[12].

[10] SEA (2013), 'Energy Scenarios for eThekwini'. In this study, the implications of a number of possible future energy scenarios for eThekwini from the base year of 2010 until 2030, have been explored using the Long-Range Energy Alternatives Planning (LEAP) simulation tool. Latest electricity data indicates that current efficiency trends in the residential and industrial sectors are beginning to track the Energy Efficiency Scenario trend.

[11] National Climate Change Strategy, 2011, RSA.

[12] Euston-Brown, M, 2013: Durban Climate Change Strategy Introductory Report: Sustainable Energy Theme, drawing on data from Ethekwini Electricity Department Annual Report, 2011-12.

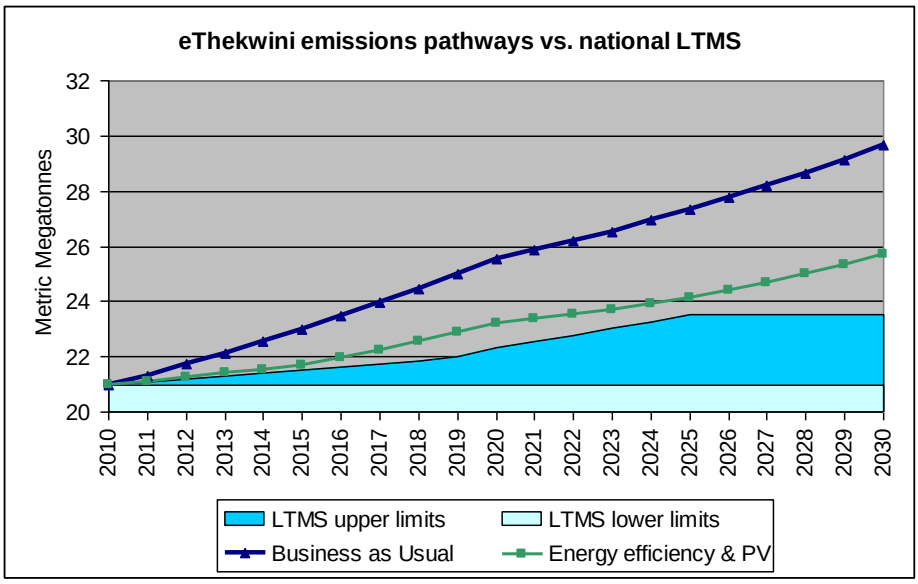

Figure 3: Durban emissions pathway in relation to the national emissions trajectory (LTMS) mapped out in the National Climate Change Response Strategy, 2011 (SEA, 2013)

Fossil fuel consumption and production within Durban also contribute to local air pollution, which has a significant impact on human and environmental health. A fossil fuel-dominated energy future renders Durban vulnerable to disruptions in energy supply and to price increases (for example, coal supply shortages may push up electricity prices, as would carbon taxes or peak oil pressures).[13]

The challenge faced here is that the scale of our fossil fuel energy economy, and substantial investment in these energy sources and related institutional and physical infrastructure, means that the shifts required are substantial and difficult. The longer such a transition is delayed, the more costly it will become. The transition may also have diverse consequences, and these need to be managed, e.g. municipal revenue reduction, job losses in outmoded industries, etc.

2.2 Meeting energy demand growth and service delivery in a context of climate change and poverty

The population and economy of Durban are growing at 1.3% and 4.6% per annum respectively. This brings with it a growing demand for physical infrastructure and resources to service basic needs and economic activity.[14] Meeting this demand will be enormously difficult, particularly as a sustainable development path requires the reduction in resource consumption while simultaneously ensuring that economic activity is facilitated through energy provision, and energy services are extended to new, usually poor, urban communities.

Improving livelihoods through access to affordable 'clean' and efficient energy, as well as to mobility, is a cornerstone of poverty reduction (some 40% of the existing population is poor) and developing local resilience to climate change impacts.

[13] Modelling indicates that the added cost of a carbon tax on a BAU scenario would be 66% greater than in a more efficient/renewable scenario.
[14] The Municipal Area experienced a 1.3% population growth rate from 1996-2011 (StatsSA, 2012); and an average economic growth rate of 4.6% since 2001 (IHS Global Insight).

The challenge in the coming decades will be for municipal electricity distribution businesses to meet these service demands, while maintaining the physical grid infrastructure and adapting to a more distributed embedded generation power supply system. Municipal distribution is a fairly complex business and managing these changes will require operational as well as strategic and conceptual capacity.

