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The Circular Economy: An Interim Guide

A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems.

The Lighting Industry, like many others, must come to embrace Circular Economy principles throughout the entire product life cycle. Developing circular principles means a full 360° approach to Procurement, Assembly, Supply Chain, Material Selection, Go-to Market strategies and 'end of first life' approach. Added to these manufacturer considerations, there will need to be process changes from designers, contractors, end-users, sustainability managers and facilities managers. This will take time and fresh thinking on how to encourage change in a Circular Economy direction given the current practices and prevalence of short-term cost considerations in the construction industry.

The purpose of this LIA interim guide is to set out a common understanding of the circular economy and attempt to predict its opportunities and challenges.

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The Lighting Industry Association Limited
Stafford Park 7, Telford, Shropshire, TF3 3BQ 01952 290905 | info@thelia.org.uk | thelia.org.uk

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1. THE NEED FOR A CIRCULAR ECONOMY

The UK Government is committed to moving towards a more circular economy, which will see us keeping resources in use as long as possible, extracting maximum value from them, minimising waste and promoting resource efficiency. The European Commission's Circular Economy Package[1] (CEP) introduces a revised legislative framework, identifying steps for the reduction of waste and establishing an ambitious and credible long-term path for waste management and recycling. In this respect, the aims of the UK Government and EU Commission remain highly aligned at this time with the UK Government's July 2020 UK Policy Paper linking directly to that of the EU Circular Economy Package.

The need for a circular economy is also set out in The European Commission's 'Circular Economy Action Plan', 2020[2], which is part of the European Green Deal. It begins with:

> 'There is only one planet Earth, yet by 2050, the world will be consuming as if there were three. Global consumption of materials such as biomass, fossil fuels, metals and minerals is expected to double in the next forty years, while annual waste generation is projected to increase by 70% by 2050.
>
> As half of total greenhouse gas emissions and more than 90% of biodiversity loss and water stress come from resource extraction and processing, the European Green Deal launched a concerted strategy for a climate-neutral, resource-efficient and competitive economy. Scaling up the circular economy from front-runners to the mainstream economic players will make a decisive contribution to achieving climate neutrality by 2050 and decoupling economic growth from resource use, while ensuring the long-term competitiveness of the EU and leaving no one behind.'

2. WHAT IS A CIRCULAR ECONOMY?

We live in a linear manufacturing model currently, with a take-make-waste extractive industrial model. We have become accustomed to hearing about reducing the consumption of single use plastics, such as coffee stirrers, banning plastic bags from supermarkets and carrying reusable cups into our favourite coffee retailer. However, a circular economy is about far more than this. 'A circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems'[3]

The design stages of lighting products and their installations are critical to all of the above. 'Waste and pollution are not accidents, but the consequence of decisions made at the design stage, where around 80% of environmental impacts are determined.'[4]

