LEDucation
Trade Show and Conference

Designers Lighting Forum

Sustainable Lighting: From Theory to Impact

Alexandra Christiana | HMFH Architects
Kate Hickcox | Pacific Northwest National Laboratory
Scott Roos | Acuity Brands
Leela Shanker | WAP Sustainability Consulting

March 18, 2025

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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Learning Objectives

At the end of this course, participants will be able to:

1. Gain a deeper understanding of the relative environmental impacts from the materials, design, manufacturing, use and end-of-life treatment of luminaires…and how our ability to reduce them will most likely evolve.

2. Understand the nuances behind material transparency labeling and life cycle assessments, what they tell us about how to truly minimize the environmental impact of the luminaires we design, manufacture & specify and the challenges to scaling these in a meaningful way.

3. Understand the benefits and limitations of simpler sustainability metrics (e.g., TM65 embodied carbon calculations and TM66 Circular Economy assessments) vs. more comprehensive Life Cycle Assessments/EPDs.

4. Be able to immediately apply learnings to your practice to reduce the impact of the luminaires you design, specify and apply and how to best advocate for positive industry change going forward.

Today's Panelists

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Sustainability Leader

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0 response submitted

What is your Job Function?

- Lighting Designer
- Architect or Interior Designer
- Electrical Engineer
- Manufacturer's Representative
- Manufacturer
- Distributor
- Other

Treemap | Bar

1 of 1

Scan the QR or use link to join

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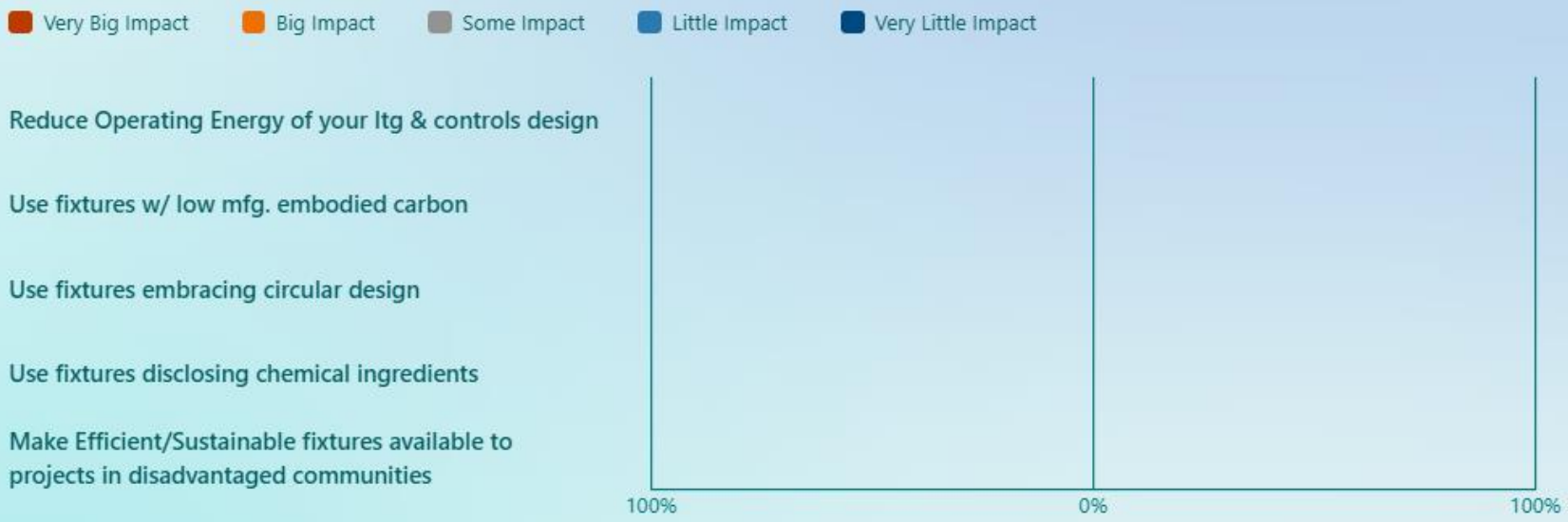
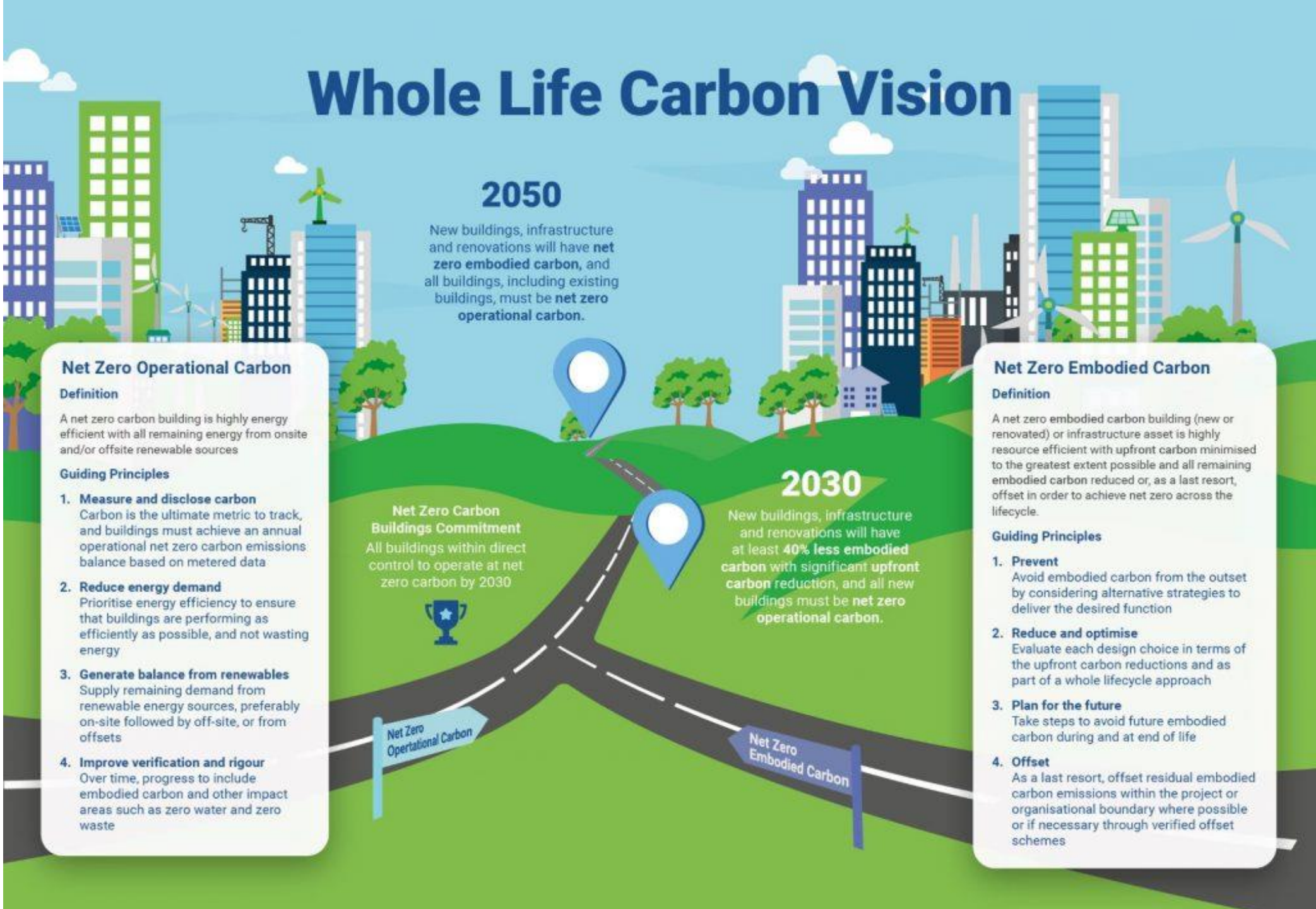
Rate the relative impact you believe the below factors can have on reducing the environmental impact of your projects



Key Sustainability Considerations

Lifecycle Carbon & Other Emissions



https://worldgbc.org/advancing-net-zero/whole-life-carbon-vision/

CO2 Emissions = Embodied + Operational Carbon

Typically 90%+ of Luminaire Lifecycle CO2 Emissions

Heavily influenced by:
-Local energy grid composition
-Fixture efficacy
-Application efficacy
-Controls integration

* Based on results of 2023 Green Light Alliance Life Cycle Assessment Incubator using the current composite of the North American Energy Grid

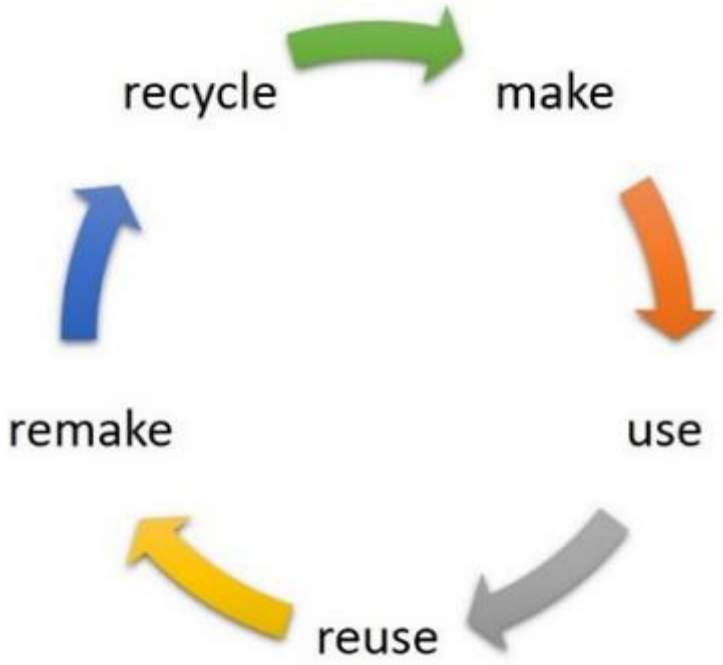
Greenhouse Gas emissions have multiple environmental impacts

Impacts	Acronym	Unit of Measure
Global Warming Potential	GWP	kg CO_2-eq
Acidification Potential	AP	kg SO_2-eq
Eutrophication Potential	EP	kg N-eq
Smog Formation Potential	SPF	kg O_3-eq
Ozone Depletion Potential	ODP	kg CFC11-eq
Blue Water Consumption	BWC	kg
and others!	…	…