New development will need to be highly efficient, and the urban environment of Durban 'redesigned' to increase density and mobility. This is often politically challenging as it has implications for urban land markets. There will also need to be enormous capital investment in public transport systems; requiring national government investment.

2.3 Harnessing the energy sector for local sustainable development

Durban, along with the rest of the country, must urgently address extremely high rates of unemployment and poverty (both in the region of 40%). 'Localising' the energy sector can provide an important opportunity.[15]

The indications are that Durban does not have a national comparative advantage in either wind or solar, but that there is substantial potential in local renewable energy applications, such as solar water heating, embedded PV power generation, micro-hydro, landfill and bio-waste or bio-fuel.

Energy technology innovation, development and manufacture, as well as efficiency retrofitting are areas that can be developed. The challenge will be to create an enabling environment that supports local development and production. This needs to reduce risk and transaction costs, reduce lengthy procurement processes within government-led initiatives, and support access to finance. In relation to embedded power generation, the investment framework needs to be established.

2.4 The 'implementation challenge' in the face of systemic inertia

Even when there is sound policy and/or strategy in place, energy transition is difficult and requires a combination of factors: substantial political will, new skills and capacity, funding streams and institutional pathways. Decision-makers are faced with tough decisions around capital-intensive programmes that have a long time horizon (often beyond a single term of political office) in a context of scarce resources and competing interests. Further, the outcome of new directions cannot always be predicted, requiring a substantial degree of flexibility and adaptability amongst policy- and decision-makers in order to be responsive to opportunity as it arises, as well as to negative consequences, should they arise.

Section Three: Vision and Aims for sustainable energy and climate change

The following preliminary vision and aims are proposed for the sustainable energy and climate change component of the DCCS:

[15] The latest Independent Development Corporation research projects claim that more than 460,000 jobs could be created by South Africa's green economy; more than by the entire mining industry.

Durban has a thriving sustainable energy sector where renewable energy supplies a significant portion of Durban's energy and energy is used efficiently by all sectors. All residents have access to safe energy sources and there are multiple economic opportunities in the sustainable energy sector.

1. 40% of Durban's electricity demand is generated from renewable energy
2. All energy in Durban is used efficiently: efficiency is applied in 100% of Durban's built environment, and in industrial and manufacturing operations.
3. All citizens have access (both physical access and social access – affordability) to suitable energy forms to meet their needs.

Section Four: Sustainable energy strategies to achieve the aims

Participants in the stakeholder workshop identified a number of strategies that could contribute to achieving the sustainable energy vision and aims as they relate to reducing greenhouse gas emissions from the sector. These strategies were combined with recommendations from the sustainable energy expert and have been synthesised to provide the list in the table below. For further background reading on sustainable energy and climate change in Durban see the technical introductory report available on the DCCS website. A number of issues raised related to transport emissions and the promotion of energy efficient forms of transportation and denser spatial planning. As the DCCS has another theme dedicated to transport, these issues have been left out of this theme report and will be incorporated into the existing transport theme at a later stage.

Aim	Proposed Strategies
40% of Durban's electricity demand is generated from renewable energy	• Renewable energy technologies including wind, solar, hydropower, biofuels and algae are promoted and implemented locally based on their appropriate application and cost-effectiveness. • Pursue substantial embedded solar PV systems to meet target, including 100 000 x 2kW residential rooftop PV and other rooftop opportunities in commercial and industrial buildings • Explore and develop viable options relating to municipal assets and small-scale renewable energy such as micro hydro and rooftop PV • The load profile is improved by introducing mechanisms to reduce peak load such as ripple control, pumped storage, smart metering and time-of-use domestic tariff. • New houses built in Durban incorporate solar water heating technology. • Street lights and traffic lights retrofitted with energy efficiency LED technology. • Rebates and incentives are introduced to encourage residents and organisations to implement renewable energy technologies. • By 2015 all resources, agencies and sectors linked to sustainable energy are identified and included in the planning process for a low carbon energy future. • Platforms for inter-sectoral collaboration are created including city-academia collaborations and commercial forums.

