

# ICAT Sustainable Development Methodology

## Case study on solar mini-grids in Kenya

Awareness on impacts of response actions  
22nd - 24th May 2019 - Santiago de Chile

AN ASSESSMENT OF THE  
SUSTAINABLE  
DEVELOPMENT IMPACT  
OF SOLAR PV MINI-GRIDS  
IN KENYA THROUGH THE  
ICAT SUSTAINABLE  
DEVELOPMENT  
GUIDANCE

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INITIATIVE FOR  
**Climate Action  
Transparency**



7 AFFORDABLE AND CLEAN ENERGY



13 CLIMATE ACTION



4 QUALITY EDUCATION



3 GOOD HEALTH AND WELL-BEING



8 DECENT WORK AND ECONOMIC GROWTH



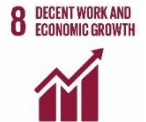
2 ZERO HUNGER



1 NO POVERTY



# Case Study



Assess the ex-ante Sustainable Development impact of **solar PV mini-grids in Kenya**

**146 mini-grids under construction as part of NDC**

- Kenya Off-grid Solar Access Project (K-OSAP)
  - Rural Electrification Authority (REA)

**31,800** non-electrified households and businesses

Assessment period 2024-2030



# Choice of the Impact Categories

## Relevance

- Country's objectives
  - Objectives of the policy
    - Stakeholders
- (Stakeholders Interviews)

## Significance

- Relevance
- Credibility
- Validity
- Reliability
- Feasibility

## Comprehensiveness

+ Indicators

### Environmental



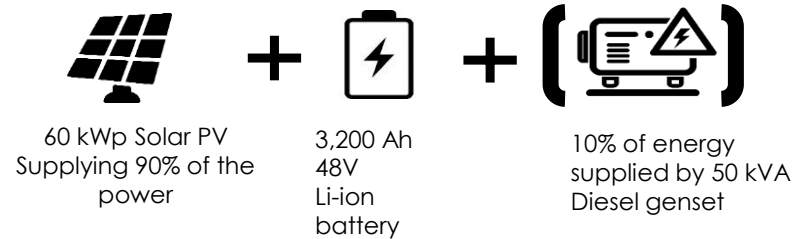
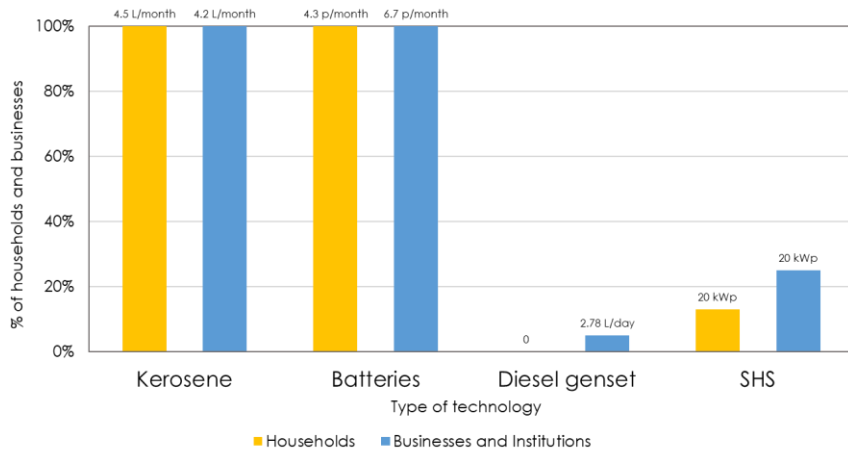
### Social



### Economic



# Baseline and Policy scenario



All parts of the system: from production to disposal (full Life Cycle)

# Qualitative Impact Assessment

1

## Identify **Specific Impacts**

- Within each impact category
- Can be short, medium, or long term impacts
- Can be identified through causal chains (we have used stakeholders interviews and literature)

2

## Specific impact are scored according to **Likelihood and Magnitude**

- Assessed using different methodologies ... (we have used online literature)
- Impacts are divided in **Significant and Non-Significant**