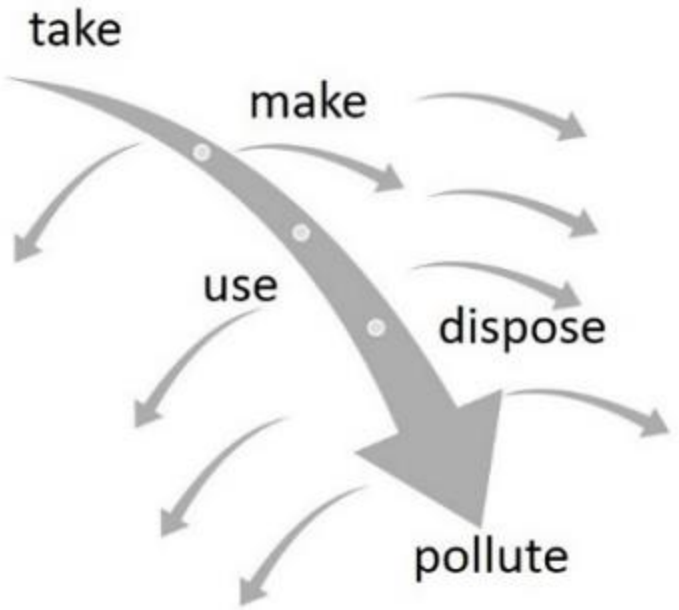
Circular Economy

Economic Model Centered on Regeneration & Reuse

Circular Model



Linear Model

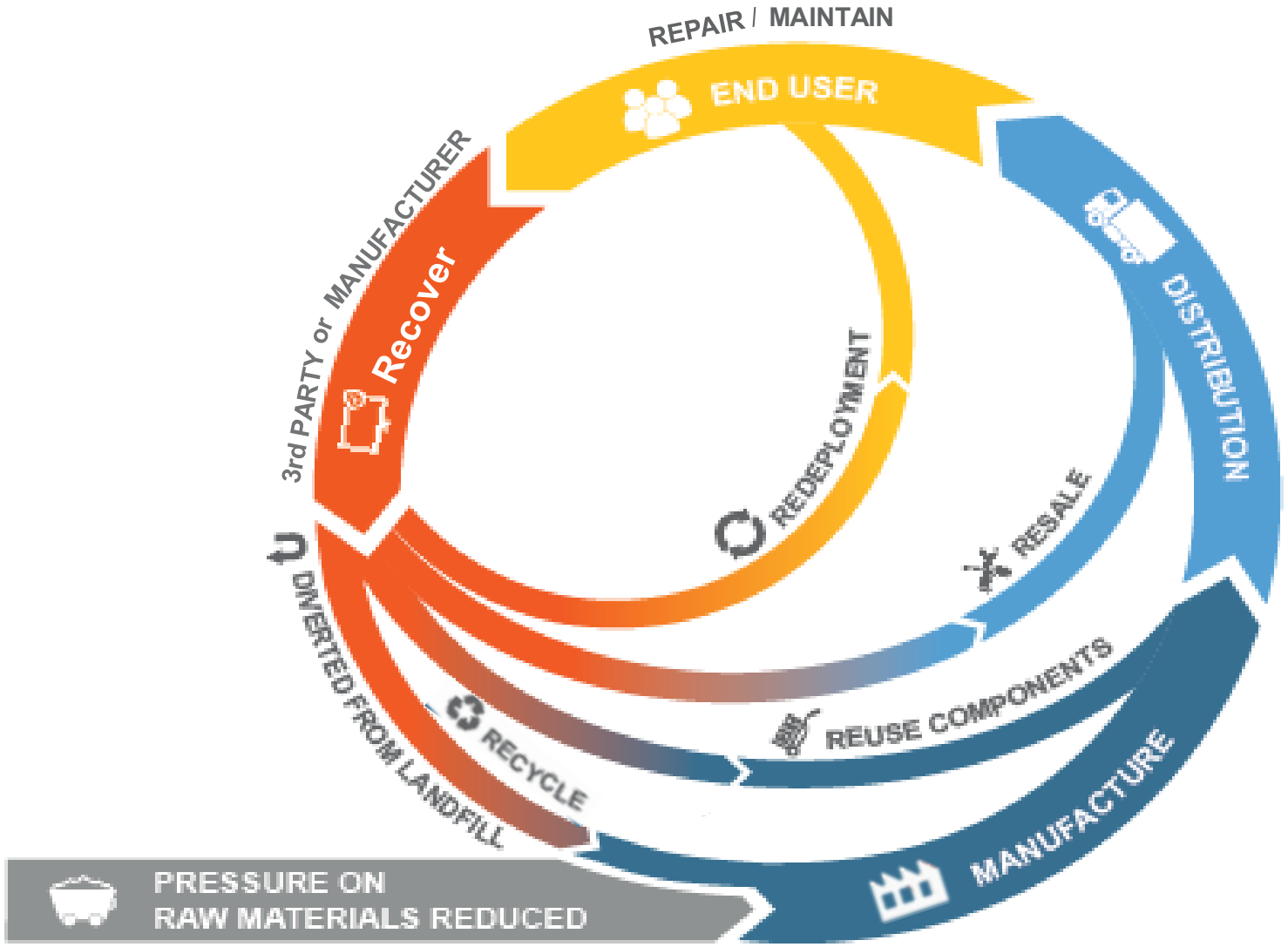


Source: A Circular Economy Handbook for Business and Supply Chains: Repair, Remake, Redesign Rethink by Catherine Weetman

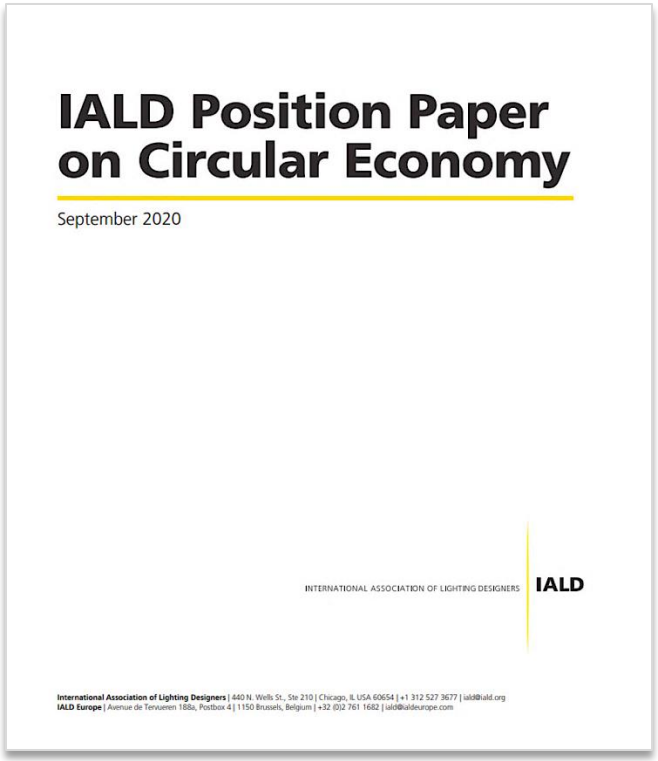
Lighting Industry is primarily a Linear Economy

RAW MATERIALS → MANUFACTURE → DISTRIBUTION → END USER → INCINERATION or LANDFILL

Aspirational Lighting Industry Circular Economy



2020 IALD Position Paper with Recommendations



"Truly embracing the circular economy philosophy requires significant change to existing practices across the lighting and building industries"

- Replaceability of LEDs & control gear while addressing long term compatibility issues through regulation
- A standard to ensure compatibility of retrofit lamps
- Products designed to last longer and be more easily repaired, refurbished, reused & recycled
  - To include new assessment tools i.e., electronic product passports, repairability index or sustainability score
  - Greater material transparency from manufactures
- Development of a secondary market for used luminaires including tax incentives
- Encourage new business models such as LaaS
  - Call for an effective way to regulate product as a service contracts to ensure they are fully coherent with the circular economy principles

IALD Position Paper on Circular Economy

Material Health

Materials Health Impacts on People and the Environment

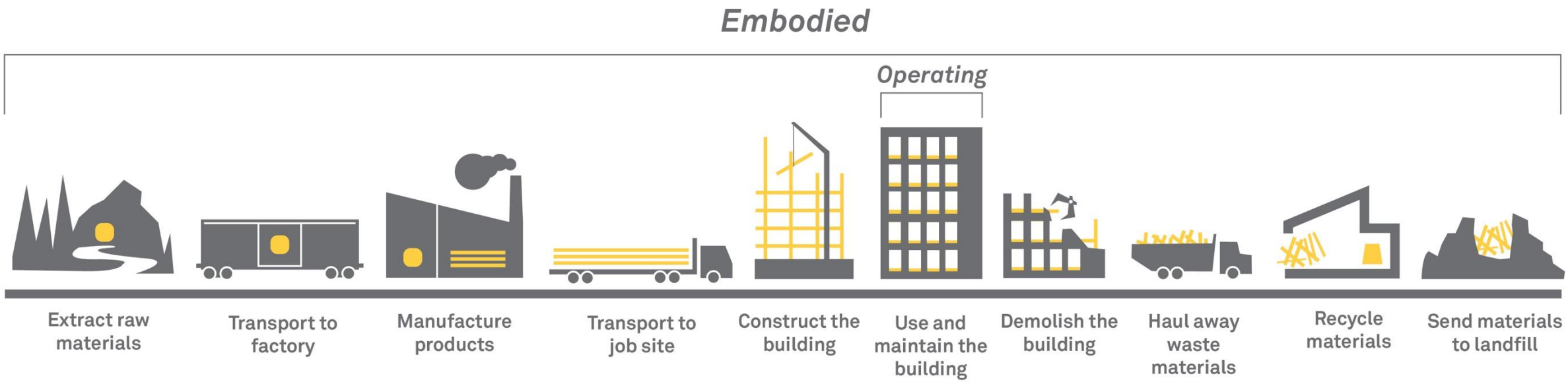
Why is this so important?

People spend the vast majority of their time indoors.

86.7%

The National Human Activity Pattern Survey (NHAPS): A Resource for Assessing Exposure to Environmental Pollutants, by Neil E. Klepeis and others, and published by the Lawrence Berkeley National Laboratory in 2001.

Beyond the Building Occupancy



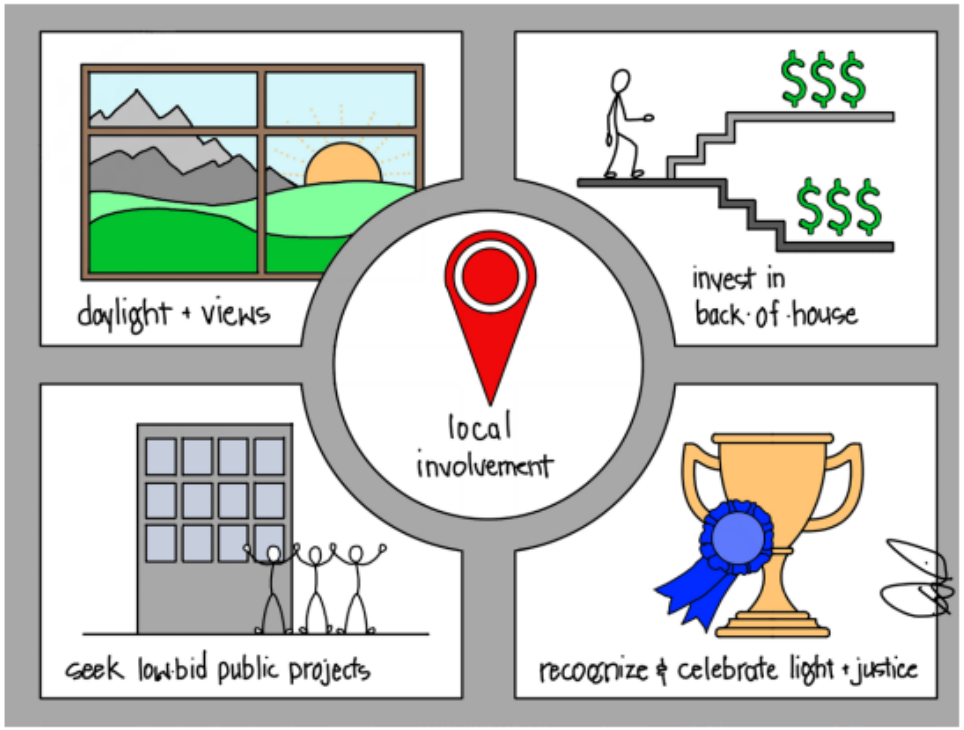
Social Responsibility

['sō-shəl ri-ˌspän(t)-sə-'bi-lə-tē]

The principle that, in addition to pursuing profit generation, corporations should strive to act in a way that positively affects society and the world.

