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Circular Economy @ Signify

Sustainability, Signify

Dr. Thomas Marinelli, Head of Sustainable Design & Sustainable Products

Agenda

1. Circular economy and lighting
2. Introduction Circular Lighting
3. Building Blocks
   a) Business Models
   b) Design
   c) Reverse Logistics
   d) Collaboration
4. Examples
   a) LEDification – what can be regained
   b) 3D printing – circular and material optimization

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1. Why is a circular economy relevant?

150%

150% Commodity price increase between 2002 and 2010

3 planets

Consuming the natural capital equivalent of 3 planets by 2050

1 trillion $

Global potential of $1 trillion in annual material savings by 2025

9%

Only 9% of all global technical materials are recycled after use

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1. Why is a circular economy relevant?

Definition:

The circular economy is an economic system that
maximizes the reusability
of products and raw materials and
minimizes value destruction.

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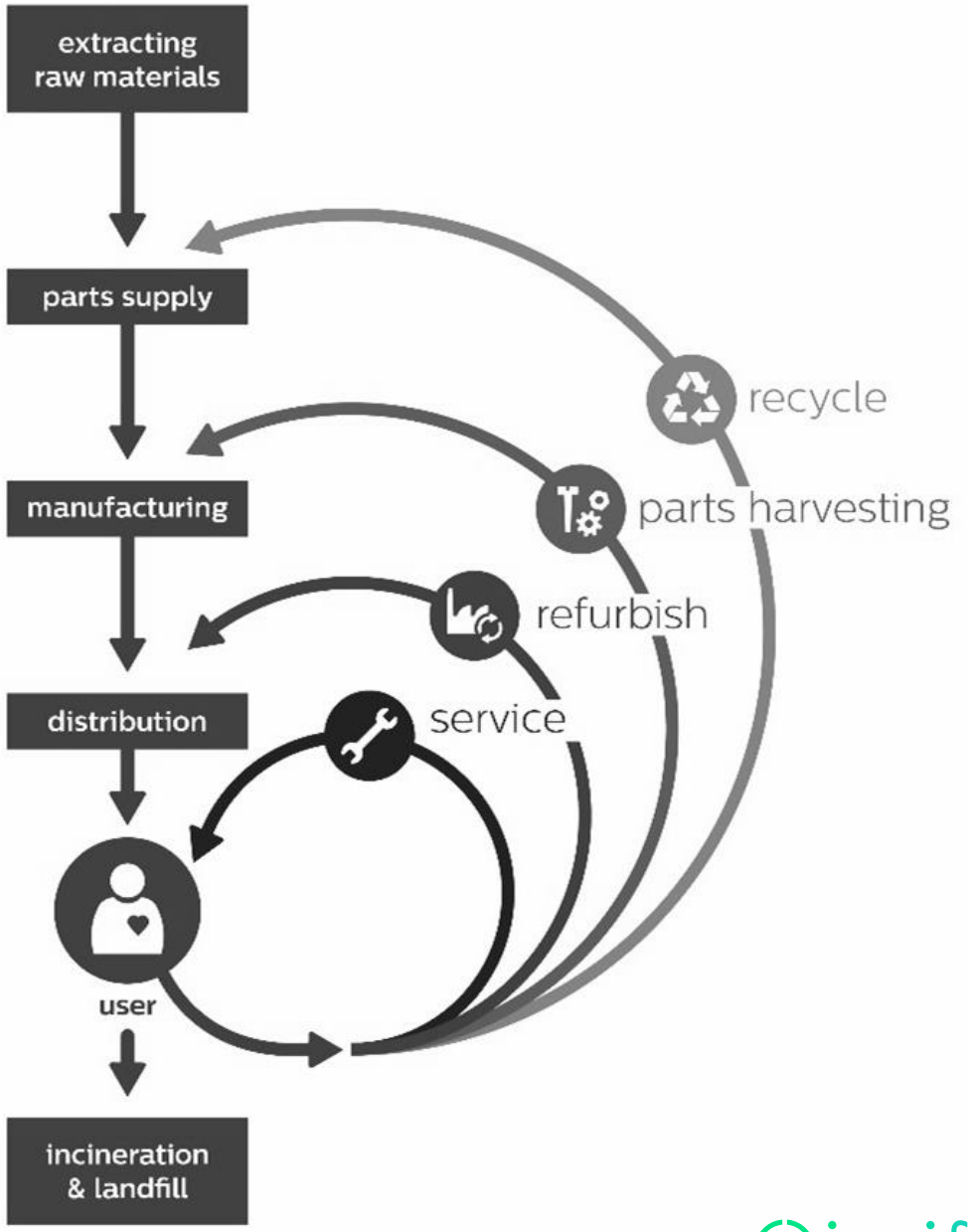
1. Circular economy and lighting

