



Workshop On

Confronting Climate Change -  
Towards Carbon Neutral Indian  
Cities

Aditi Dass, October 29 2009

**THE °CLIMATE GROUP**




Overview of the session °C

A Brief Introduction to The Climate Group  
Climate Change and The Business Landscape

- Science
- Policy

Case Studies/ Solutions

- LED Lighting

**THE °CLIMATE GROUP** 

# THE CLIMATE GROUP



- Independent NGO based in Europe, USA, Canada, Australia, China, India
- Founded in 2004
- Mission: work with proactive leaders from government and business to accelerate a low carbon economy
- Rapidly expand the uptake of best practices on reducing GHG emissions



**THE CLIMATE GROUP**



## Overview of the session


A Brief Introduction to The Climate Group  
Climate Change and The Business Landscape

- Science
- Policy

Case Studies/ Solutions

- LED Lighting

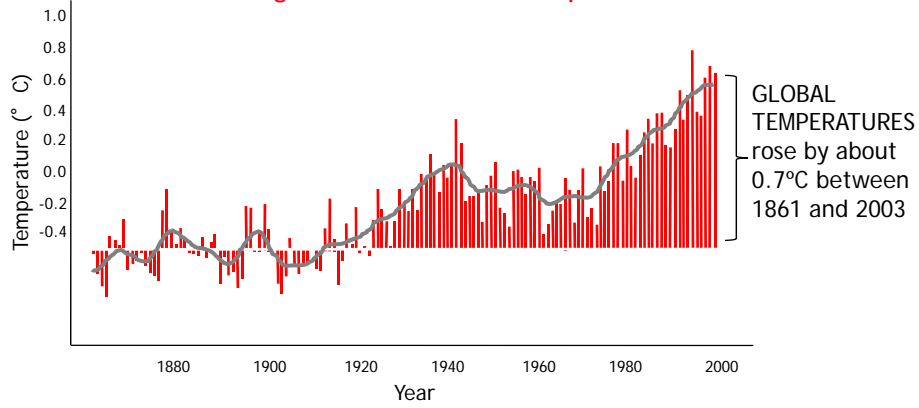
**THE CLIMATE GROUP**



# Temperatures are rising



### Global Average Near Surface Temperatures 1861-2003



Source: Hadley Centre for Climate Prediction and Research

THE CLIMATE GROUP



# Increased Intensity of Extreme Weather



THE CLIMATE GROUP



## Overview of the session



### A Brief Introduction to The Climate Group Climate Change and The Business Landscape

- Science

- Policy

### Case Studies/ Solutions

- LED Lighting

THE CLIMATE GROUP



## India



### Addressing Climate Change and Energy Security



*"It is in India's interests to ambitiously build a low carbon economy"*

- Shyam Saran

#### India's International Position

- Commitments of Developed countries
- Per capita emission
- Fund & tech to support adaptation & mitigation

#### India's Current Actions and Targets

- National Action Plan on Climate Change
  - **Eight missions**: focus on solar technologies, energy efficiency, sustainable habitat, water, Himalayan ecosystem, forests, agriculture and knowledge.
- Power generated through **renewable energy** technologies will have to be **increased substantially** against the present **5% by 2030**.
- India is spending **2.17% GDP annually** on addressing the **variability of climate change** through projects in agriculture, coastal zones and health and sanitation.

THE CLIMATE GROUP



Overview of the session °C

A Brief Introduction to The Climate Group  
 Climate Change and The Business Landscape:

- Science and Economics
- Policy

Case Studies/ Solutions

- LED Lighting

THE CLIMATE GROUP HSBC Climate Partnership

Evolution of Lighting °C

Conversion Efficiency / Cost

**Incandescent Lamps**

- Life : ~1500Hrs
- Light Generation : By heating Filament
- Lumens / Watt : 11
- Eco Friendliness : Expensive to handle waste / end of life
- Thermal Issue : Generates more heat than useful light

**Fluorescent Lamps**

- Life : ~10000Hrs
- Lighting Mechanism : Mercury vapor striking hazardous Phosphorus coating on the glass wall
- Lumens / Watt : ~50
- Eco Friendliness : Hazardous, expensive to handle wastages / end of life
- Thermal Issues: Generates UV & heat
- Power Management : Possible to Manage 50% power with expensive Ballast

**Compact Fluorescent Lamps (CFL)**

- Life : ~50000Hrs
- Lighting Mechanism : Lead and Phosphorus free Junction
- Lumens / Watt : ~100+
- Eco Friendliness : Green, easy to manage waste
- Thermal Issue : Cool - Virtually no heat is generated
- Power Management : Possible to Manage 100% Power with less expensive drivers