Lighting Manufacturer's View

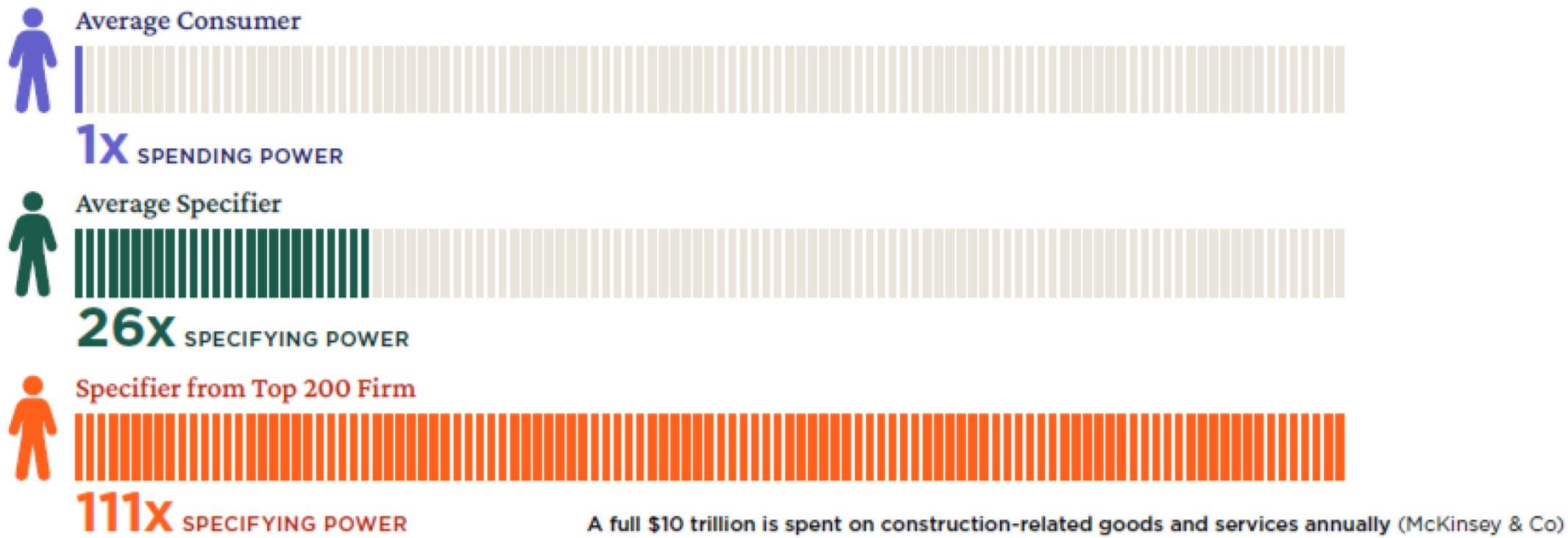
Lighting Practitioner's View



Planning, designing, implementing, and investing in lighting for historically neglected communities through a process of stakeholder respect and engagement

www.LightJustice.org

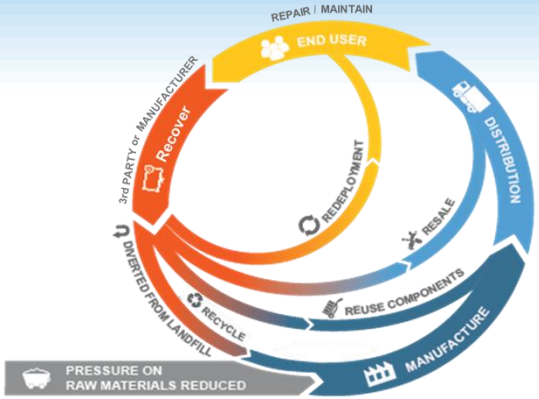
The Power of Specification



A full $10 trillion is spent on construction-related goods and services annually (McKinsey & Co)

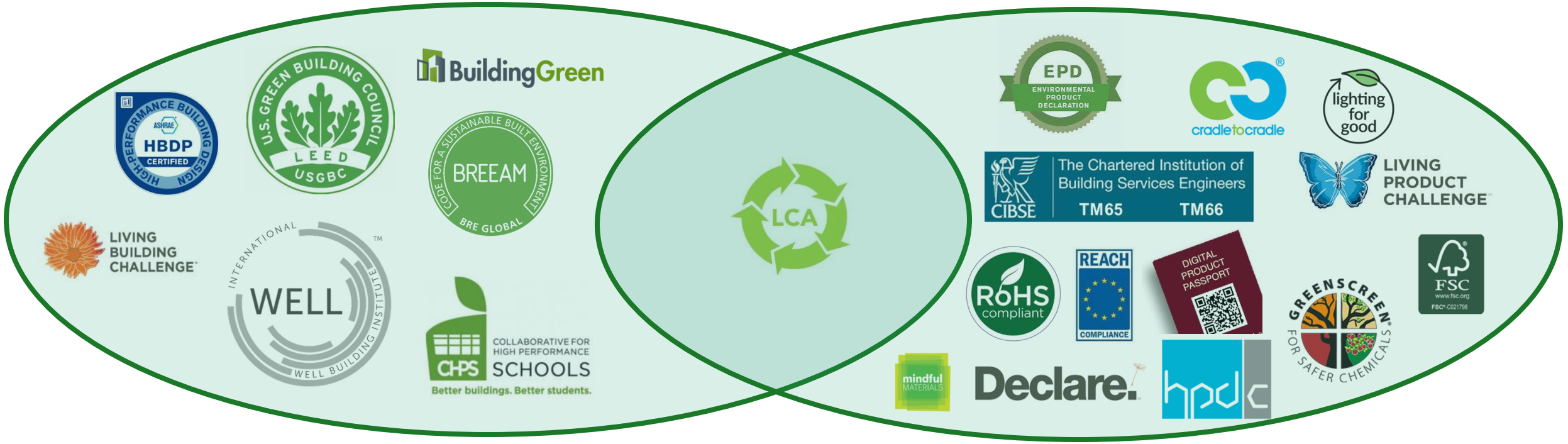
Panel Discussion

- What are the biggest areas of opportunity to lower the environmental impact of lighting & why?
- Given these 4 areas - in practice - which opportunities are we seeing in our work?



Methodologies

Rating Systems, Certification, Labels & Declarations



Whole Building

Product Level

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Key Rating Systems, Certifications, Labels & Declarations

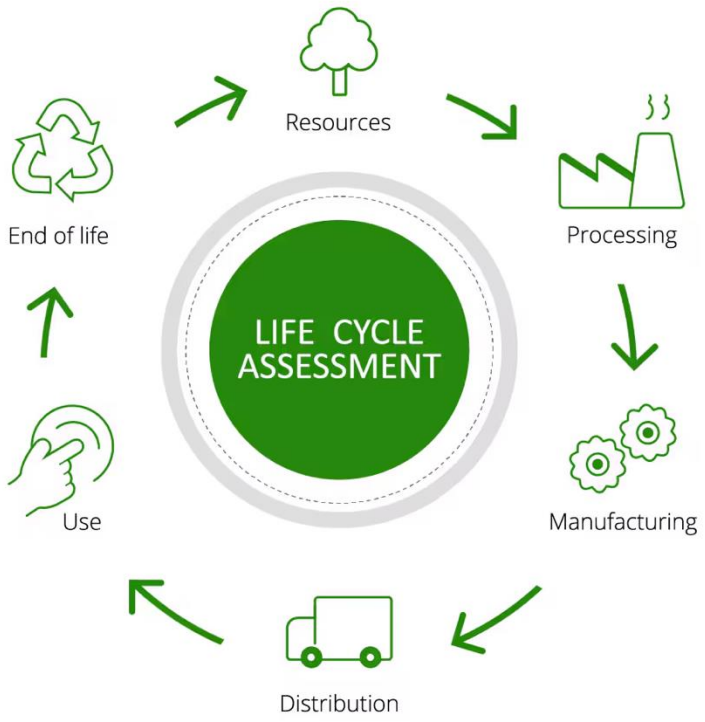
	Human Health	Climate Health	Ecosystem Health	Social Health & Equity	Circular Economy
Whole Building					
LEED					
WELL					
Living Building Challenge					
Product Level					
Declare Labels					
Health Product Declarations (HPD)					
RoHS					
Life Cycle Assessments/EPDs					
Life Cycle Assessments/PCFs					
TM65 Embodied Carbon Estimation					
TM66 Circular Economy Assessment					
Product Circularity Data Sheets					

Life Cycle Assessments (LCAs)
&
Environmental Product Declarations (EPDs)

Life Cycle Assessment

Key to informed & sustainable decision-making

LCA is an environmental accounting methodology that measures the potential environmental impacts of a product across various stages of its lifecycle.