Address 4 material loops via 4 enablers



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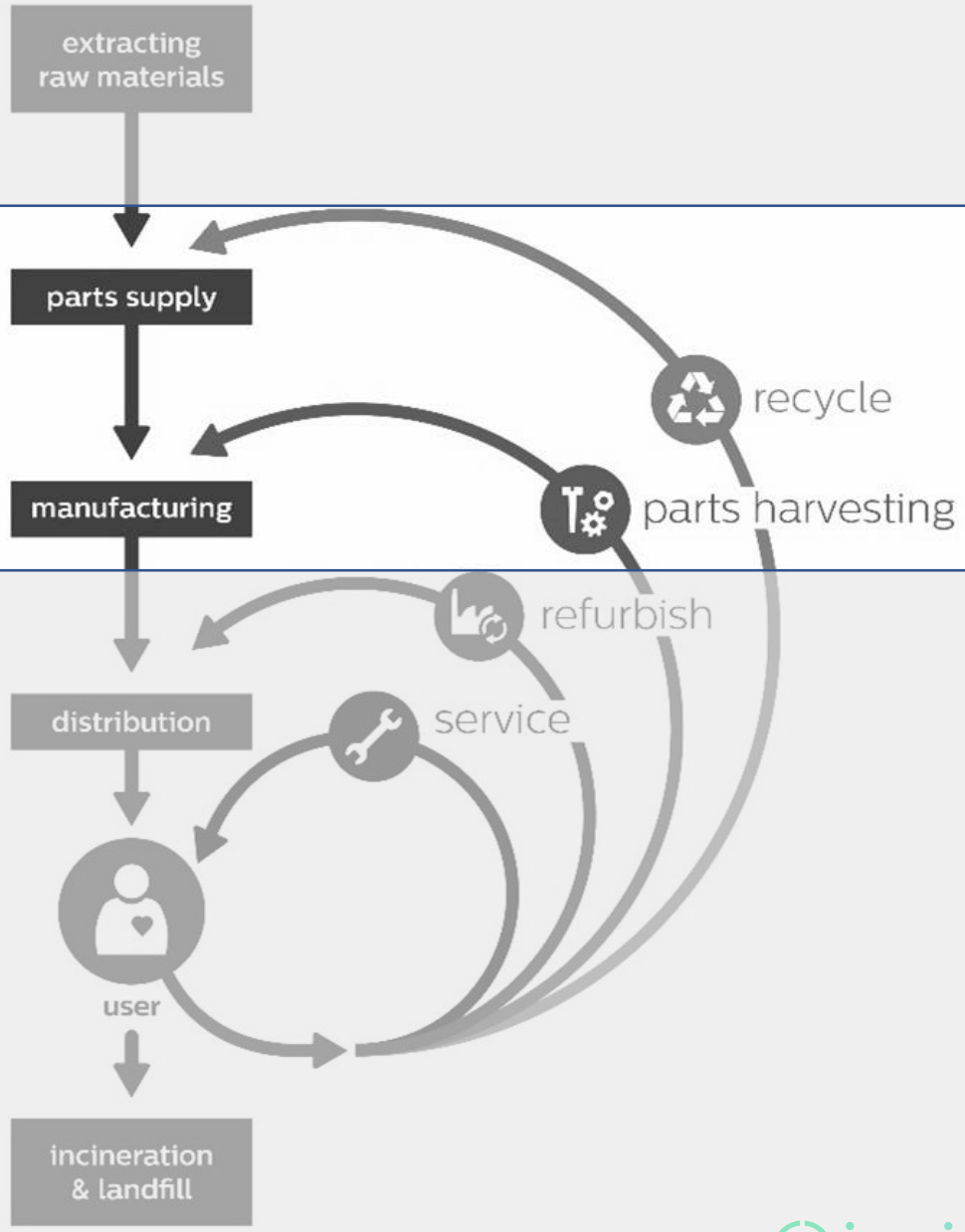
2. Introduction Signify Circular lighting

- LaaS performance contract
- Circular Economy ready luminaires
- End of contract repurposing options
- Systemic change via collaboration

Aimed to:

Maximize the reusability and to minimize value destruction.