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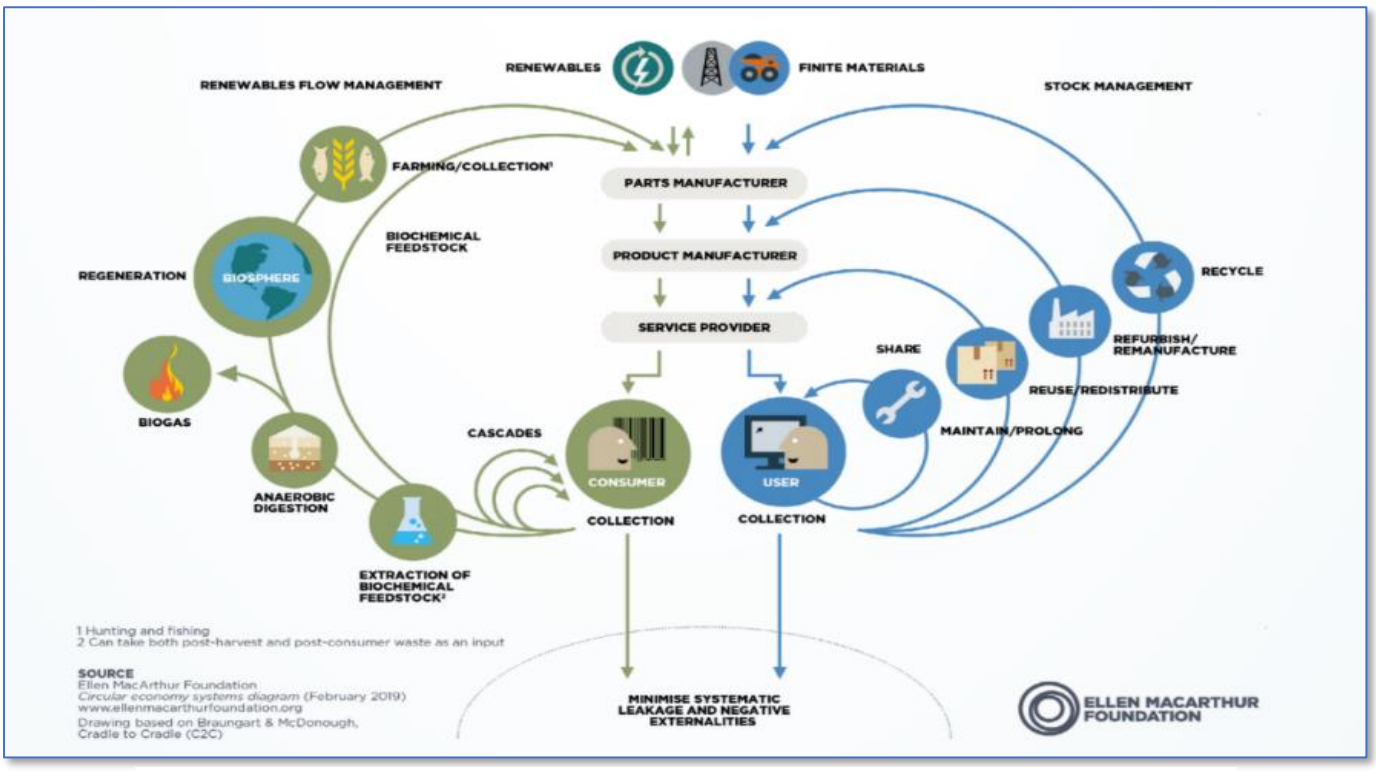
This infographic[5] provides a circular economy overview.



3. THE CIRCULAR ECONOMY & LIGHTING

The Circular Economy applied to lighting and other segments is discussed in the BEIS report prepared by ICF Consulting Services Ltd: 'UK Energy-related Products Policy Study, Final Report, July 2021' and specifically on lighting in LightingEurope's October 2017 white paper: 'Serviceable Luminaires in a Circular Economy'[6]. Taking outcomes from these reports, and adding comments, particularly on controls, the LIA suggests the following features and benefits that the serviceability of lighting products brings to customers, the environment and the economy:

- Luminaires should be durable, a longer technical lifetime thereby improving the material efficiency of the sector and reducing waste. Where the use of a space does not change, and in the absence of any significant technological advances that makes a new luminaire the most appropriate option, the lowest environmental impact is for the existing lighting to continue in use. Designed obsolescence, or value engineering that compromises longevity are the opposite of durability.
- Luminaires should, except for relatively rare technical or application reasons, be repairable, giving longer technical lifetime and thereby improving the material efficiency of the sector and reducing waste.
- Luminaires can be upgraded to improve their performance resulting in greater energy savings. E.g.: a more efficient LED module is installed, or a presence sensor is added to the luminaire. This can involve

remanufacturing old lighting stock like TL5 luminaires as well as older technology LED luminaires. Replaced parts can be recycled or sometimes reused in line with Circular Economy principles.