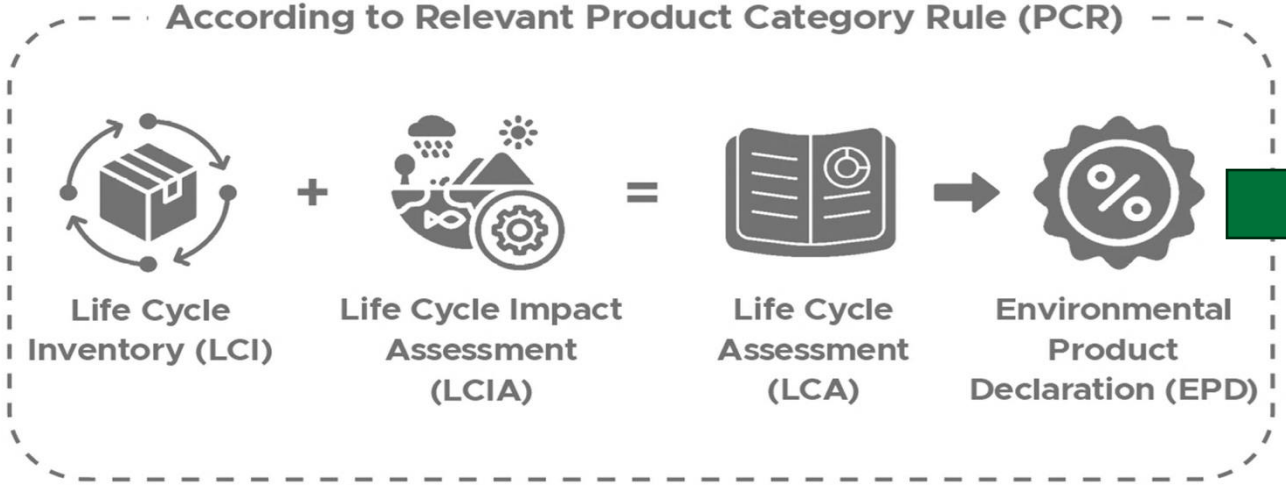


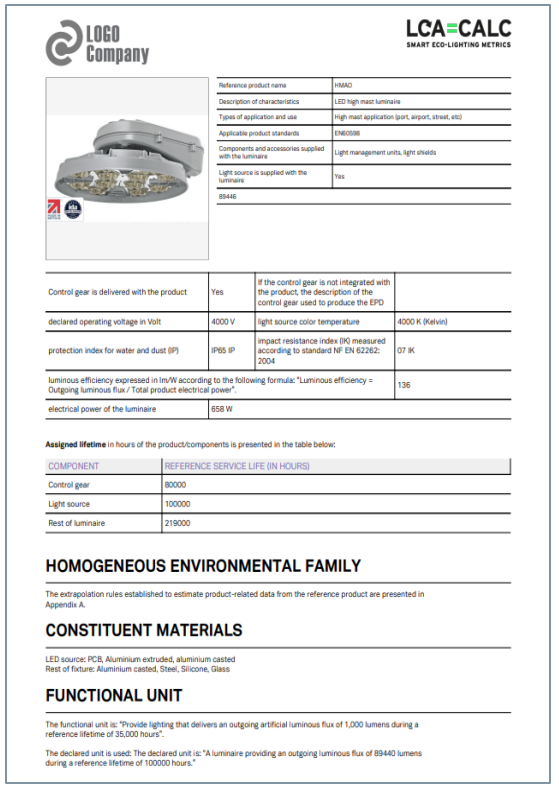
ATMOSPHERE			WATER		EARTH	
Global Warming Potential refers to long-term changes in global weather patterns that are caused by increased concentrations of greenhouse gases in the atmosphere.	**Ozone Depletion Potential** is the destruction of the stratospheric ozone layer, which shields the earth from ultraviolet radiation that's harmful to life, caused by human-made air pollution.	**Photochemical Ozone Creation Potential** happens when sunlight reacts with hydrocarbons, nitrogen oxides, and volatile organic compounds, to produce air pollution known as smog.	**Acidification Potential** is the result of human-made emissions and refers to the decrease in pH and increase in acidity of oceans, lakes, rivers, and streams – polluting groundwater and harming aquatic life.	**Eutrophication Potential** occurs when excessive nutrients cause increased algae growth in lakes, blocking the underwater penetration of sunlight needed to produce oxygen and resulting in the loss of aquatic life.	**Depletion of Abiotic Resources (Elements)** refers to the reduction of available non-renewable resources, such as metals, that are found on the periodic table of elements, due to human activity.	**Depletion of Abiotic Resources (Fossil Fuels)** refers to the decreasing availability of non-renewable carbon-based compounds, such as oil and coal, due to human activity.
10.39 kg CO_2-Equiv.	2.66E-07 kg CFC 11-Equiv.	1.46E+00 kg O_3 -Equiv.	6.30E-02 kg SO_2-Equiv.	2.13E-02 kg N-Equiv.	- kg Sb-Equiv.	- MJ

<u>Includes</u> use phase energy consumption

Typically, 85%+ of a luminaire's lifecycle emissions

LCA Process





LOGO Company

LCA=CALC SMART ECO-LIGHTING METRICS

Reference product name	HMAO
Description of characteristics	LED high mast luminaire
Types of application and use	High mast application (port, airport, street, etc)
Applicable product standards	EN60598
Components and accessories supplied with the luminaire	Light management units, light shields
Light source is supplied with the luminaire	Yes
89446	

Control gear is delivered with the product	Yes	If the control gear is not integrated with the product, the description of the control gear used to produce the EPD	
declared operating voltage in Volt	4000 V	light source color temperature	4000 K (Kelvin)
protection index for water and dust (IP)	IP65 IP	impact resistance index (IK) measured according to standard NF EN 62262: 2004	07 IK
luminous efficiency expressed in lm/W according to the following formula: "Luminous efficiency = Outgoing luminous flux / Total product electrical power".			136
electrical power of the luminaire	658 W		

Assigned lifetime in hours of the product/components is presented in the table below:

COMPONENT	REFERENCE SERVICE LIFE (IN HOURS)
Control gear	80000
Light source	100000
Rest of luminaire	219000

HOMOGENEOUS ENVIRONMENTAL FAMILY

The extrapolation rules established to estimate product-related data from the reference product are presented in Appendix A.

CONSTITUENT MATERIALS

LED source: PCB, Aluminium extruded, aluminium casted
Rest of fixture: Aluminium casted, Steel, Silicone, Glass

FUNCTIONAL UNIT

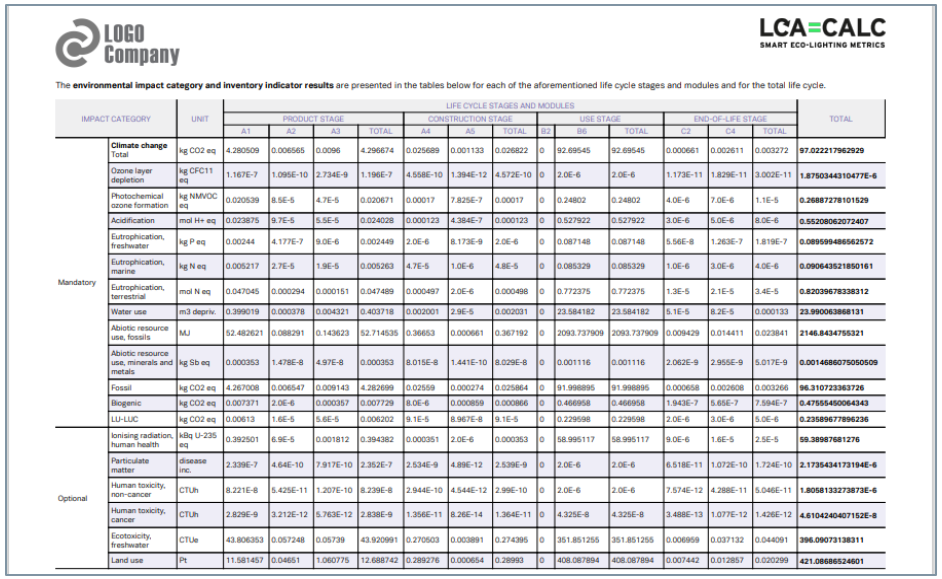
The functional unit is: "Provide lighting that delivers an outgoing artificial luminous flux of 1,000 lumens during a reference lifetime of 35,000 hours".

The declared unit is used: The declared unit is: "A luminaire providing an outgoing luminous flux of 89440 lumens during a reference lifetime of 100000 hours."

EPD

- Summarizes LCA results
- Removes manufacturer's proprietary information

- Complex, time consuming & costly
- Provides manufacturer deep insights on potential areas of improvement
- Generally, not comparable between like products due to differing data sources, assumptions, modeling, etc.



LOGO Company

LCA=CALC SMART ECO-LIGHTING METRICS

The **environmental impact category and inventory indicator results** are presented in the tables below for each of the aforementioned life cycle stages and modules and for the total life cycle.

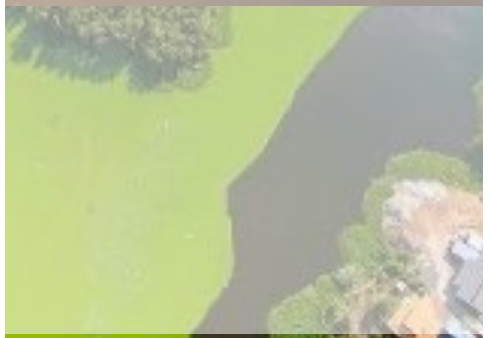
IMPACT CATEGORY		UNIT	LIFE CYCLE STAGES AND MODULES													TOTAL
			PRODUCT STAGE				CONSTRUCTION STAGE			USE STAGE			END-OF-LIFE STAGE			
			A1	A2	A3	TOTAL	A4	A5	TOTAL	B2	B6	TOTAL	C2	C4	TOTAL	
Mandatory	Climate change Total	kg CO2 eq	4.280509	0.006565	0.0096	4.296674	0.025689	0.001133	0.026822	0	92.69545	92.69545	0.000661	0.002611	0.003272	**97.022217962929**
	Ozone layer depletion	kg CFC11 eq	1.167E-7	1.095E-10	2.734E-9	1.196E-7	4.558E-10	1.394E-12	4.572E-10	0	2.0E-6	2.0E-6	1.173E-11	1.829E-11	3.002E-11	**1.87503443104776E-6**
	Photochemical ozone formation	kg NMVOC eq	0.020539	8.5E-5	4.7E-5	0.020671	0.00017	7.825E-7	0.00017	0	0.24802	0.24802	4.0E-6	7.0E-6	1.1E-5	**0.26887278101529**
	Acidification	mol H+ eq	0.023875	9.7E-5	5.5E-5	0.024028	0.000123	4.384E-7	0.000123	0	0.527922	0.527922	3.0E-6	5.0E-6	8.0E-6	**0.55208062072407**
	Eutrophication, freshwater	kg P eq	0.00244	4.177E-7	9.0E-6	0.002449	2.0E-6	8.173E-9	2.0E-6	0	0.087148	0.087148	5.56E-8	1.263E-7	1.819E-7	**0.089599486562572**
	Eutrophication, marine	kg N eq	0.005217	2.7E-5	1.9E-5	0.005263	4.7E-5	1.0E-6	4.8E-5	0	0.085329	0.085329	1.0E-6	3.0E-6	4.0E-6	**0.090643521850161**
	Eutrophication, terrestrial	mol N eq	0.047045	0.000294	0.000151	0.047489	0.000497	2.0E-6	0.000498	0	0.772375	0.772375	1.3E-5	2.1E-5	3.4E-5	**0.82039678338312**
	Water use	m3 depriv.	0.399019	0.000378	0.004321	0.403718	0.002001	2.9E-5	0.002031	0	23.584182	23.584182	5.1E-5	8.2E-5	0.000133	**23.990063868131**
	Abiotic resource use, fossils	MJ	52.482621	0.088291	0.143623	52.714535	0.36653	0.000661	0.367192	0	2093.737909	2093.737909	0.009429	0.014411	0.023841	**2146.8434755321**
	Abiotic resource use, minerals and metals	kg Sb eq	0.000353	1.478E-8	4.97E-8	0.000353	8.015E-8	1.441E-10	8.029E-8	0	0.001116	0.001116	2.062E-9	2.955E-9	5.017E-9	**0.001468607505050509**
	Fossil	kg CO2 eq	4.267008	0.006547	0.009143	4.282699	0.02559	0.000274	0.025864	0	91.998895	91.998895	0.000658	0.002608	0.003266	**96.310723363726**
	Biogenic	kg CO2 eq	0.007371	2.0E-6	0.000357	0.007729	8.0E-6	0.000859	0.000866	0	0.466958	0.466958	1.943E-7	5.65E-7	7.594E-7	**0.4755545006434 3**
	LU-LUC	kg CO2 eq	0.00613	1.6E-5	5.6E-5	0.006202	9.1E-5	8.967E-8	9.1E-5	0	0.229598	0.229598	2.0E-6	3.0E-6	5.0E-6	**0.2358967789623 6**
Optional	Ionising radiation, human health	kBq U-235 eq	0.392501	6.9E-5	0.001812	0.394382	0.000351	2.0E-6	0.000353	0	58.995117	58.995117	9.0E-6	1.6E-5	2.5E-5	**59.38987681276**
	Particulate matter	disease inc.	2.339E-7	4.64E-10	7.917E-10	2.352E-7	2.534E-9	4.89E-12	2.539E-9	0	2.0E-6	2.0E-6	6.518E-11	1.072E-10	1.724E-10	**2.17354341731 94E-6**
	Human toxicity, non-cancer	CTUh	8.221E-8	5.425E-11	1.207E-10	8.239E-8	2.944E-10	4.544E-12	2.99E-10	0	2.0E-6	2.0E-6	7.574E-12	4.288E-11	5.046E-11	**1.80581332738 73E-6**
	Human toxicity, cancer	CTUh	2.829E-9	3.212E-12	5.763E-12	2.838E-9	1.356E-11	8.26E-14	1.364E-11	0	4.325E-8	4.325E-8	3.488E-13	1.077E-12	1.426E-12	**4.61042404071 52E-8**
	Ecotoxicity, freshwater	CTUe	43.806353	0.057248	0.05739	43.920991	0.270503	0.003891	0.274395	0	351.851255	351.851255	0.006959	0.037132	0.044091	**396.09073138311**
	Land use	Pt	11.581457	0.04651	1.060775	12.688742	0.289276	0.000654	0.28993	0	408.087894	408.087894	0.007442	0.012857	0.020299	**421.08686524601**