	• Linkages between all levels of government; local, provincial and national, in the sustainable energy field are strengthened through regular meetings of the KwaZulu-Natal Sustainable Energy Forum • A research day focusing on the transition to a low carbon energy future is hosted in 2014 that brings multi-disciplinary academics together. • Implementation of strategy maximises employment creation, noting that increasing renewable energy mix already creates more jobs than conventional options, and locating the generation locally will bring those jobs into the city.
All energy in Durban is used efficiently: efficiency is applied in 100% of Durban's built environment, and in industrial and manufacturing operations.	• Energy efficient technologies, including LED technology and intelligent lighting design and technologies, heat pumps and solar geysers, and gas and induction stoves, are promoted and implemented by residents and organisations. By 2020, 50% of mid-high income households have implemented efficient water heating technologies. By 2017 50% of mid-high income households use LPG for cooking. By 2020 all sectors have achieved 100% lighting efficiency. • All Durban's children, residents and organisations understand the reasons behind saving energy, how to save energy, and how this impacts on reducing carbon emissions and saving money. Education is through energy saving awareness campaigns and programmes and energy is introduced in the school curriculum by 2018. • Local building legislation requires the implementation of energy efficient technologies and design in new buildings beyond existing national standards. Capacity is developed to ensure implementation; requirements are monitored and legislation enforced. • Energy efficient programmes should target energy intensive users. • Energy efficient technologies are implemented at all government buildings.
All citizens have access (physical access and social access) to suitable energy forms to meet their needs.	• Formal electrification of informal areas to ensure energy social grant reaches the poorest households • Encourage a 'basket' of energy services to meet the energy needs of poor households and reduce the 'energy burden' or cost of energy, for example, thermally efficient housing materials/features, solar water heating, hot boxes and electrification with social grant.

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Appendix One: Sustainable Energy Theme Working Group Meeting Minutes

Minutes of meeting held on 7th November 2013.

#	Item	Action
1.	**Welcome** Derek Morgan from the eThekwini Municipality's Energy Office welcomed everyone to the meeting and introduced the Durban Climate Change Strategy Project to the stakeholders. The project is an initiative by eThekwini Municipality's Energy Office (EO) and Environmental Planning and Climate Protection Department (EPCPD) and has been contracted out to Urban Earth and FutureWorks! to facilitate the development of the Strategy. Derek added that as the senior manager of the eThekwini Municipality's Energy Office, this working group on Sustainable Energy meeting is especially important to him. Derek explained that the purpose of the Durban Climate Change Strategy (DCCS) project is to develop a Climate Change Strategy document that will provide guidance for the city as a whole, to mitigate against and adapt to climate change. Derek explained that the workshop would help answer the question of 'where do we want to go as a city in Sustainable Energy' and will help to unlock funding. Derek encouraged stakeholders to participate in the meeting as their comments will be used to identify aims and strategies for the Sustainable Energy theme. Derek also presented a table showing the economic potential of energy in Durban. The graph showed that R40billion goes out of Durban and Derek explained that this is the kind of potential that we are working with in Durban.	
2.	**Introductions** Margaret McKenzie provided a brief overview of the process that had been followed by the project up to this point. She explained that the project had been initiated with public consultation where stakeholders were asked to provide input on what should be the key focus areas of the strategy. The results of stakeholder feedback were then presented at a Reference Group meeting. The Reference Group was made up of a group of people who volunteered from different sectors to provide guidance to the strategy development process. Following advice from the Reference Group seven key themes were identified for the strategy: 1. Biodiversity 2. Health 3. Food Security 4. Water 5. Sustainable Energy	

	6. Transport 7. Waste and Pollution Margaret explained that the DCCS project was now in the process of hosting public working group meetings on each of the seven themes to develop aims and strategies for each of the themes. Seven technical experts have been procured by EPCPD and EO and will provide expert technical advice on each of themes. Margaret added that a second round of working group meetings will be held in the new year where stakeholders will get an opportunity to comment on the written theme report and add additional content. She explained that the strategy document then will be adopted by council. Margaret stated that the Sustainable Energy working group meeting was the fifth of the seven theme working group meetings to be held and introduced Megan Euston-Brown as the technical expert responsible for providing advice on the Sustainable Energy theme. She explained that there will be a discussion after the presentation and thereafter there will be a group discussion. Margaret added that in the environmental management field there are many sustainable energy issues that can be discussed but that the focus of this workshop is to concentrate on specific sustainable energy issues that are linked to climate change.	

