

# Climate MRV for Africa – Phase 2

## MRV of Mitigation actions

### Energy Efficiency in LIGHTING



**NIRAS**  
Lead partner

GreenStream

**TÜVRheinland**<sup>®</sup>  
Precisely Right.

**camco**  
clean energy

## Project of the European Commission DG Climate Action

EuropeAid/136245/DH/SER/MULTI

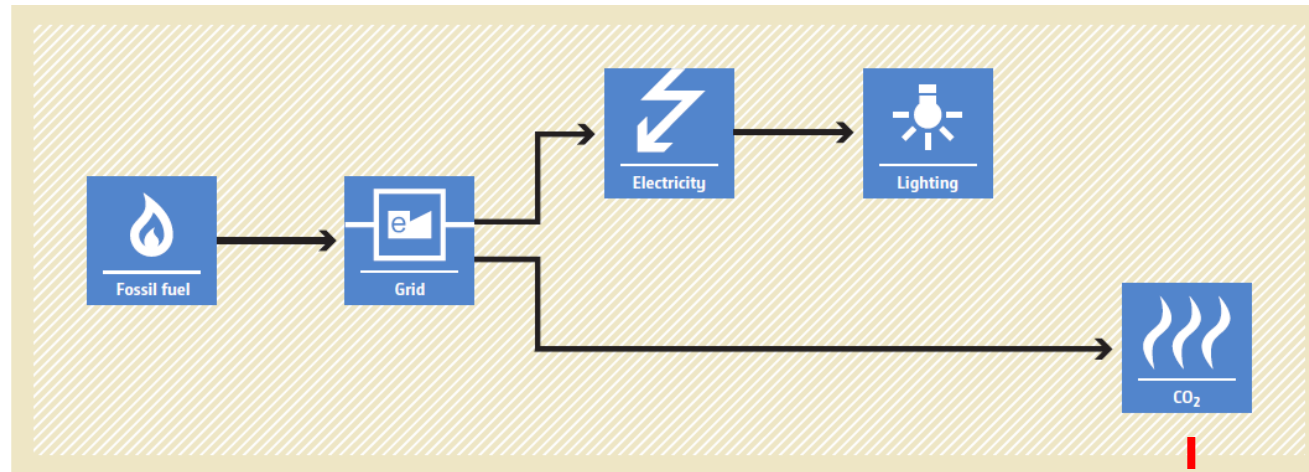
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Team Leader and Key Experts

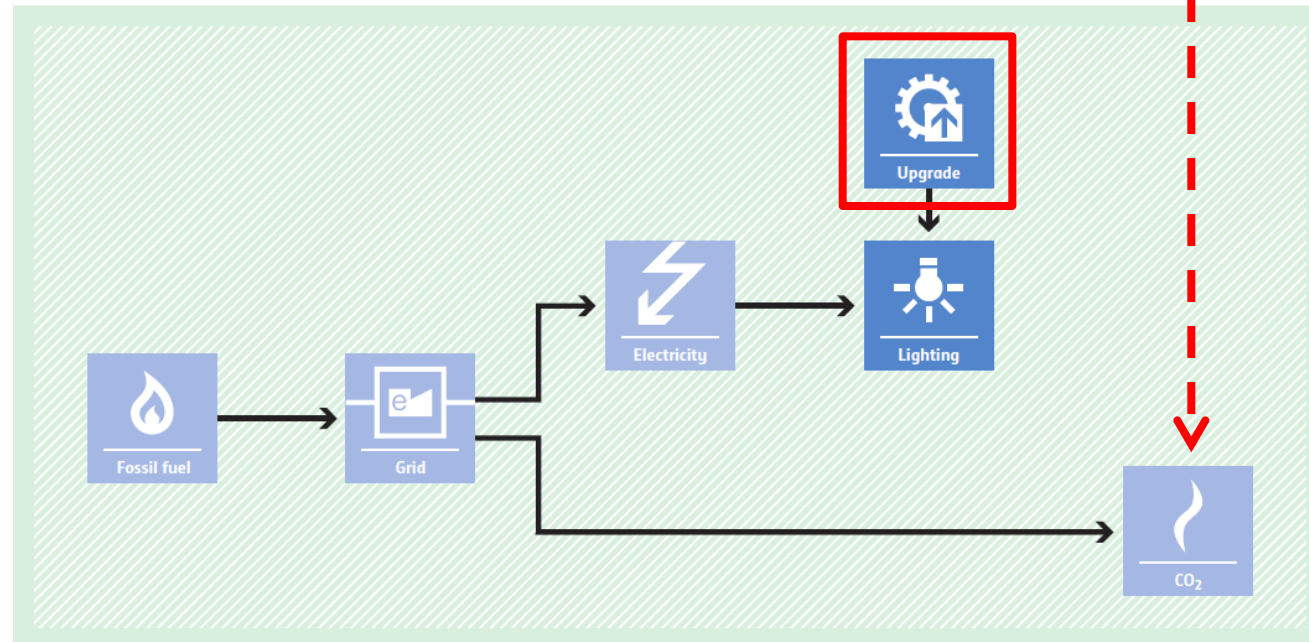
May 2017

# 1. Define policy/action: EE Lighting

Baseline scenario:  
low-efficiency lighting



Mitigation scenario:  
high-efficiency lighting



# Lighting options – efficient light bulbs

Incandescent light bulbs

Fluorescent tubes

Halogen lights

Compact Fluorescent Light (CFL)