**LED**

Parameters	LED	CFL	Incandescent
Life in hours	50,000	10,000	1,500
Lumens/watt	100+	54.17	11
Eco-Friendly	yes	No	No
UV Rays	No	Yes	Yes
Infrared Rays	No	Yes	Yes
Generate Thermal Heat	No	Yes	Yes

Eco friendly (Carbon Free) / Life

LED solution enables Green, Efficient, Highly Reliable and Managed Lighting

THE CLIMATE GROUP HSBC Climate Partnership

5



### INDOOR LED LIGHTING

**LED Lighting for 55,000 Sq Ft Office Area**



**Corporate office in South India to have complete LED lighting, first of its kind**

VIGNANI

THE CLIMATE GROUP



### SOLAR- LED

**LED lighting for 210,000 sq ft underground parking**



**20 KW Solar Power for 3-Tier underground parking**

Solar Panel



Panel technology from [unclear]

Mono Crystalline

**Corporate office multi level basement parking with LED lighting, first of its kind in South India**

THE CLIMATE GROUP

VIGNANI



## CENTRALISED SOLAR POWER FOR CAMPUS STREET LIGHTS



**35% Cost Reduction compared to Stand-Alone Solar Street Lights**

THE CLIMATE GROUP

VIGNANI

## Why outdoor lighting?

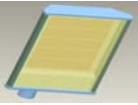
- Lighting accounts for 8% of total global GHG emissions (energy) & 19% of the world's electricity use. Outdoor lighting accounts for 8% of the above
- There are 90 million street lights. Electricity savings of 1/3 would charge 33 million plug-in electric vehicles
- Over 40% of the lighting is still produced by incandescent lamps, which are extremely inefficient; producing abt 15 lumens of light per watt (CFLs produce 40-60 lumens/watt)
- LEDs and smart adaptive controls can further reduce energy use and emissions by 50-80%
- LEDs have shown efficiencies of 100 lumens/watt (130-160 lumens/ watt demonstrated in commercial laboratories) - 3 times more efficient than CFLs.
- LEDs deliver the same amount of light & brightness at the street level using 20-30% less energy. They produce more environmentally friendly lighting, significantly reduce energy and maintenance costs, and improve the quality and safety of public spaces.
- LEDs and smart controls are great partners

THE CLIMATE GROUP



## Street Lighting C

Lamp Type	Benefits	Disadvantages
Mercury vapor	<ul style="list-style-type: none"> <li>• Low capital cost</li> <li>• Relatively long lifespan</li> <li>• Popular in developing countries</li> </ul>	<ul style="list-style-type: none"> <li>• Low energy efficiency</li> <li>• Poor color rendering</li> <li>• Better color available, but at lower efficiency</li> </ul>
Low Pressure Sodium	<ul style="list-style-type: none"> <li>• Highest energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Very poor color rendering</li> </ul>
High Pressure Sodium (HPS)	<ul style="list-style-type: none"> <li>• High energy efficiency</li> <li>• Highest market share of all outdoor lamps</li> <li>• Relatively low capital cost</li> </ul>	<ul style="list-style-type: none"> <li>• Most lamps have low color rendering</li> <li>• Better color available, but at lower efficiency</li> <li>• Difficult to dim &amp; control</li> </ul>
Metal Halide	<ul style="list-style-type: none"> <li>• Excellent color rendering</li> <li>• Higher capital cost compared with HPS</li> </ul>	<ul style="list-style-type: none"> <li>• Significant lumen depreciation</li> <li>• Lower lifespan than HPS</li> <li>• Difficult to dim &amp; control</li> </ul>
Light Emitting Diode (LED)	<ul style="list-style-type: none"> <li>• Highest color rendering</li> <li>• Highest energy efficiency</li> <li>• Easily dimmed &amp; controlled</li> <li>• Very long lifespan</li> <li>• Lowest maintenance costs</li> </ul>	<ul style="list-style-type: none"> <li>• Highest capital cost</li> <li>• Limited availability and choice</li> </ul>



## Street Light Solution C

LED Street light Model	12W	30W	64W
Input Voltage	230 V, 50Hz	230 V, 50Hz	230 V, 50Hz
Total power consumption	16 Watts	35 Watts	72 Watts
Efficacy	>90%	>90%	>90%
Centre illuminance (LED)	18 Lux @ 12 Feet	35 Lux @ 12 Feet	55 Lux @ 18 Feet
<b>Equivalent CFL/HPSV Lamp</b>	<b>36W CFL</b>	<b>80W MH</b>	<b>150W HPSV/150W MH</b>
Centre illuminance CFL/HPSV	8 Lux @12 Feet	30 Lux @12 Feet	50 Lux @18 Feet

**THE CLIMATE GROUP**

VIGNANI



°C

**70%**

Photos courtesy of Pacific Gas & Electric



**LightSavers** is an international consortium of government agencies and companies on 3 continents working together to accelerate LEDs and smart adaptive controls in outdoor applications. The program started in Toronto.