3.	**Presentation**
	
	Megan Euston-Brown introduced herself and stated the company she works for: Sustainable Energy Africa. She presented a summary of the Introductory Report for the Sustainable Energy Theme and focused on the following aspects:
	
	• Durban's key sustainable energy challenges associated with climate change, including:
	  ○ Sustainable energy transition
	  ○ The impact of Durban as the third most consuming city in South Africa
	  ○ The challenge of fossil fuel dependence
	  ○ The challenge of low carbon development
	  ○ The challenge of 'green economy' growth
	  ○ The challenge of complex system transition
	• Strategies in Durban that have been implemented to address changes in climate
	• The low carbon development path
	• Scenario costs of energy
	• Energy transition management
	The Sustainable Energy Presentation and Technical Report can be downloaded from the DCCS Website.	

4.	**Comments and Questions**	

	The floor was then opened where stakeholders were invited to ask questions. The following issues were raised by stakeholders during discussion and responses made by the technical expert and eThekwini Municipality officials. The issue of prepaid metres in low cost housing was raised. It was discussed that people are reverting back to burning fossil fuels because of these metres. The issue of cycling in Durban was discussed and it was stated that the topography isn't suitable as it is not flat and easy to cycle as it is in Cape Town. The tariffs on Solar panels were discussed and it was mentioned that these are too high and should be subsidised. The impacts of the Bisasar Landfill were discussed as having large impacts on the community members surrounding it. The Smart Energy Plan was raised and it was stated that it should be included in the Strategy for Durban. The hidden costs and unforeseen circumstances of solar heater installations were discussed. It was stated that where the water comes from is a cost that needs to be taken into account. The data on the 'Business as Usual' graph was discussed with regards to the source of decoupling data and it was agreed that this data is not reflective of the whole picture. The fact that rapid transport systems rely on densities was discussed and the question was raised on how this will work if South Africa doesn't have the required densities. The poor communications between National, Provincial and Local Governments were discussed. It was stated that local governments are not being made aware of polices and plans that affect them. It was mentioned that although some departments are top down others are more integrated and there is room for growth in this sector.	
5.	**Group Discussion** Margaret McKenzie asked stakeholders to form groups of six people each. Groups were allowed 20 minutes for identifying strategies to address the key issues relating to Sustainable Energy and climate change, and five minutes to capture these strategies on key cards. The stakeholders were given flip chart sheets to record their discussions (See Annex A) prior to noting their top three strategies on key cards. A representative of each group was then asked to present their group's top three strategies.	

The various strategies proposed by the groups are presented below. They have been grouped into common areas:

Create biological offsets

- Algae absorbing sunlight and carbon dioxide – raceway ponds 1Ha
- Algae - fuels (biomass cultivation; algal ponds; 1Ha pond equals 2 tonnes CO_2 per month, 25-50/yr/pond; co-products of caroteniods, biofertiliser and animal feed; current stage provisional patent (*need a commercial approach to algae offsets*)

Use alternate energy sources

- Energy storage – for use of energy in peak period generated off-peak
- 40% of eThekwini Municipality electricity demand generated within eThekwini Municipality from renewable energy
- Use wind and solar power to reduce demand on coal e.g. solar powered street lights, wind farms, Au street lights 2020
- Solar energy, every new house should have it

Minimise transport GHG emissions

- Immediate – transport fuel liquid to balance octane levels to decrease fuel consumption by 10% as well as costs, needs and emissions (government needs to test and approve and endorse)
- 80% of road freight transport shift to rail freight
- Modal shift of passenger transport (*two points of view in the group - one make public transport the main form of transport or two – develop more acceptable energy efficient private cars*)
- Two major projects (dug out port and rapid transport) planning, design and implementation – consider long term energy efficiency

Regulate energy efficiency in buildings and developments

- Energy efficiency programme to be focused on industry, residential, government and new developments – ensure monitoring
- Energy efficiency
    - LED technology (75% - 90%)
    - Heat pumps / solar geysers 69-74%
    - Gas stoves, induction stoves
    - Solar PV: off-grid, battery back-up, grid tie
- Building regulations – change within a year
- Building legislation
    - Enforcement of current
    - Technically sound
    - Energy efficient buildings