Light Emitting Diode (LED)



Low Pressure Sodium

High Pressure Sodium

LED



# Lighting options – efficient light bulbs

	<b>Incand't</b>	<b>Halogen</b>	<b>CFL</b>	<b>LED</b>
<b>Purchase price</b>	\$0.41	\$1.17	\$0.99	\$3.66-\$4.99
<b>Watts</b>	60	43	14	6.5-9.5
<b>Lumens (mean)</b>	860	750	775	800-815
<b>Lumens/watt</b>	14.3	17.4	55.4	85.8-123.1
<b>CRI</b>	100	100	82	80
<b>Lifespan (hours)</b>	1,000	1,000	10,000	15,000-20,000
<b>Lifetime (years)</b>	0.46	0.46	4.6	6.8-11.4
<b>Energy cost (20 yrs @ 11 cents/kWh)</b>	\$289	\$207	\$67	\$31-\$46
<b>Total cost (20 yrs)</b>	\$307	\$259	\$70	\$42-\$56

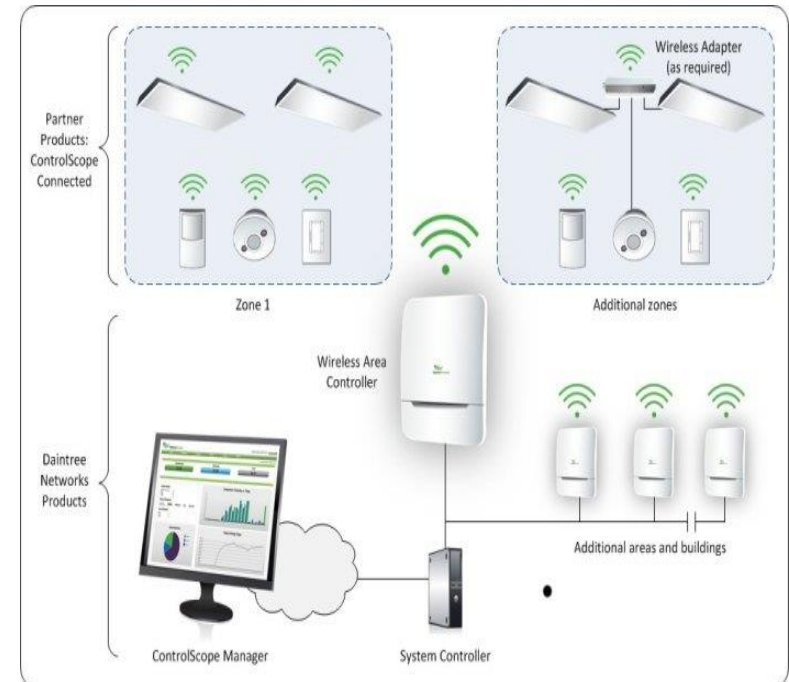
# Lighting options – light controls

Programmable switches

Dimming controls

Motion-sensitive controls

Photo-sensitive controls



# 2.a Define boundary: WHERE

## Buildings:

Residential

Commercial

> Offices

> Shops

> Hotels/restaurants

## Street lighting

All areas

➤ Urban

➤ Suburban



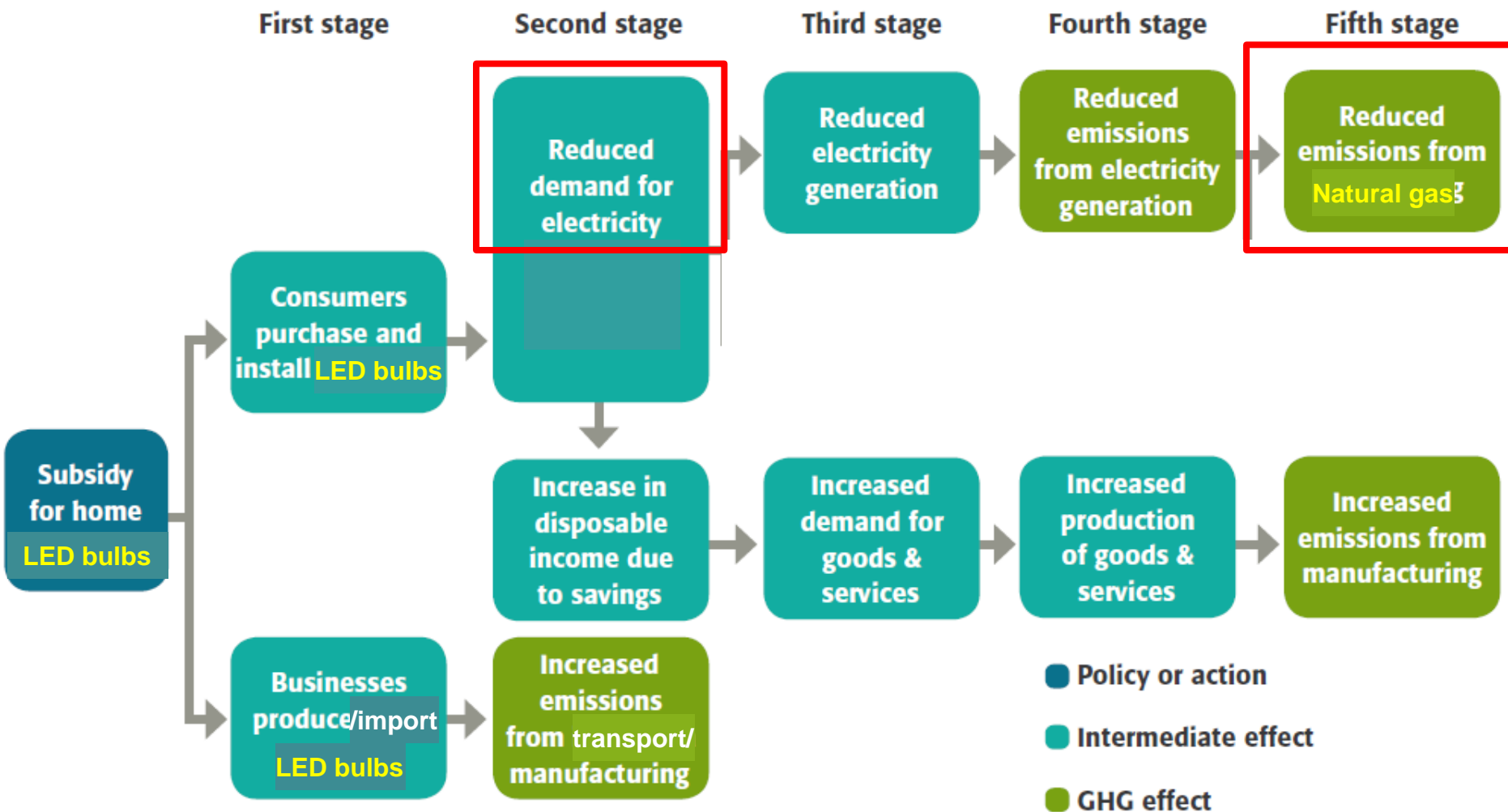
## 2.b Define boundary: WHAT GHGs

### ➤ Assess significance of GHGs

GHG effect	Likelihood	Magnitude	Included?
<b>CO2</b>	<b>Very likely</b>	<b>Major</b>	<b>Included</b>