Product Carbon Footprint (PCF)
&
Embodied Carbon Calculation Methodology (TM65)

Product Carbon Footprint

Governed by ISO14067

Same basic process as for an LCA, but only reports out carbon emissions and **excludes** Use Stage

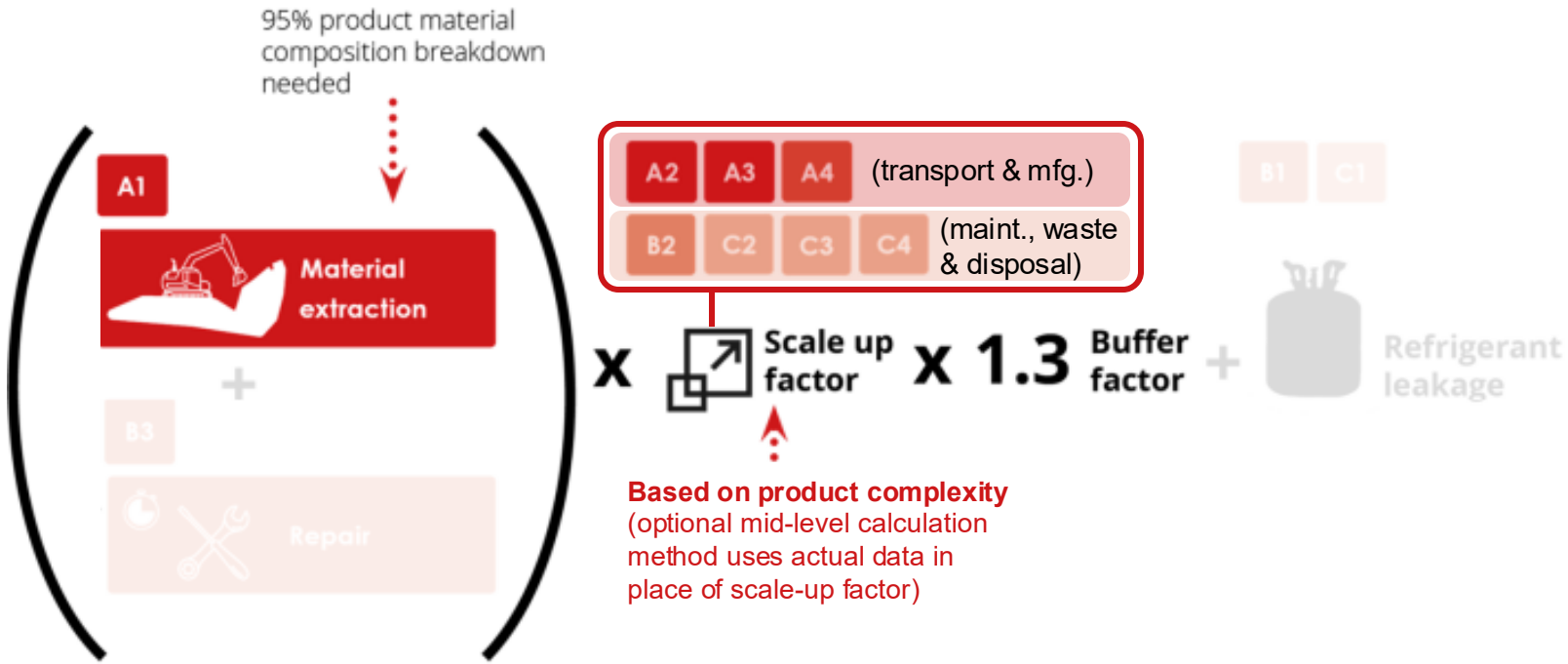


Impacts	Acronym	Unit of Measure
Global Warming Potential	GWP	kg CO_2-eq
Acidification Potential	AP	kg SO_2-eq
Eutrophication Potential	EP	kg N-eq
Smog Formation Potential	SPF	kg O_3-eq
Ozone Depletion Potential	ODP	kg CFC11-eq
Blue Water Consumption	BWC	kg
and others!	…	…

TM65 Embodied Carbon Calculation Methodology

CHARTERED INSTITUTION OF BUILDING SERVICES ENGINEERS

Basic calculation method created by CIBSE



Not Included:

A5 B4 B5 B6 B7

- Construction/installation
- Replacement/refurbishment
- Use stage energy/water consumption

Note: Repair & Refrigerant Leakage impacts generally not material/relevant for luminaires

TM65-Tool-BEAMA-webinar-Carl-Collins

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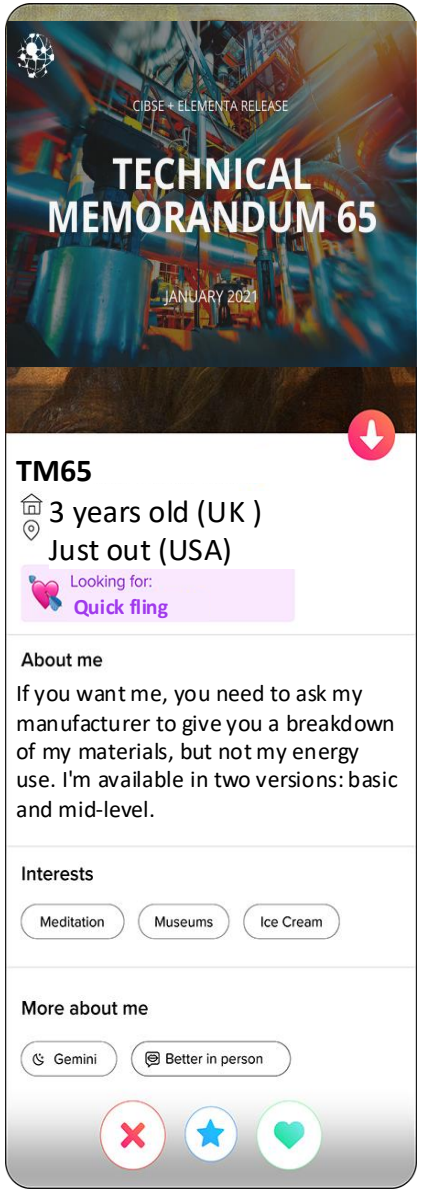
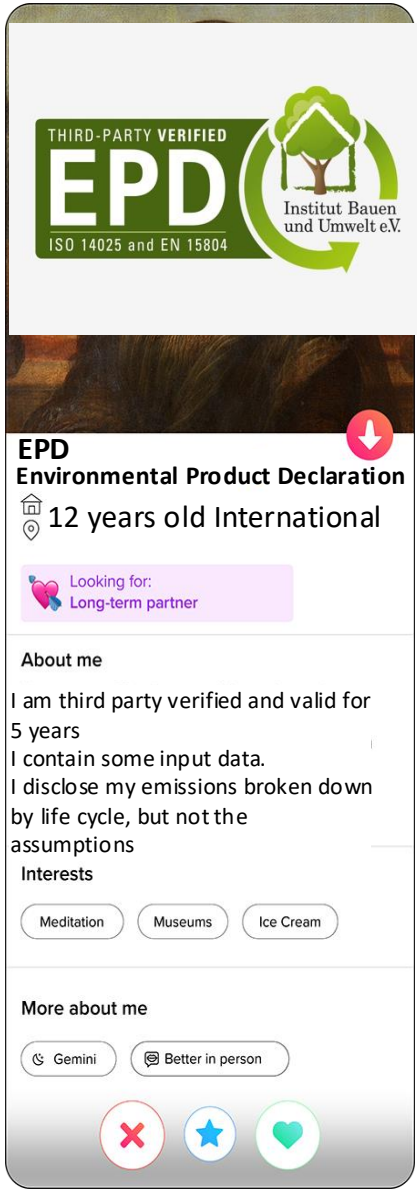
EPDs

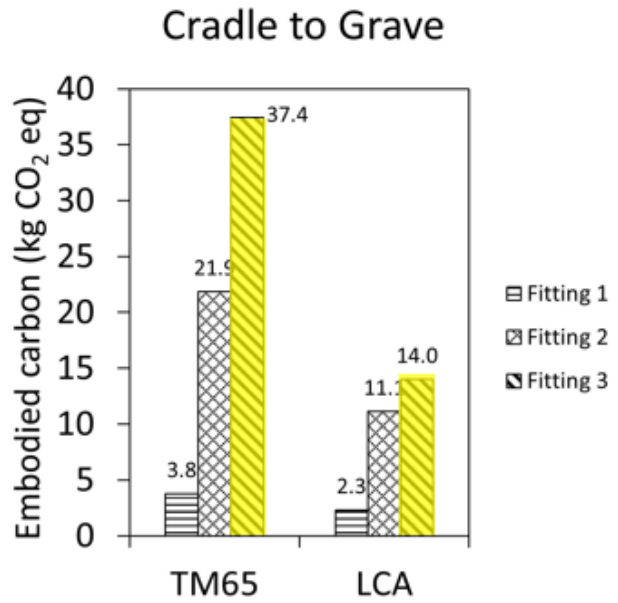
Vs.