3

## **Overall impact** on impact categories according to specific impacts



# Qualitative Assessment Results

Impact categories	Specific impacts	Likelihood	Magnitude
Waste generation	<b>Increased generation of e-waste from PV</b>	Possible	Major
	<b>Reduced generation of waste from kerosene lamps, portable batteries and candles</b>	Likely	Moderate
	Increased generation of residential waste level due to increase consumption	Likely	Minor
Access to clean, reliable and affordable energy	<b>Access to clean, reliable and affordable electricity</b>	Very likely	Major
	Access to clean sources of cooking	Possible	Minor
Accessibility and quality of education	Increased study time at school and home	Likely	Minor
	<b>Quality of education facilities and teaching</b>	Likely	Moderate
	Higher attendance and school performance	Possible	Minor
Food security	Improved food availability from improved agricultural productivity	Unlikely	Major
	Improved food availability from increased knowledge and information from telecommunication systems	Likely	Minor
	<b>Improved food security from improved food storage due to refrigerators</b>	Likely	Moderate
Access to water	Improved access to water for drinking and productive uses	Unlikely	Moderate
Accessibility and quality of healthcare	<b>Improved access to healthcare due better service in HCs and longer working hours</b>	Likely	Moderate
	<b>Improved access to healthcare due to the possibility of storing vaccines</b>	Likely	Moderate
Gender equality and empowerment of women	<b>Mobility at dark hours</b>	Likely	Moderate
	Knowledge on health and family planning	Possible	Minor
Economic activity (community)	<b>Business creation</b>	Likely	Moderate
	Increased productivity	Likely	Minor
	Access to finance through mobile phones	Very likely	Minor
Employment	More jobs due to increasing activity of local industry	Likely	Minor
	<b>More jobs in the solar industry</b>	Likely	Moderate
	Less jobs from kerosene, candles and batteries sectors	Possible	Unknown
Income	<b>Increase in income of businesses</b>	Possible	Moderate
	<b>Household's economy</b>	Possible	Moderate

# Life Cycle Assessment



An **assessment method** that quantifies **all of the environmental consequences** of a good or service, considering its **entire life cycle**

Recommended tool to assess environmental impacts

UNEP World Summit on Sustainable Development  
"Johannesburg Summit" (2002)

## Impacts

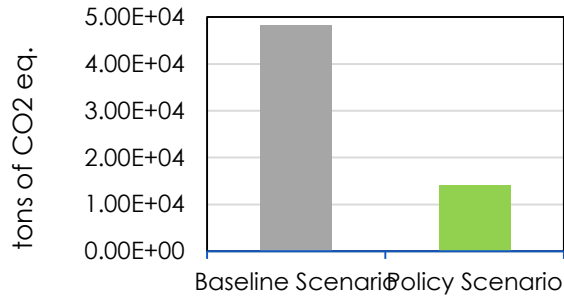
- **Global** (Climate change, ozone depletion, Depletion of non-renewable resources...)
- **Regional** (Acidification, Eutrophication, Toxicity , Air pollution...)
- **Local** (land/habitat loss, Depletion of water resources...)

## Avoids burden shifting

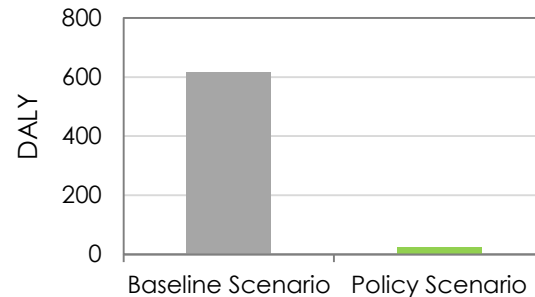
- Between impact categories
- Between life cycle stages
- In time and space