- Luminaires can be “future-proofed” and enjoy a longer economic lifetime. Thanks to regular upgrades, luminaires remain a state-of-the-art infrastructure and respond to the evolving needs of customers. E.g.: a connectivity plug enables transforming existing fixtures into a connected lighting system and avoids the full replacement of otherwise obsolete luminaires.
- New business models are developing, though wider availability could take time to realise, of a circular economy supporting ‘ecosystem’ to service, repair and upgrade luminaires - these will create new jobs. Other related new opportunities arise for professionals offering monitoring, maintenance, data services.
- Lighting design may/will evolve to offer circular specification on a through project scale, with independent professionals to advise on and support in-service interventions with lighting equipment.
- Serviceable luminaires increase the proximity of manufacturers to their customers and allow them to offer products and services to improve efficiency and support circular economy principles.
- Repairs and upgrades to lighting control systems can often be made by replacing or adding component devices to return the system to proper functionality or even to enhance and add to their functionality.
- Lighting control systems can have software and/or firmware upgrades automatically applied to various component devices that can effectively update, protect and even increase the functionality of the components and the systems they reside in. Preventative bug fixes and updates are already commonplace with connected lighting controls systems. The use of the “Cloud” as a method of monitoring and upgrading software can be imagined. Lighting control systems, and particularly wireless versions, can support the circularity of the buildings in which they are installed by allowing greater flexibility in how the space is re-configured through its life as the needs or the users of the space change, without the need to rip out and replace cabling and switches, etc. that are still functioning properly. As buildings evolve so features can be turned on and off to suit the use of the space. Controls can also be used to monitor hours of operation and so help with maintenance planning and with insight into potential luminaire or component re-use opportunities.
- Options to deal with technology that is superseded, banned under energy efficiency legislation, no longer available or supported. For example, MR16 conversion to LED. This keeps the fabric of the product and the associated embodied carbon and extends useful life.
- Preserve internal appearance of spaces - perhaps light forms part of the recognised (or even listed) status of a building - by remanufacturing what already exists.
- Large reductions in use-stage energy consumption of the lighting installation are achievable through the use of efficient lighting technologies, for example LED luminaires and lamps and lighting controls systems. Similarly, the design of lighting systems that makes better use of daylight, reduces the number of fittings, and only provides higher lux levels to those areas that actually require lighting will also improve both material and energy efficiency. Reduced energy consumption results in lower demand for raw material extraction for fuel, energy generation equipment and distribution infrastructure and so also supports the principles of material efficiency and the circular economy.

- Circular practices such as repair, re-use, product as a service can all be supported by the data provided by analytics from lighting controls systems. For example, it's easier to anticipate the remaining life of a component if it's known for how long and to what extreme the component has been operated previously.

4. CHALLENGES AND OPPORTUNITIES AHEAD

Circular business models present opportunities for business as set out above. However, as with any other traditional manufacturing industry, the transition to a circular model for the lighting industry is unlikely to come without challenges.

- Regarding Article 4 from the Ecodesign Directive quoted above – is it possible to treat an industry as diverse as lighting in one measure? The domestic market is huge and includes a lot of imported, often low-cost lamp and luminaire solutions that are not designed for the circular economy. Industrial and street lighting provide better opportunities to target both design and application. For example, Zhaga has made some inroads into the standardised approach to LEDs and in street lighting this has been quite successful as the DALI Alliance is now working with Zhaga to create the D4i / Zhaga scheme. Commercial lighting is a mixed picture. As an industry, we have the opportunity to define not only the design of the scheme and luminaires, but also minimum quality standards for performance and interoperability between devices.
- Does it make sense to focus on light source replacement at the same pace as shorter-lived control gear, especially considering that the decisions needed for, and skills needed to successfully change a light source can be complex (at an extreme, standardisation of interfaces)?
- Should compliance be via self-declaration or independent assessment? Think of the costs involved – especially if mandatory for all derivatives and custom solutions. Also think about the non-compliance of unscrupulous importers. Compliance also refers to the correctness of green claims (avoiding 'Greenwash'). Maybe self-declaration for luminaires designed to use lamps and control gear which have been independently certified?
- Interoperability of software and interchangeability of hardware both support circularity for example by allowing components from multiple suppliers to be used in products or systems initially produced by a different manufacturer, so removing the reliance on a single supplier for repair and upgrade. This can be especially critical where that original manufacturer has gone out of business, potentially rendering a product or system unable to have its life extended through repair or upgrade. However, there are significant concerns around mandating interoperability and interchangeability, including risks around disincentivising a producer's efforts to innovate, so potentially resulting in net-negative effects for sustainability as well as a sacrifice of user experience.
- The lighting industry moving more towards being a service industry could make sense, but it will take time: think of setting up local repair networks and extended duties of care with commitments to provide spares at reasonable cost.
- We should not stifle innovation and creativity by travelling too far down the road of commoditised modularity and less regular component upgrades.
- How to responsibly gauge the extent of upgrade possibilities for a luminaire? These upgrade possibilities can add expense and environmental impact. How to balance this with the likelihood that

these upgrades will be put into practice? This will vary segment by segment. Not every circular activity necessarily has a positive outcome in every situation and so it's important to keep the ultimate goal of improved environmental sustainability in mind, rather than being overly fixated on the routes used to get there. An example of thinking on this topic is given in the references.[7]