Focus on the Smart Energy transition

- By 2015 Energy Office has mapped all resources and agencies for the Smart Energy Transition (*when we say agencies academics etc we*

	looked primarily around government – third around academic – public awareness) • By 2015 the planning process for the Smart Energy Transition • In 2014 research day brings multi-disciplinary academics to focus on Smart Energy Transition **Focus on sustainable energy education and awareness** • Roll out awareness programmes on energy efficiency – include in curriculum (2018) • Education - should be included in the school curriculum	
6.	**Discussion** Margaret opened the floor for a final round of questions and comments to allow stakeholders the opportunity to mention any areas that had not been covered in the report backs. The issue of the high impact of marine bunkering was raised. It was stated that because the fuel is not being used here the costs of this practice are distorted. Another issue raised was that people are not being made aware of the issues surrounding sustainable energy. Other issues such as HIV are publically broadcasted on television shows but no one talks about sustainable energy. It was also mentioned that people should receive hard copy documentation about the issues. In addition it was stated that the processes involved in the journey to get to the end result are too long and should be shortened. Another issue raised was the expansion of the Energy Office. It was stated that the department should be expanded. The last issue raised was that graphs showing data comparing countries use data recorded in different years which makes it difficult to make effective comparisons. It was noted however that although it is sometimes difficult to get updated data, Durban is doing a better job at comparative studies.	
7.	**Closure** Margaret outlined the process going forward. This included the following: • A short report summarising the content provided by the groups will be prepared. • The technical specialist, Megan Euston-Brown, will review the report and provide comments and recommendations. • The report will then be uploaded on the website and emailed to everyone for further comment. • A follow-up meeting will be held early next year to present the draft strategy and to collect any comments and suggestions on the sustainable energy component of the strategy.	

	Derek then closed the meeting, thanked everyone for their participation and ideas, and thanked Megan for her input.	

Annex A: Flip chart sheet discussion notes – Strategies

Group 1

Transportation

- Fuel (Cars, trucks, earth moving machines, ships)
    - Product to use for reduction of emission which is tried and approved by National Government
- Car pooling (work, schools)
    - Lanes
    - More than one person in a car
    - More school buses collecting from local points
- Public Transport
    - New ones being put into place, what is being used?
    - Upgrading all taxis
    - Putting trains into place, connecting longer distances

Energy Efficiency

- Homes
    - LED Technology / motion sensors for lights
    - Heat pumps / solar geysers (rebate system)
    - Gas stoves, induction stoves
    - Solar PV: Off-grid, batter back-up, Grid tie
- Building
    - Make sure the law is being enforced and once building completed, someone checks that all was put in, that was said

Group 2

Two aspects – reduction of usage/energy demand and production of green energy

- Encourage more efficient marine fuel usage / bunkering
- Goods transportation – less goods on trucks / roads – better use of railways
- Electrification of public transport
- Storage of generated energy – generated during low usage periods
- Building legislation should point to energy efficiency as priority and enforce it
- Create safe roads / public transport so people are inclined to cycle / walk / catch a train or bus
- Economic benefit of solar geysers has to be proportionate to expense – incentivise / lease system / rebates
- Time of use power billing

Group 3

- Smart energy transition for eThekwini
- Building processes that pull together existing structures (academic / political / technical / business / civic) – partly the role of the Energy Office
- Specific targets:
    - By 2015 Energy Office has mapped all resources and agencies needed for the transitions
    - By 2015 the planning process for the smart Energy Transition is under way

Group 4

- Need for much greater education / marketing to develop a more informed public
- Use of media - radio / television / municipal paper eGagasini / local free papers
- We need to develop flexible technology that is appropriate to low – income contexts - variety of projects that draw in a range of multi-disciplinary people
- Advantages: Durban Energy council / KZN Sustainable Energy Forum / Climate Change Task Team
- Strengthen local and provincial linkages
- Inter-sectoral collaboration – different academic disciplines (academic, political, NGO, technical)
- How do we get taxi associations on board so they can see the profits in new transport systems
- Are academic institutions being responsive to emerging problems or still geared to old era of big centralised systems?