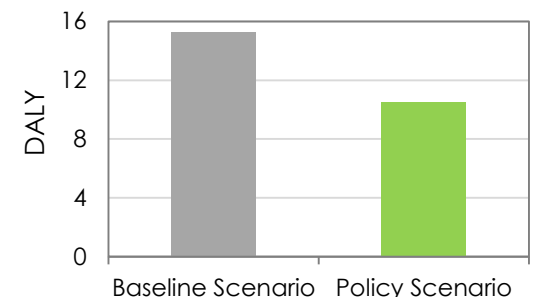
# Quantitative Impact Assessment



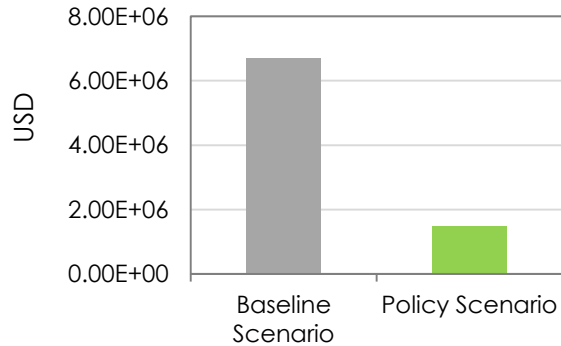
Climate Change



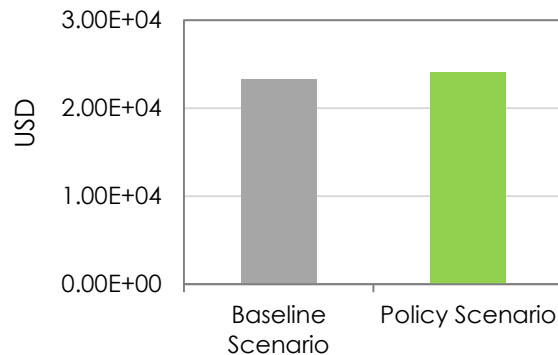
Air Pollution



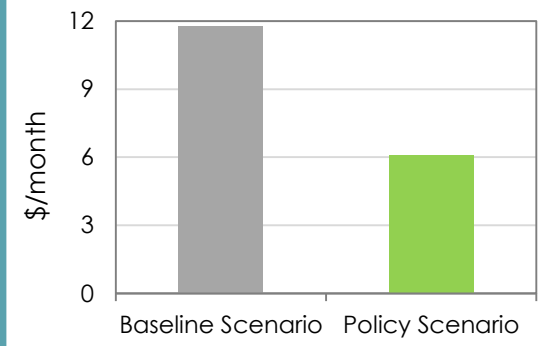
Human Toxicity



Fossil resource depletion



Mineral resource depletion



Expenses on electricity

## Life Cycle Assessment (LCA)

# Putting results into perspective

Equivalent to 0.4% of NDC target for electricity generation



Importance of communicating results using SDGs

- Common framework



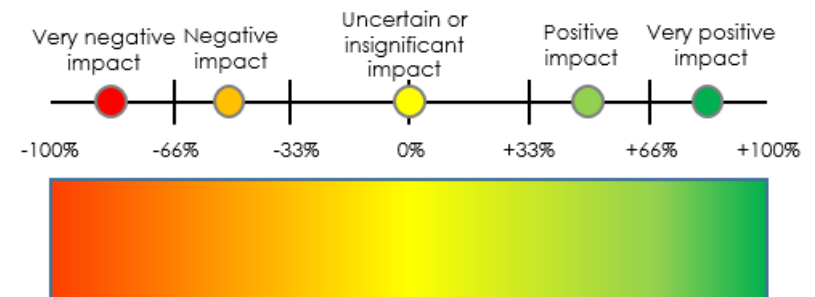
# Connecting impacts to SDGs

Impact categories and specific impacts analysed are connected to the **SDGs targets**

## Qualitative categories

		Magnitude (Negative)			Magnitude (Positive)		
		Major	Moderate	Minor	Minor	Moderate	Major
Likelihood	Very likely						
	Likely						
	Possible						
	Unlikely						
	Very unlikely						