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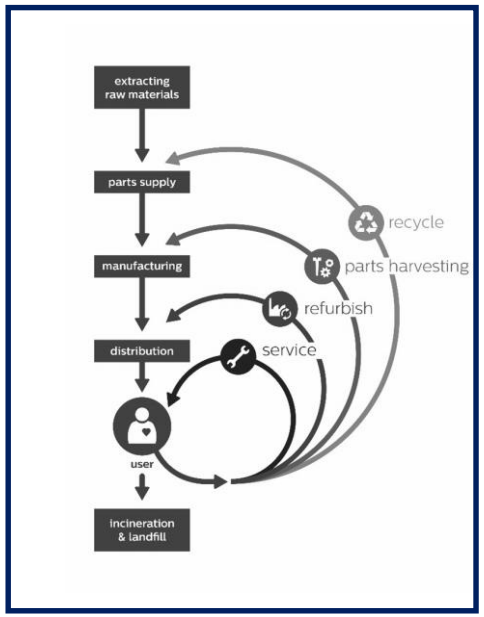
3. Circular lighting business model

A Signify LaaS Performance Contract



Change the model from possession to performance
Preserve the value by cycling longer or more often

Circular lighting includes a.o.:

- Re-purpose existing installation
- Performance KPIs (uptime, light quality, savings)
- Future proof via modular upgrade options
- Circular Economy Ready Luminaires
- End of contract (re-use and re-purposing) options

3. Circular lighting & existing service building blocks

	Managed Services		
Circular lighting as added value on existing building blocks	**Standard**	**LaaS**	**Circular Lighting**
Audit and Consulting	●	●	●
System Execution	●	●	●
Operations	●	●	●
Maintenance, Training and Documentation	●	●	●
Performance (Energy, Lighting and Uptime/Other KPI)	●	●	●
Financing A. On Balance for Customer (*)		●	●
Financing B. Off Balance for Customer (*)		●	●
Use of Circular designed products			●
End of Contract Management (Reusability – Value Preservation)			●

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3. Design for circular economy

Philips Pacific LED Circular Economy ready luminaire

1

Modular design:
Includes standardized components

2

Upgradable:
Upgradable to connected lighting system

3

Disassembly:
Non-destructive, less than five steps

4

Easy to maintain:
Lower failure rates due to efficient spare parts and asset management

5

Recycling:
Product breakdown into separated materials' waste streams*

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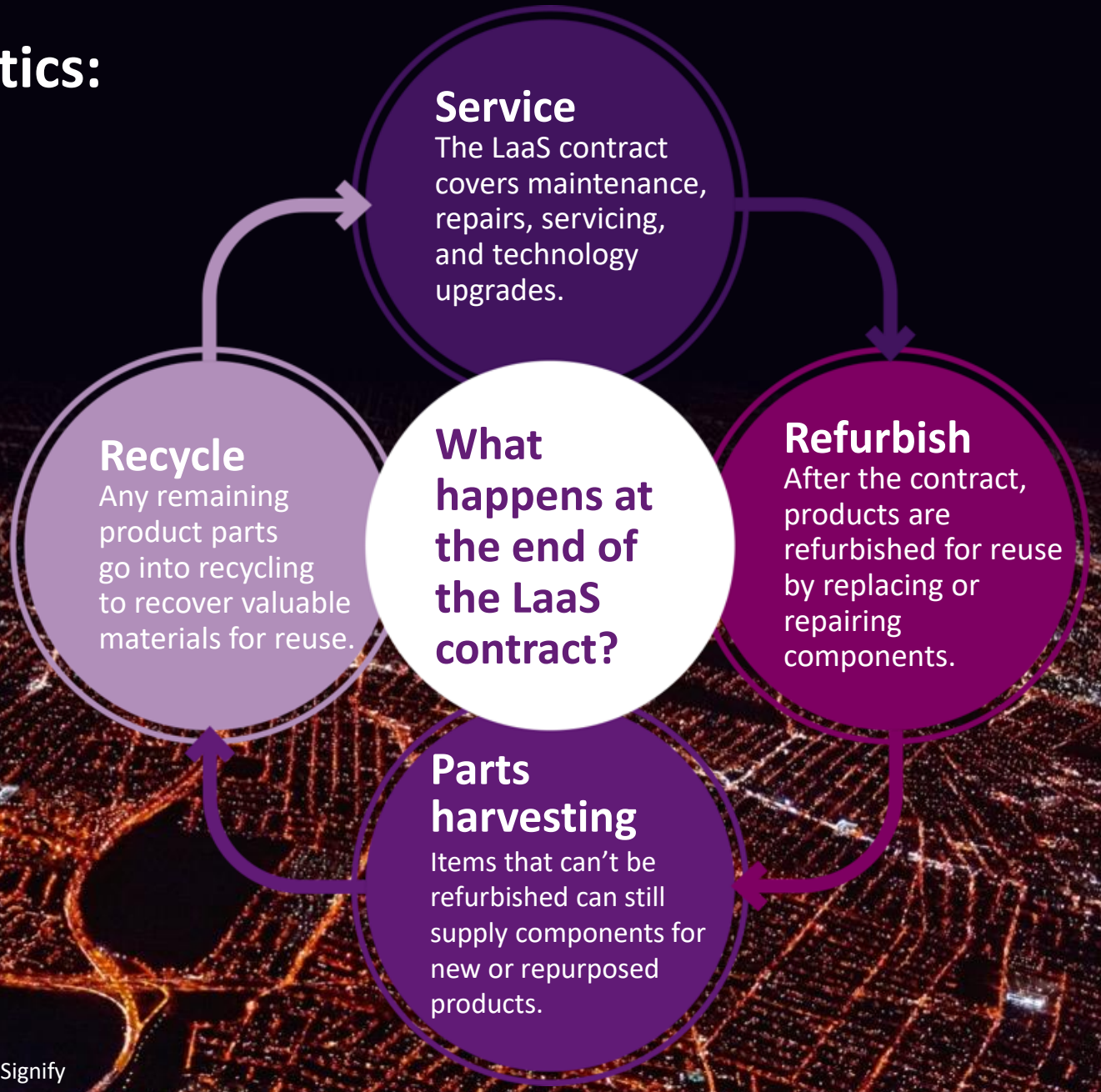
3. Reversed Logistics:



3. We're in it together

Cross-chain and cross-sector collaboration

Creating sustainable solutions for a circular economy requires bold steps and **close collaboration between many different parties:**

- At Signify, we are embarking upon a new service-based relationship with our customers. We fulfill the role of a trusted long-term partner in sustainability.
- In deploying and managing the lighting installations on site, we work with many technical partners like designers, architects and installers.
- To enable ongoing innovations in production and performance, we collaborate with the top suppliers and manufacturers in the supply chain.
- Our good relationships with leading sustainability consultants and researchers let us stay at the cutting edge of lighting innovation creating brighter lives and a better world.

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4. Examples

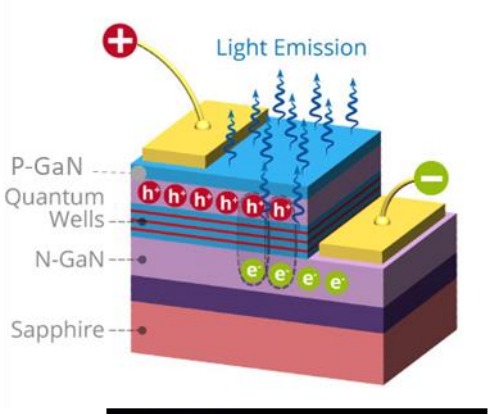
LED

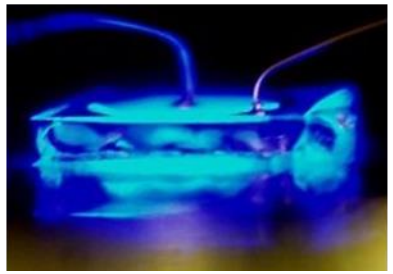
Current building blocks for visible emission:

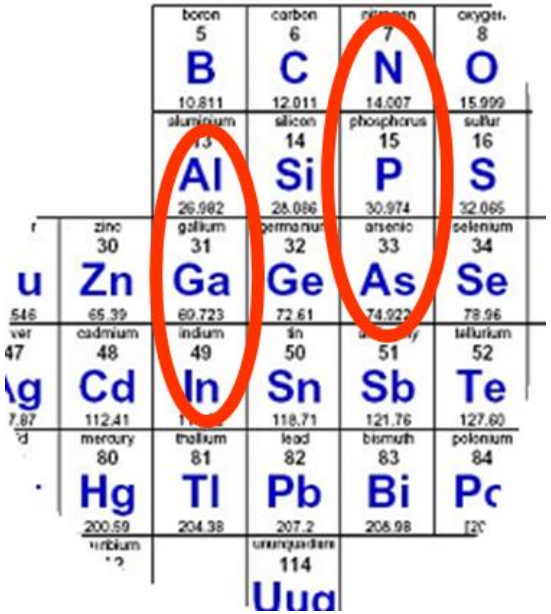
- **InAlGaN (blue/green, 99%),** multi layers of various compositions of GaN/AlGaInN grown on sapphire (AlO)
- **AlGaInP (red/orange, yellow),** multi layers of various compositions of AlGaInP grown on GaAs