TM65





TM65 RESULTS INFLATED



Shanker, L., Mazzei, I., Bowes, T., Streamlining Life Cycle Assessment for Complex MEP Products – Learnings from Lighting, (2024), *CIBSE Technical Symposium*, Cardiff, 11-12 April 2024.

Colhado Gallo,C, Jans-Singh, M., Kalayil, J., Pillay, A. and Wong,J. (2024) CIBSE Technical Symposium "Review of TM65 Methodology against Environmental Product Declarations for use in Embodied Carbon Calculations of MEP products"

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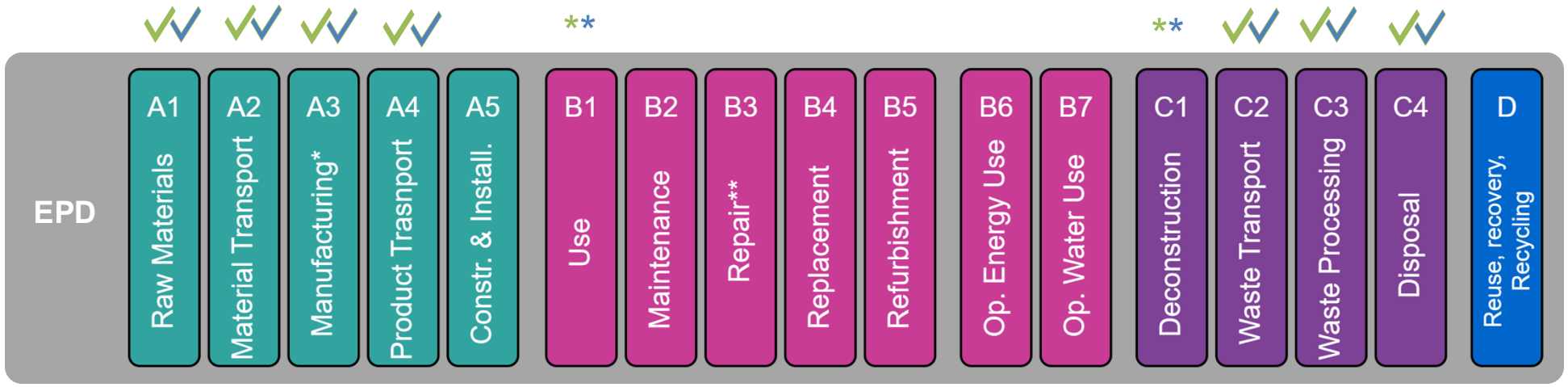
Alternative approaches to reporting Environmental Impacts

	EPD Environmental Product Declaration	PCF Product Carbon Footprint	TM65 Embodied Carbon Calculation Methodology
Emissions	All	CO2	CO2
Lifecycle Stages	Mfg, Use, EOL	Mfg & EOL	Mfg & EOL
Governed by ISO Standards?	Yes	Yes	No, but generally aligned
Third party Verified	Mandatory	Optional	Optional
Renewal Period	5-year	Not Specified	Not Specified
Accuracy | Comparability	High | Low	High | Low	Medium | Medium
Helps earn LEED credit?	Yes	Yes?	No

✓ PCF

✓ TM65

** only relevant for products with refrigerants



Colhado Gallo,C, Jans-Singh, M., Kalayil, J., Pillay, A. and Wong,J. (2024) CIBSE Technical Symposium "Review of TM65 Methodology against Environmental Product Declarations for use in Embodied Carbon Calculations of MEP products"

Circular Economy Assessment (TM66)
&
Product Circularity Data Sheets

TM66 Circular Economy Digital Assessment Tool

Created by UK Chartered Institute of Building Service Engineers in cooperation with the Society of Light & Lighting

- Assesses circularity attainment specific to luminaires in 4 categories:
  - Product Design
  - Manufacturing
  - Materials
  - Ecosystem
- Manufacturer “Make” survey: 78 attributes
- Specifier “Specify” survey: 26 attributes
  - when “Make” assessment not available
- Survey answers based on “supporting evidence”
  - Third-party verification available in UK

Result

Category	Points Scored	Maximum possible points	Assessment
Product design	21.0	35.0	2.4
Manufacturing	10.9	11.0	3.9
Materials	5.0	16.0	1.3
Ecosystem	15.0	22.0	2.7
Overall performance	**51.9**	**84.0**	**2.6**

How to analyse the score	
0 to 0.5	Very poor circular economy performance
0.5 to 1.5	Some circular economy functionality
1.5 to 2.5	Definite/substantial progress to circularity
2.5 to 4.0	Excellent circularity

This digital tool is designed to be used in conjunction with CIBSE TM66 *Creating a circular economy in the lighting industry*, available from www.cibse.org/knowledge.

TM66 Example Question

	Circular economy effect	Feature	Select evidence per action towards circular economy					Score	Evidence in support of choice
			0	1	2	3	4		
			No evidence	Some positive evidence	Positive evidence	Excellent positive evidence	Outstanding evidence		
Upgradability	Allows products to be upgraded, keeping existing products in use rather than requiring new products with high percentages of virgin feedstock to be procured	Ease of upgrading light source	Impossible	Risk of damage	Possible	Easy/ Zhaga Style		-1	
		Effect of light source upgrade on thermal performance	Degraded	High risk of reduction	Maintained but difficult	Maintained and easy		-1	
		Ease of configuring upgrade, including plug sockets, driver settings	Impossible	Termination & configure	Plug & configure	Plug & play		-1	
		Availability of upgrade light sources	Not available	Available, but product specific	Available, covers multiple products	Commonly available		-1	

TM66 Categories of Evaluation & Key Elements

Product Design

- Adaptability
- Upgradeability
- Use in second life
- Modularity
- Durability
- Material/BOM simplification vs. “typical”
- Assembly techniques
- Design for remanufacture
- Controls Obsolescence
- Performance Certifications
- Circularity Design Competence

Manufacturing

- Manufacturing Complexity Weighting
- Supply Chain Engagement
- In-house closed loop manufacturing
- Social Responsibility

Materials

- Reduction of virgin materials
- Plastics identified for recyclability
- Biodegradable materials
- Innovative sustainable materials
- Biodegradable packaging

Ecosystem for Product Reuse

- Systems & Resources
- Reusable packaging
- On-Site upgradability
- Accurate photometry accessible
- Component supplier commitment
- Warranty
- Manufacture Competence & buy-in

Product Circularity Data Sheet

- Proposed as the official standard for communicating data on the circular economy properties of products in concert with the ISO323 Circular Economy Technical Committee
- Not specific to lighting products
- Each product gets assessed by answering approximately 100 true-false statements in 4 sections:
  - Composition
  - Designed for Better Use
  - Designed for Disassembly
  - Designed for Reuse
- Not a rating system in that there is no resultant score
- Responses captured in a standardized IT exchange protocol that can be easily shared across platforms, including ones that can assign a score

Instructive & likely will become part of EU circularity directive compliance

https://circulareconomy.europa.eu/platform/en/toolkits-guidelines/product-circularity-data-sheet

Declare Labels
&
Health Product Declarations (HPDs)

AIA Materials Pledge

support **HUMAN HEALTH** by preferring products that support and foster life throughout their life cycles and seek to eliminate the use of hazardous substances.

support a **CIRCULAR ECONOMY** by reusing and improving buildings and by designing for resiliency, adaptability, disassembly, and reuse, aspiring to a zero-waste goal for global construction activities.

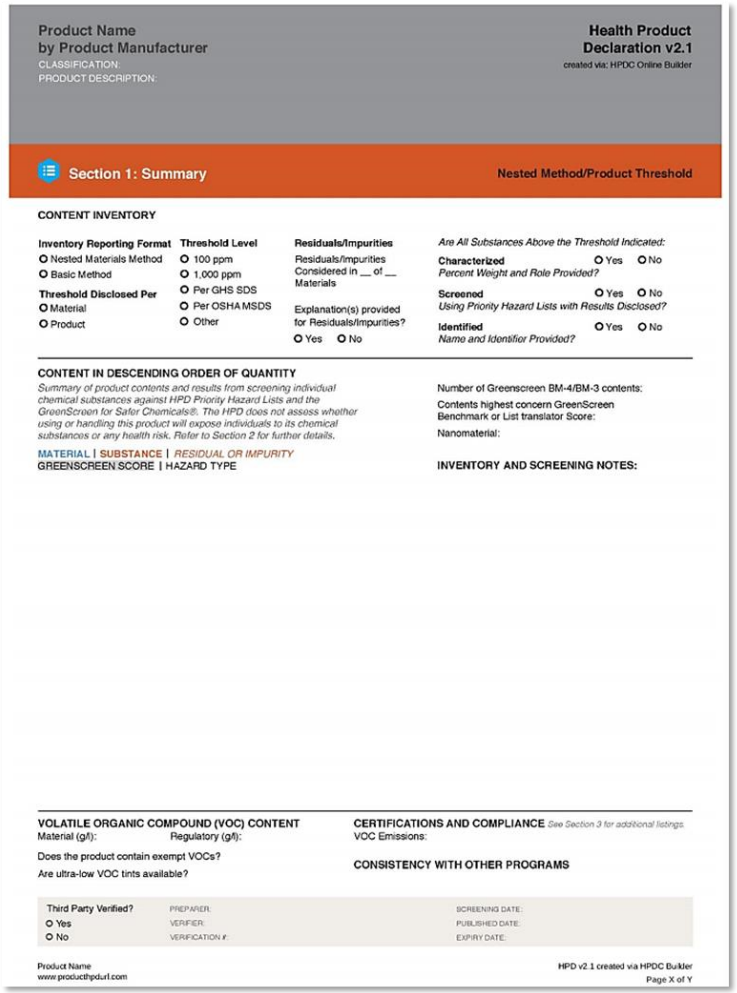
support **CLIMATE HEALTH** by preferring products that reduce carbon emissions and ultimately sequester more carbon than emitted.

support **ECOSYSTEM HEALTH** by preferring products that support and regenerate the natural air, water, and biological cycles of life through thoughtful supply chain management and restorative company practices

support **SOCIAL HEALTH & EQUITY** by preferring products from manufacturers that secure human rights in their own operations and in their supply chains, positively impacting their workers and the communities where they operate

Health Product Declaration

- Open Industry Standard
- Every chemical in every component on the BOM disclosed to either 100 or 1000 ppm
- Optional third-party verification


Product Name
by Product Manufacturer
CLASSIFICATION:
PRODUCT DESCRIPTION:

Health Product Declaration v2.1
created via: HPDC Online Builder

Section 1: Summary — Nested Method/Product Threshold

CONTENT INVENTORY

Inventory Reporting Format
O Nested Materials Method
O Basic Method

Threshold Disclosed Per
O Material
O Product

Threshold Level
O 100 ppm
O 1,000 ppm
O Per GHS SDS
O Per OSHA MSDS
O Other

Residuals/Impurities
Residuals/Impurities Considered in __ of __ Materials

Explanation(s) provided for Residuals/Impurities?
O Yes O No

Are All Substances Above the Threshold Indicated:

Characterized — O Yes O No
Percent Weight and Role Provided?