- How to responsibly gauge when it is a good time to upgrade? Lumen depreciation levels? Availability of more efficient light sources? New controls options? This will involve new ways of doing business with maybe extended relationships between specifiers and their clients.
- What is considered to be the smallest unit of reasonable repair beyond which there are no practically repairable parts? Repairing a circuit board is seldom practical. However, repairing a product by replacing a circuit board could certainly be practical where the circuit board is designed for replacement. It seems like luminaires give us a great opportunity to support the principles of circular economy as they can certainly have serviceable parts such as the light source, the LED driver/ballast, optics, decorative elements, control system devices, etc. Deep repairs, like repairing a circuit board, raise much greater concern about whether such repairs are done properly, and that the product remains in compliance with safety, performance, and other legal requirements.
- Who carries out repairs or upgrades? Potentially, mirroring the car industry, this would often not be the original manufacturer. The repairer is simply seeking to restore the product's original function and performance and, in this case, there is no logical need to seek a new UKCA / CE certification. The upgrader in the case of lighting is very likely required to provide new UKCA/CE compliance and warranty. Guidance on recertification requirements will be available in the upcoming lighting annex to BS8887 (Code of Practice for the Re-Manufacture of Luminaires).
- Standards and guides on Circular Economy principles are essential to aid with design and discipline for green claims. Without a comprehensive and harmonised approach, there will be confusion ahead between clients, specifiers, engineers and manufacturers.
- Customer requirements for the product choices they make to fit with their own ESG/CSR aspirations around materials, manufacturing location, social impact of production, etc, may differ from industry guidance.
- Within the lighting industry, we must accept and adopt the need for keeping lighting products in service, be that through Repair, Re-use, Maintenance, Upgrade or Remanufacturing and the tools available for us to do so. We must understand the subtle differences between them and importantly how compliance, safety, competence, responsibility/ownership and warranty topics are dealt with appropriately in each case. We must consider applications where ownership of the product changes, and where it does not, where work is done onsite or returned to a manufacturer/remanufacturer/ repairer.
- The move to circularity is slowed by the large installed base of non-repairable products already in the field, plus those that are still being produced and placed onto the market today.

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5. CIRCULAR ECONOMY & LEGISLATION

Several pieces of legislation already exist or are in development in the UK and to a greater extent, the EU, that impose circularity obligations on manufacturers, producers and other stakeholders in lighting products. Some key examples are introduced below:

UK Legislation:

1. The Ecodesign for Energy-Related Products and Energy Information (Lighting Products) Regulations 2021.

   Link to SI - https://www.legislation.gov.uk/uksi/2021/1095/contents/made

   The Circular Economy is touched upon in Chapter 2, Part 6:

   "Manufacturers, authorised representatives, and importers of containing products must ensure that light sources and separate control gears can be replaced with the use of commonly available tools and without permanent damage to the containing product.

   Paragraph (1) does not apply where a technical justification related to the functionality of the containing product is provided in the technical documentation explaining why the replacement of light sources and separate control gear is not appropriate".

2. WEEE Regulations Reforms
   The current WEEE regulations have now been in place for a decade. During 2023, the UK Government has committed[i] to consulting on changes to the WEEE system. Officials have already held informal discussions with stakeholders so we can be reasonably confident of some of the headline proposals on which they are likely to consult:
   - Moving the point of producer responsibility – in essence, providing householders and businesses with free of charge collection of WEEE. For householders, that might include strengthened obligations on distributors, in particular free collection of used appliances when delivering new household appliances including luminaires.
   - Better embedding of circular economy principles in the regulations. That could include changes to drive a greater focus on reuse and repair, rather than recycling, and also measures, such as eco-modulation of WEEE obligations and hence fees, to encourage better eco-design of new products.
   - Tackling non-compliant product sold via online marketplaces. The likely solution would be to create a new class of producer. This would require online marketplaces to take on the financial obligations for collection and treatment of their overseas sellers. This would be consistent with the current reforms to the waste packaging system.
   - A review of how financial obligations on producers are set and the metrics that should in future be used to measure success of a reformed system.