*Photo courtesy of TCG*

## What is TCG's Value Add?

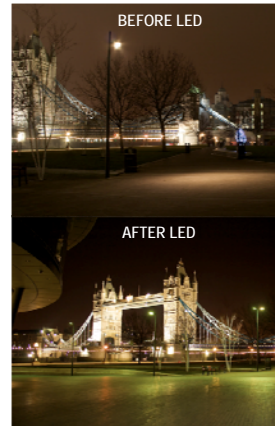


*10 km of solar street lighting in Dezhou, China*

- **Awareness:** workshops on LEDs
- **Pilots:** TCG protocol to evaluate performance in the field
  - Illumination quality
  - Lumen depreciation
  - Durability
  - Economics
- **Procurement:** supplier list & events
- **Financing:** help to quantify investment return to attract appropriate financing

## Four Reasons to Pilot Test

- Does LED meet our needs?
  - illumination intensity
  - uniformity/distribution
  - durability
  - cost
- Learn from other pilot hosts using common approach
- Establish data for large scale scale up and financing
- Accelerate the science and acceptance of LED outdoor solutions



Photos courtesy of the London Development Agency

THE CLIMATE GROUP



## What Do Case Studies Tell Us?

- **Oakland pilot (US DOE):**
  - 52% energy savings
  - Luminaire retrofits cost \$1,200 each
- **Illumination:**
  - LED equivalent to HPS
  - LEDs gave better uniformity
- **Simple payback scenarios:**
  - 5 years new construction
  - 14 years retrofit



Photo courtesy of Ruud Lighting; surface plot from PG&E

THE CLIMATE GROUP







## LED Street lighting In Indian Cities

- Kolkata Municipal Corporation
- West Bengal State Electricity Distribution Company Ltd
- The Bureau of Energy Efficiency
- West Bengal Pollution Control Board
- **Results:**
  - **400 HPSV street lights replaced by equivalent LEDs in 9 streets in Kolkata**
- Facilitated by THE ° CLIMATE GROUP (*under the aegis of HSBC Climate Partnership Program*)

THE ° CLIMATE GROUP



©The Guardian, Dan Chung, photographer

THE ° CLIMATE GROUP



THANK YOU

**Contact Information**

**ADITI DASS**  
**STATES & REGIONS PROGRAM**  
**The Climate Group**  
[adass@theclimategroup.org](mailto:adass@theclimategroup.org)

Photo courtesy of Ruud Lighting

## Good Technology $\neq$ Good Product

- Lifetime and economics of the LED chip depends on:
  - Junction temperature
  - Ambient temperature
- A good LED chip needs a well designed luminaire
  - Must dissipate heat
  - Do not overdrive chip
  - Economics depend on LED life
- **Rigorous field pilot testing is needed**

Average Junction Temperature (°F)	Usage in Hours
40	250,000
50	150,000
60	100,000
70	75,000
80	55,000
90	40,000
100	30,000
110	20,000
120	15,000

THE CLIMATE GROUP

HSBC Climate Partnership **C**

## Current Activities



- Working towards informing and enabling collaboration through best practise sharing across sectors and at a multi stakeholder level.
- Bringing together major FIs to discuss leverage investments for clean energy. Capacity building of FIs to design climate sensitive products and services.
- Accelerate deployment of low carbon solutions, through participation of Indian companies in a global industry alliance focussing on energy efficiency, renewable energy and others.
- Working closely with leading IT companies and Government of India on ICT enabled solutions for key sectors (power, buildings etc).

THE CLIMATE GROUP



## Light Savers - *low carbon lighting project*



- Aim: accelerate market penetration of LEDs and smart adaptive lighting controls in outdoor lighting applications
- LED pilot projects in selected cities in the US, Canada, UK, China and India. Official launch in September 2009 when Mayors in each city will make a public announcement.
- Applications include pedestrian pathways, parking lots and garages, neighbourhood streets and major arterial roads
- Over 12 months of pilot testing to inform each city's eventual scale up strategy.
- The low carbon lighting project is being funded by a philanthropic donation from HSBC under the HSBC Climate Partnership Program

Rensselaer Univ - Kim and Schubert - 'If all of the world's light bulbs were replaced with LEDs for a period of 10 years, researchers say it would reduce

- global oil consumption by 962 million barrels
- the need for 280 global power plants
- carbon dioxide emissions by 10.68 gigatons, and
- result in financial savings of \$1.83 trillion.

THE CLIMATE GROUP