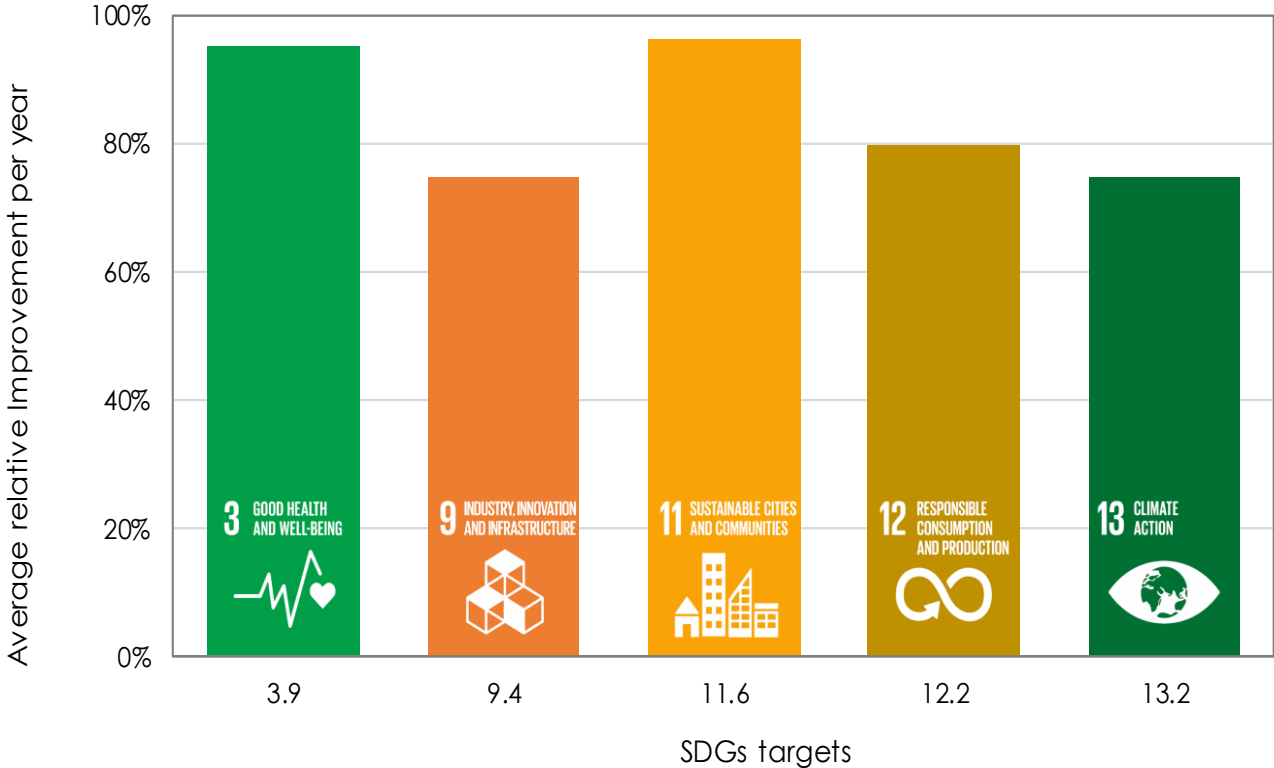
## Quantitative categories





Impact category	SDGs target	Reason
Climate Change mitigation	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities  13.2 Integrate climate change measures into national policies, strategies and planning	9.4 The impact on climate change mitigation of the policy increases resource-use efficiency and consists in an adoption of clean and environmentally sound technology  13.2 The policy considered is a climate change measure
Air pollution (Indoor and Outdoor)	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9 Air pollution, such as the one avoided in the policy scenario affects the number of deaths and illnesses from air contamination
Human Toxicity (Air, water and soil)	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9 Human toxicity impacts evaluated in the case study causes deaths and illnesses from water, air and soil pollution
Depletion of non-renewable resources	12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2 The impact categories on fossil and mineral resources evaluated keep track of the efficient use of natural resources
Waste generation and disposal	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment  12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	12.4 The specific impacts on “Increased generation of e-waste from PV”, “Reduced generation of waste from kerosene lamps, portable batteries and candles” and “Increased generation of residential waste” will have an effect on the management of waste and minimize their impacts on humans and environment.  12.5 The same specific impacts will also have an effect on prevention and reduction of waste
Accessibility and quality of health care	3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	3.8 The specific impacts on “Improved access to healthcare due better service in HCs and longer working hours” and “Improved access to healthcare due to the possibility of storing vaccines” are connected with accessing quality essential health-care services and vaccines for all
Food security	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3 The specific impacts “agricultural productivity” and “knowledge and information from telecommunication systems” will affect agricultural productivity of small-scale food producers, through productive resources and inputs, and knowledge
Access to safe drinking water	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1 The specific impacts “Improved access to water for drinking and productive uses” will affect access to safe and affordable drinking water for all
Access to clean, reliable and affordable energy	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services  7.2 By 2030, increase substantially the share of renewable energy in the global energy mix  7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support	7.1 The specific impacts “Access to clean, reliable and affordable electricity” and “Access to clean sources of cooking” contribute to access to affordable, reliable and modern energy services  7.2 The access to energy evaluated in this impact category will happen through use of renewable energy, which substitutes fossil fuels  7.b The access to energy evaluated in this impact category consists of infrastructures and upgrade technologies supplying modern and in developing countries

# Quantitative SDGs impact







Thank you for your attention!

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