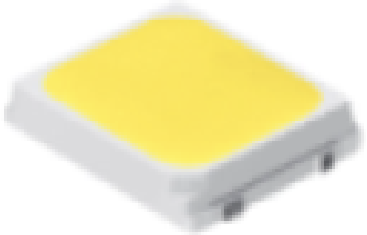
Most popular package

- 2835: 2.8x3.5mm leadframe
  - Cu thickness 200µm, plated with Ag 3µm
- GaN chip: 0.1mm^2 up to 1mm^2
  - GaN thickness ~6µm on substrate (3-30µg Ga per chip)
- Silicone/phosphor mix
    - Silicone ~3.5mg
    - Phosphor ~1mg YAG (Ce ~1mol%); ~0.1mg ECAS (Eu ~2mol%)









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What to be regained from any valuable in LED package after usage?

TRENDS

- More and more focus on comfort lighting: CCT, CRI, warm dim, spectral tuning (daylight rhythm), connectivity.
- For retrofit products from metal to plastic to full glass, all having electronics insight

- For luminaires: further integration of LED / driver / housing / sensors

VALUABLES

- LED production consumes critical metals such as Ga, In, Ce, Y, Lu
- Recycling not viable for LED products (very low levels)
  - ➢ Might be viable in LED production waste streams
- Recycling of LED leadframe, driver components, housing etc. could be of interest (Ag, Cu, Au)

3D printing luminaires

Case study: Praxis

Functional High Bays tailored to customer needs

Praxis needed a fast and functional but also decorative luminaire to light their stores. As part of a major light-as-a-service (LaaS) relighting operation, Telecaster PM Series are used as general lighting. A light-weighted, very easy to install, cost effective and esthetically flexible luminaire which made the business case work. And because of the light-weight, local production and re-usable design and materials it’s also very sustainable.

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Contribution 3D printing to your sustainability goals
Reduce carbon footprint and material waste

No paint, less parts, no screws

Telecaster 3D printed products are designed for a circular economy, reducing significant waste

- **Design**: higher serviceability and upgradable by default
- **End-of-life footprint** significantly better due to improved recyclability and re-use of polycarbonate (re-grinding)
- **Closing the material loop** within the factory, re-using own material

Up to 50% lower carbon footprint

- The **carbon footprint** associated with the extraction of raw materials is lower for plastics than for metals
- Manufactured and assembled in Europe, no (semi-) parts transport from China
- Significant **lower product weight**, lower carbon emissions for transport to customers

A huge variety is cooking in the kitchen

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Our Q3 2018 achievements

20% decrease in gross carbon footprint
compared to Q3 2017

Carbon neutral
Operations in Benelux, MET, UKI, IIG, France, Iberia, China, US, Canada

90% of risk suppliers passed the audit

79.0% Sustainable revenues

CDP™
We achieved the highest score in the 2017 CDP climate disclosure & supply chain

Dow Jones Sustainability Indexes
We were named 2017 & 2018 **Industry leader in the DJSI**

MSCI ESG Research
We were categorized as **ESG leader** with an 'AA' rating by MSCI ESG research

13% decrease in Total Recordable Case rate
compared to Q3 2017

31% decrease in waste to landfill
compared to Q3 2017

84% of industrial waste is recycled

1.59 Billion LED
lamps and Luminaires delivered since 2015

80% of our used electricity came from renewable sources

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Our programs contribute to 4 UN Sustainable Development Goals (SDGs)

Social impact of our portfolio

- Creating light for greater wellbeing and safety
- Providing access to light in off-grid areas via solar lighting
- Improving yield in horticulture and aquaculture to provide food for a growing population
- Providing humanitarian lighting in cases of emergency or disaster through the Signify Foundation

7 AFFORDABLE AND CLEAN ENERGY · 11 SUSTAINABLE CITIES AND COMMUNITIES · 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Social impact of our operations

- Implementing an Injury prevention program to create a safe and healthy workplace for our employees and contractors
- Working with our suppliers to ensure good working conditions

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Environmental impact of our portfolio

- Decreasing our customers' footprint via energy efficient lighting
- Realizing even more energy savings for our customers through connected lighting
- Saving material resources via Circular lighting
- Driving accelerated renovation rates of buildings

11 SUSTAINABLE CITIES AND COMMUNITIES · 12 RESPONSIBLE CONSUMPTION AND PRODUCTION · 13 CLIMATE ACTION

Environmental impact of our operations

- Increasing energy efficiency of our own operations and logistics and shifting to renewable electricity
- Investing in carbon offsetting projects with social and environmental impacts
- Reducing waste generation and waste to landfill
- Working with suppliers to reduce their footprint
- Shifting to electric / hybrid vehicles

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