Screened — O Yes O No
Using Priority Hazard Lists with Results Disclosed?

Identified — O Yes O No
Name and Identifier Provided?

CONTENT IN DESCENDING ORDER OF QUANTITY

Summary of product contents and results from screening individual chemical substances against HPD Priority Hazard Lists and the GreenScreen for Safer Chemicals®. The HPD does not assess whether using or handling this product will expose individuals to its chemical substances or any health risk. Refer to Section 2 for further details.

MATERIAL | SUBSTANCE | *RESIDUAL OR IMPURITY*
GREENSCREEN SCORE | HAZARD TYPE

Number of Greenscreen BM-4/BM-3 contents:
Contents highest concern GreenScreen Benchmark or List translator Score:
Nanomaterial:

INVENTORY AND SCREENING NOTES:

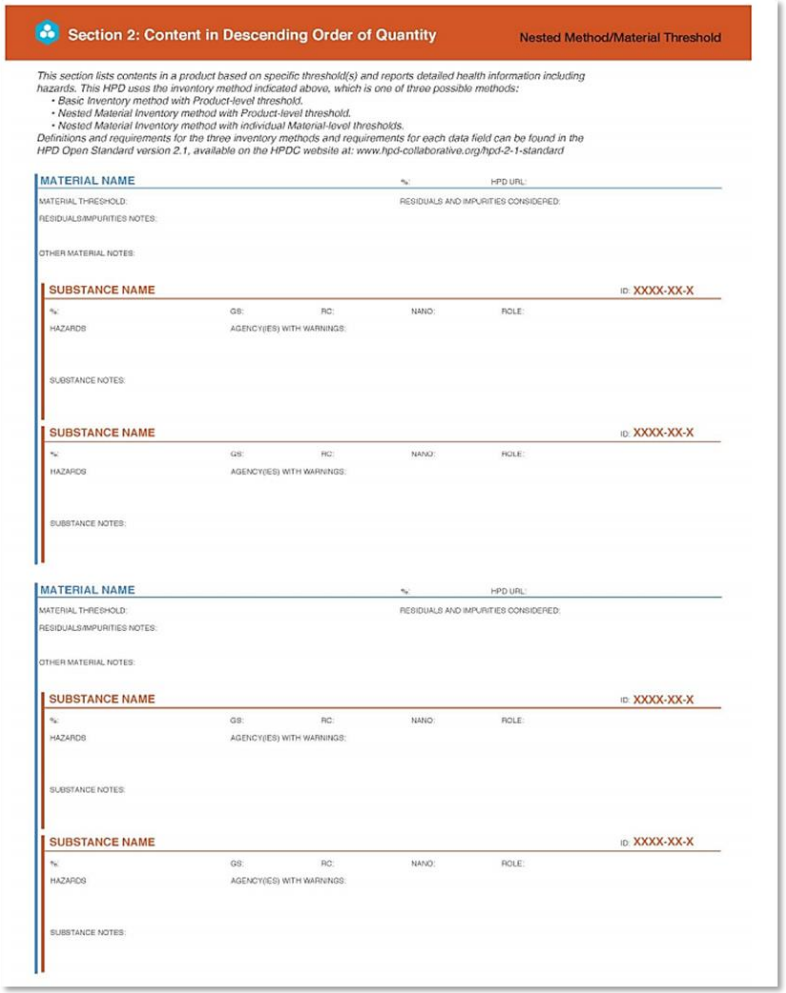
VOLATILE ORGANIC COMPOUND (VOC) CONTENT
Material (g/l):
Regulatory (g/l):
Does the product contain exempt VOCs?
Are ultra-low VOC tints available?

CERTIFICATIONS AND COMPLIANCE *See Section 3 for additional listings.*
VOC Emissions:

CONSISTENCY WITH OTHER PROGRAMS

Third Party Verified?
O Yes
O No
PREPARER:
VERIFIER:
VERIFICATION #:
SCREENING DATE:
PUBLISHED DATE:
EXPIRY DATE:

Product Name
www.producthpdurl.com
HPD v2.1 created via HPDC Builder
Page X of Y


Section 2: Content in Descending Order of Quantity — Nested Method/Material Threshold

This section lists contents in a product based on specific threshold(s) and reports detailed health information including hazards. This HPD uses the inventory method indicated above, which is one of three possible methods:
- *Basic Inventory method with Product-level threshold.*
- *Nested Material Inventory method with Product-level threshold.*
- *Nested Material Inventory method with individual Material-level thresholds.*

Definitions and requirements for the three inventory methods and requirements for each data field can be found in the HPD Open Standard version 2.1, available on the HPDC website at: www.hpd-collaborative.org/hpd-2-1-standard

MATERIAL NAME — %: — HPD URL:
MATERIAL THRESHOLD: — RESIDUALS AND IMPURITIES CONSIDERED:
RESIDUALS/IMPURITIES NOTES:
OTHER MATERIAL NOTES:

SUBSTANCE NAME — ID: XXXX-XX-X
%: GS: RC: NANO: ROLE:
HAZARDS — AGENCY(IES) WITH WARNINGS:
SUBSTANCE NOTES:

SUBSTANCE NAME — ID: XXXX-XX-X
%: GS: RC: NANO: ROLE:
HAZARDS — AGENCY(IES) WITH WARNINGS:
SUBSTANCE NOTES:

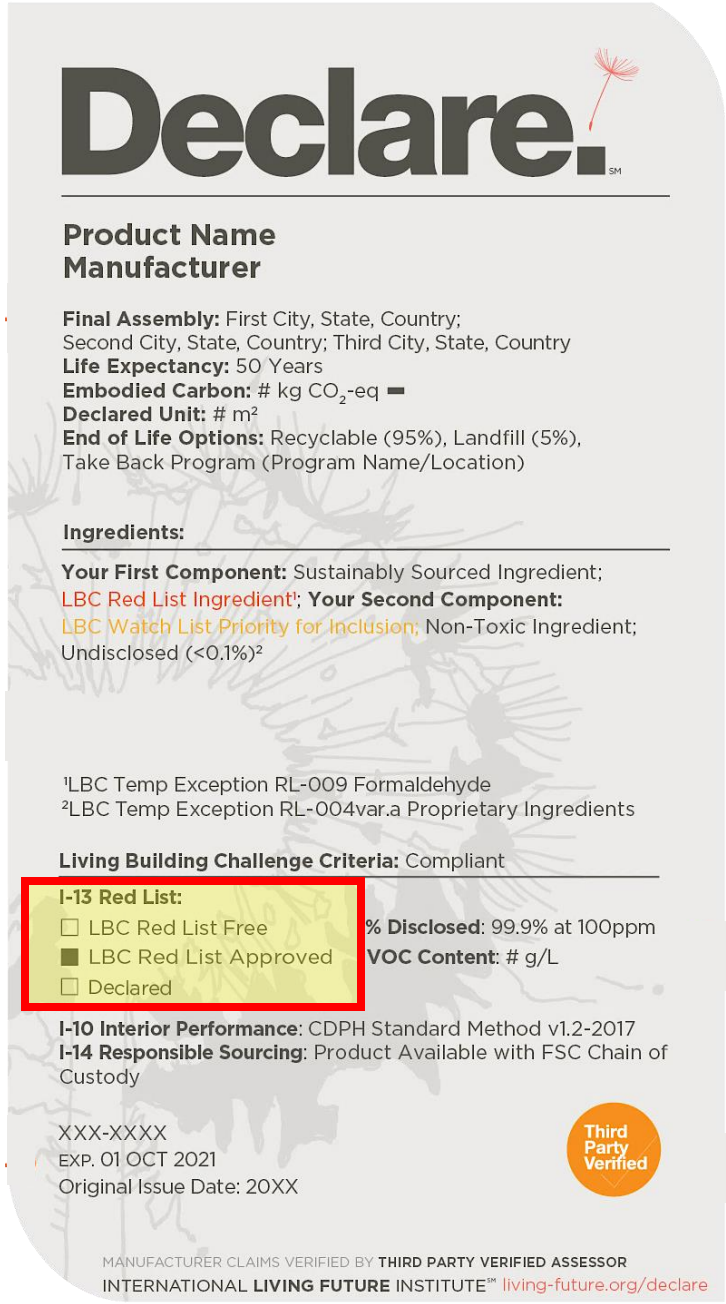
MATERIAL NAME — %: — HPD URL:
MATERIAL THRESHOLD: — RESIDUALS AND IMPURITIES CONSIDERED:
RESIDUALS/IMPURITIES NOTES:
OTHER MATERIAL NOTES:

SUBSTANCE NAME — ID: XXXX-XX-X
%: GS: RC: NANO: ROLE:
HAZARDS — AGENCY(IES) WITH WARNINGS:
SUBSTANCE NOTES:

SUBSTANCE NAME — ID: XXXX-XX-X
%: GS: RC: NANO: ROLE:
HAZARDS — AGENCY(IES) WITH WARNINGS:
SUBSTANCE NOTES:

DECLARE Product Labeling

- Ingredients disclosed to the most stringent 100 ppm level
- Red List chemicals highlighted in dark orange
- Emerging chemicals of concern highlighted in light orange
- Small Electronics Exemption
- Additional mandatory information:
  - Final assembly locations
  - Life expectancy
  - End of life options including recyclable content %
- Optional:
  - Embodied Carbon
  - Third Party Verification
- Considerably more expensive to obtain/maintain vs. HPDs including annual renewal



Declare.

Product Name
Manufacturer

Final Assembly: First City, State, Country; Second City, State, Country; Third City, State, Country
Life Expectancy: 50 Years
Embodied Carbon: # kg CO_2-eq
Declared Unit: # m²
End of Life Options: Recyclable (95%), Landfill (5%), Take Back Program (Program Name/Location)

Ingredients:

Your First Component: Sustainably Sourced Ingredient; LBC Red List Ingredient[1]; **Your Second Component:** LBC Watch List Priority for Inclusion; Non-Toxic Ingredient; Undisclosed (<0.1%)[2]

[1]LBC Temp Exception RL-009 Formaldehyde
[2]LBC Temp Exception RL-004var.a Proprietary Ingredients

Living Building Challenge Criteria: Compliant

I-13 Red List:
☐ LBC Red List Free
■ LBC Red List Approved
☐ Declared

% Disclosed: 99.9% at 100ppm
VOC Content: # g/L

I-10 Interior Performance: CDPH Standard Method v1.2-2017
I-14 Responsible Sourcing: Product Available with FSC Chain of Custody

XXX-XXXX
EXP. 01 OCT 2021
Original Issue Date: 20XX

Third Party Verified

MANUFACTURER CLAIMS VERIFIED BY **THIRD PARTY VERIFIED ASSESSOR**
INTERNATIONAL **LIVING FUTURE** INSTITUTE℠ living-future.org/declare

INTERNATIONAL LIVING FUTURE INSTITUTE℠

https://living-future.org/declare/declare-about/

Corporate Sustainability Reports

Focusing on Diversity, Equity, and Inclusion

DEI Council Formalizes our Commitment to an Inclusive Environment

To promote DEI in the workplace, we have created a DEI Council responsible for setting our diversity strategy and creating a three-year roadmap of initiatives, many resulting from associate feedback.