Group 5

- Wind generated power to reduce demand (set up wind farms) decentralised system
- Energy efficient programs to be focused on industry and residential
- Creating awareness on energy efficiency
- Collaboration between industry to use alternative / renewable fuels
- Roll out energy efficiency solutions (occupational sensors) at schools and government buildings
- Use solar panels for street lights
- Set energy efficiency standards for new developments and ensure that these are monitored

Group 6

Durban

- Present problems
    - High carbon footprint
    - High temperatures
- Proposed system
    - Algal pond – 1 ton algae extracts 2 tons CO_2
- The biological solution – sustainable approach
    - Using biomass to convert CO_2 from atmosphere – Biofuel

Group 7

Supply, awareness, demand and modal shift

- Coal
- Renewables, roof space for, MW Solar?
- Population density? Timeframes...
- Oil, Biofuels?
- Private vehicle desirable
- Limit and spend on transport (LDV) infrastructure
- Fuel efficiency and electro mobility
- Passenger transport, freight transport

Group 8

- Education
    - People need to know what the importance of the energy efficiency is in terms of cost saving and reducing carbon emissions
- Solar Energy
    - We have plenty of sun shine in Durban
    - We need to use more solar energy for heating and generating electricity
- Building Regulations
    - Should be encouraging energy efficient methods e.g. solar panels, double glass, insulation etc.
    - Rain water collection tank

Appendix Two: Detail of data sources for Durban statistics

Ethekwini Sustainable Energy Indicators: data set 2010 baseline as far as possible

Indicator	Figure	Unit	Data source	Data year
Population	3442361	persons	StatsSA census 2011	2011
Energy (GJ)	191 013 550	GJ	SEA 2013: Compiled from eT GHGEI 2010 raw data (elec) plus SAPIA data (liquid fuel), coal data (industry)	2010
GVA	175446344.1	ZAR	Global Insight	2013
Energy intensity (GJ/GVA)	1.1		Calculation	2010/2013
Greenhouse Gas Emissions from Energy consumption	22952075	tCO2e	From leap model energy total 191 122 738 GJ energy balance figures using internationlly accepted conversion factors (IPCCC)	2010
GHG Emissions Intensity	0.13		Calculation	2010
Energy related emissions/capita	6.7		Calculation	2010
Electricity consumed: Total 2010	11545510389	Kwh	eT GHGEI 2010: calender year not financial year, so sightly differs from Elec Dept AR and includes total sales, losses and Eskom sales (source data next tab)	2010
Electricity consumed by eT municipality for internal functions/services	1329154	GJ	ZC leap model 1.2 energy balances, from GHGEI 2010 raw data	2010
Electricity consumed by eT municipality for internal functions/services	369209444.4	Kwh	Calculation from above figure	
Embedded renewable energy	50000000	Kwh	GHGEI 2010	2010
Embedded renewable energy	180000	GJ	Calculation (conversion factor: 0,0036GJ/Kwh	2010
Embedded RE as share total energy	0.09%	%	Calculation	2010
Embedded RE as share total electricity consumed	0.4%	%	Calculation	2010
Embedded RE as share total Municipal 'own' electricity consumption for municipal functions/services	14%	%	Calculation	2010
Municipal area	2295	km2	StatsSA Census 2011	2011
Density	1502	people/ km2	StatsSA Census 2011	2011
No. of households	956713	households	StatsSA census 2011	2011
No. of households claiming FBE (approx from graph)	75000	households	Ethekwini Elec Dept Annual Rpt 2011/12	2011-2012
No. of households claiming FBE (approx from graph)	65000	households	Ethekwini Elec Dept Annual Rpt 2011/12	2010-2011
No. of households with income below R4 800/annum (20% households): "extreme indigent"	204 407	households	StatsSA census 2011	2011
Share of "extreme indigent" households accessing the FBE grant 2010-2011	32%	% HH	Calculation	2010/2011
Share of "extreme indigent" households accessing the FBE grant 2011-2012	37%	% HH	Calculation	2011/2012
Number of households with income below R19 600/annum (still within poverty line)	263343		StatsSA census 2011	2011
Share of poor households accessing the FBE grant 2011-12	28%		Calculation	2011/2012

Public transport as share all pass-km	57%	% pass km	Ethekwini Transport Authority (pers. com, June 2012 ETA	2010
Household access to modern energy (electricity for lighting as proxy for access to electricity)	89.90%	% HH	StatsSA census 2011	2011
Households using 'clean and safe' fuels for cooking (electricity and LPG)	73%	% HH	StatsSA census 2011	2011
Total number households without formal electricity connection	265000 - 317000	HH	Municipal Dwelling Count figures quoted in personal interveiw with Electricity Dept, Sept 2012 (SEA)	2011
Energy burden: portion of household income spent on energy amongst the poorest residents	6.4-20 %	% HH income	Independent research: Knox consulting (small sample)	2012
Non-motorised transport (NMT) as portion total mobility: population that walk/cycle to school or work	39%	% persons	StatsSA census 2001	2001