<b>CH4</b>	<b>Very likely</b>	<b>Minor</b>	<b>Excluded</b>
<b>N2O</b>	<b>Very likely</b>	<b>Minor</b>	<b>Excluded</b>

### ➤ GHG sinks? **No**

# 2.c Map Causal Chain – Home LEDs





# 3.a Estimate emissions: BASELINE

## ➤ Fundamental equation

A		B		= A x B
<b>Electricity consumption (MWh)</b>	<b>x</b>	<b>Grid Emissions factor (tCO<sub>2</sub>/MWh)</b>	<b>=</b>	<b>CO<sub>2</sub> emissions (tCO<sub>2</sub>)</b>

## ➤ Electricity consumption:

- Top-down: total consumption by the sector/end-use
- Bottom-up:  $\Sigma$  [fixtures x capacity x hours of use]

# CDM methodologies for LIGHTING

AM0046

AM0113

AMS-II.N.

AMS-II.J.

AMS-II.L.

AMS-II.N.

AMS-III.AR.

# 3.b Estimate emissions: MITIGATION

- **Option 1:**
  - Repeat the calculation for Efficient Lighting AND
  - Subtract **BASELINE – MITIGATION** emissions
- **Option 2:**
  - Calculate as % **reduction** on BASELINE emissions



## 3.c Estimate emissions: SAVINGS

$$ER = \sum_i \sum_u \text{Energy savings}_{i,u} \times EF$$

*ER: Emission reduction*

*EF : Grid emission factor*

*i= type of fixture*

*u= usage group*

# 3.d Performance indicators: MONITORING



# Thank you!

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