Our DEI Council is composed of the Chief Human Resources Officer, Chief Financial Officer, General Counsel, Chief Communications Officer, Human Resources process owners, and leaders from the Company's Employee Resources Groups (ERG), MAGIC (Minorities Amplifying Growth, Inclusion, and Community), The Women's Network, and our newest ERG formed in FY21, PRIDE (People Respecting Identity, Diversity, and Equity).

23% of Management* identify as women (Global)

40% of associates identify as women (Global)

17% of Management* identify as people of color (US only)

41% of associates identify as people of color (US only)

Our Progress Against the FY22 Targets

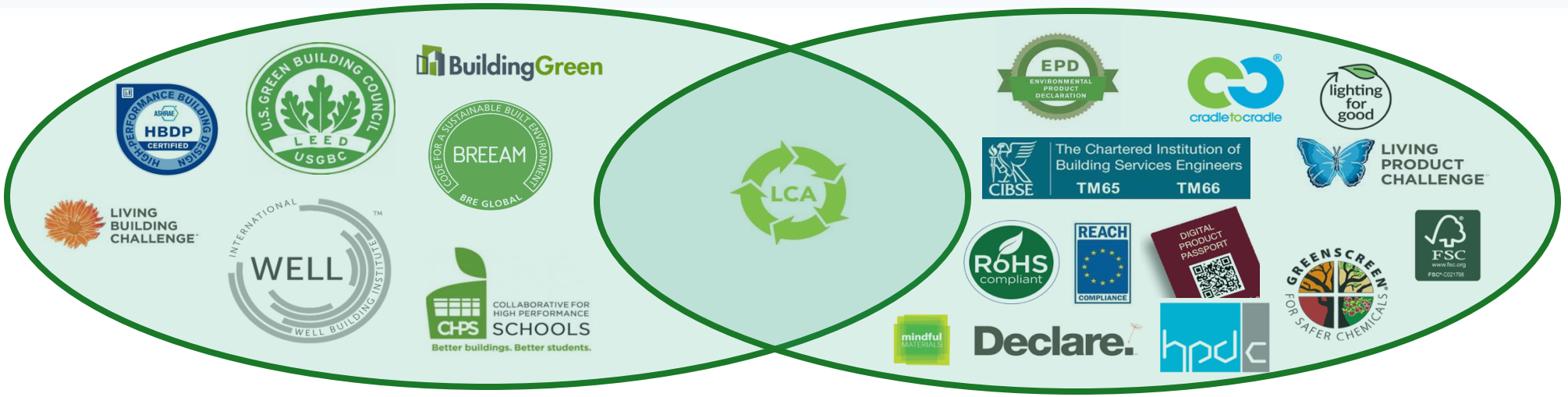
In FY20, we outlined our FY22 targets. We're providing an update on our FY21 and introducing our new 100 million metric ton carbon avoidance ambition.

Goal	Metric	FY19 Baseline	FY21 Target	FY21 Actual	FY22 Target	Status
Carbon Intensity	g CO_2 / $	25.92	20.73	24.02	19.44	Continuing
	%	-	-20%	-11.01%	-25%	
Energy Efficiency	Mt CO_2	83,698	66,958	73,888	62,774	Continuing
	%	-	-20%	-11.72%	-25%	
Raw Materials	%	-	-20%	-27%	-25%	✓ Achieved and Completed
Customer Energy Reduction	Billions of kWh	9.6	18.0	28.77	27.0 (cumulative FY19–22. Goal met, goal retired)	✓ Achieved and Completed
Associate Engagement	%	71	81	84*	85	FY21 Target Achieved
Ethics	%	100% of salaried associates	100% of salaried associates and 60% of hourly associates	100% of salaried associates and 80% of hourly associates	100% of salaried associates and hourly associates	FY21 Target Achieved
Supplier Ethics	%	n/a	70% of total spend	80% of total spend	90% of total spend	FY21 Target Achieved

*Our survey partner changed to Willis Towers Watson in FY21. The metric measures sustainable engagement.

Panel Discussion

- How useful are these metrics in helping us drive real gains in sustainability?



Whole Building **Product Level**

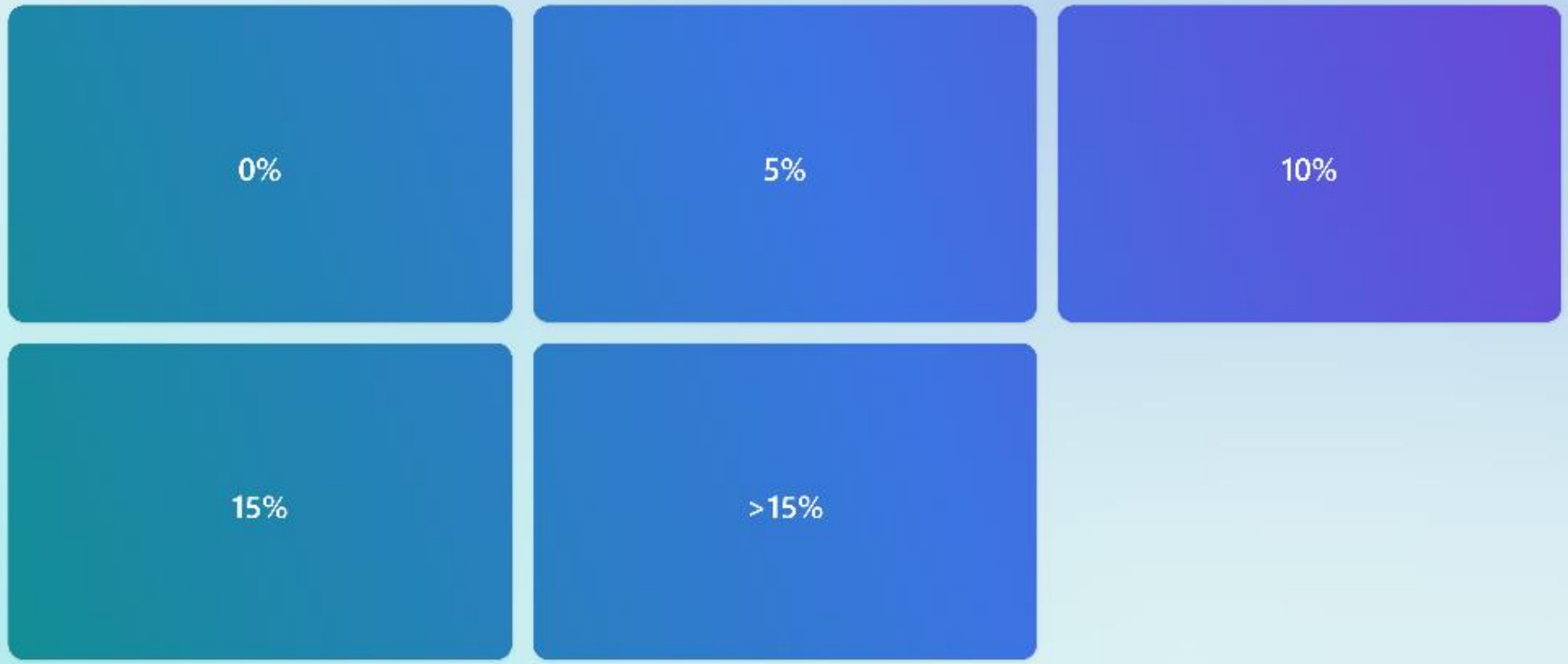
Scan the QR or use link to join

https://forms.office.com/r/6cdJQFhQQp

Copy link

0 response submitted

What Premium will your customers pay for credible/comparable/maintainable sustainability certifications/assessments



Treemap | Bar

1 of 1

Panel Discussion

- What can we do **NOW** to drive meaningful reductions in environmental impact?

Panel Discussion

- What future changes should we advocate for to help the industry realize the full potential of sustainable lighting?

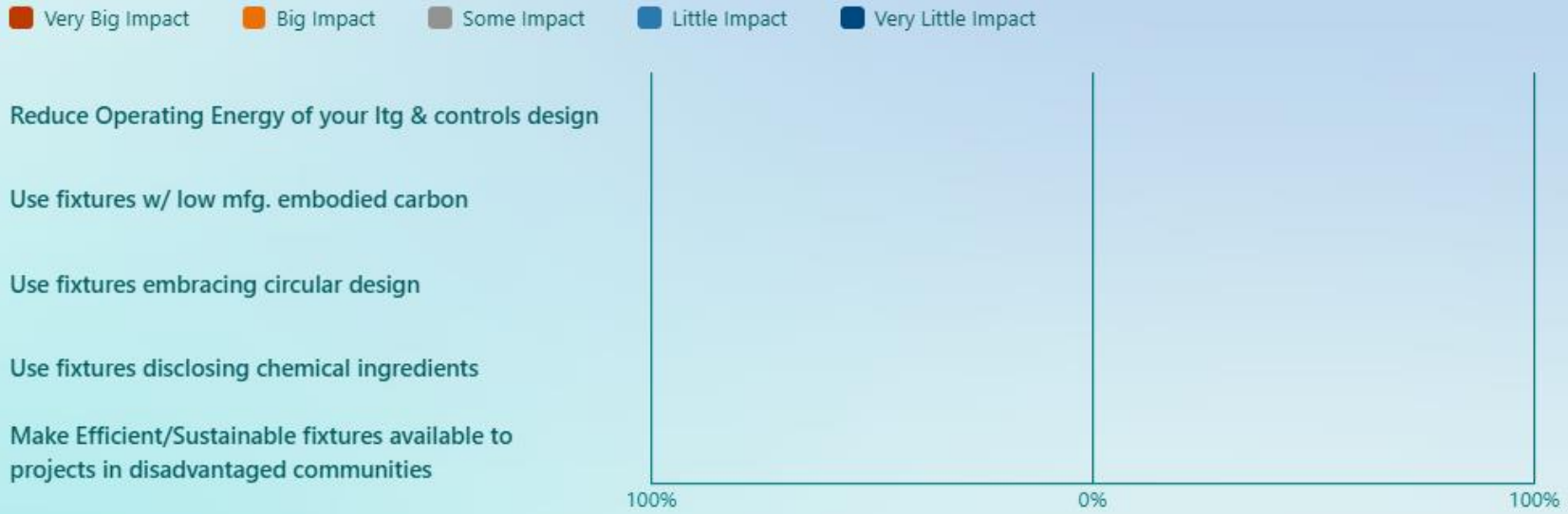
Scan the QR or use link to join

https://forms.office.com/r/DHa6GTwFdg

Copy link

0 response submitted

Re-rate the relative impact you believe the below factors can have on reducing the environmental impact of your projects



Q&A

LEDucation
Trade Show and Conference

This concludes The American Institute of Architects Continuing Education Systems Course

LEDucation.org

LEDucation
Trade Show and Conference

Thank you for attending!

Please scan the QR code to rate it and leave feedback.

LEDucation Presentation Committee

Wendy Kaplan, Kelvix | Craig Fox, ETC | Shaun Fillion, NYSID / RAB | Stacey Bello, KGM Lighting

LEDucation.org