[i] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133967/environmental-improvement-plan-2023.pdf

3. Environment Act 2021

4. Green Claims Code
   The Competition and Markets Authority (CMA) has the power to protect consumers and businesses from misleading marketing by businesses. That includes misleading green claims. The CMA has published guidance[ii] for businesses to clarify their obligations when making environmental claims. The Code consists of six key principles. The principles are that claims made must:

   - be truthful and accurate;
   - be clear and unambiguous;
   - not omit or hide important relevant information;
   - consider the full life cycle of the product or service;
   - be substantiated; and
   - ensure comparisons are fair and meaningful.

   The Code provides further detail on each principle and helpful examples of applying the principles to common environmental claims.

   The Code applies to all businesses which make environmental claims whether this is directly to consumers or to other businesses. This includes, but is not limited to, manufacturers, wholesalers, distributors, retailers and online marketplaces.

EU Legislation:

It is likely that the first legislation to take effect in regard to sustainability will come from the EU, who are particularly active with the topic and so their work is highly influential in other parts of the world outside the European Union.

1. EU 2019/2020 – Ecodesign requirements for light sources and separate control gears (aka Single Lighting Regulation). See https://eur-lex.europa.eu/eli/reg/2019/2020/oj. Article 4 contains the same requirements as described in the UK regulation in 1 above.
2. Multiple current EU regulatory initiatives include proposals to include circularity criteria including obligations such as communicating on, and / or minimum performance limits on aspects such as durability, recyclability, recycled material content, repairability and full-life life-cycle assessments (LCAs) for products or buildings. Examples of such proposals that may have relevance to stakeholders in the lighting industry in the EU would include:
   i. **EcoDesign for Sustainable Products Regulation (ESPR)** – part of the umbrella Sustainable Products Initiative (SPI) package of regulatory proposals. Includes draft

[ii] https://www.gov.uk/government/publications/green-claims-code-making-environmental-claims/environmental-claims-on-goods-and-services

obligations around reporting on (and ultimately banning) the destruction of unsold consumer goods, product durability and LCAs.

ii. **Sale of Goods Directive** review – Includes proposals to require producers to prioritise repair over replacement for consumers as the first remedy (as opposed to allowing the option of repair or replacement) in the event of product failure. Requirements relating to the availability of spare parts for minimum durations also feature as a possible new producer obligation.

iii. **Legislation on Substantiating Green Claims** – With a key objective of tackling the greenwashing that takes place today, this legislative initiative looks set to introduce proposals that will require producers to back-up green claims they make, potentially by requiring full-life life-cycle sustainability assessments to accompany products that give much more transparency about a product's environmental credentials, including in relation to circular aspects such as re-useability and recyclability.

iv. **Green Taxonomy** – Aims to use product and activity classifications to direct investment towards economic activities related to sustainability including circularity aspects (long lifetime, repairability, guarantees, spare part availability, recyclability, etc) and to disincentivise investments towards less-sustainable activities.

v. **Green Public Procurement (GPP)** – Introduces minimum sustainability performance obligations on purchases by publicly owned organisations (government offices, schools, hospitals, libraries, etc), including aspects related to circularity.

vi. **Review of the Energy Performance of Buildings Directive (EPBD)** – This review is primarily targeted at helping the EU reach its 2030 and 2050 carbon-emission reduction targets, but also introduces the concept of Building Renovation Passports. These link to circularity in that they document the long-term renovation roadmaps of buildings towards extending their life and improving their sustainability.

Additionally, the French implementation of the existing EPBD into their local building regulation recently introduced requirements for full-life life-cycle assessments of buildings, built-up from the LCAs / Energy Performance Declarations (EPDs) for the components of the building (including luminaires).

6. CIRCULAR ECONOMY STANDARDS & METRICS

TM66

The Society of Light & Lighting (SLL), part of the Chartered Institution of Building Services Engineers (CIBSE), published TM66 in September 2021. TM66 consists of two components, a 47-page Technical Memorandum – Creating a circular economy in the lighting industry, and the Circular Economy Assessment Method (CEAM) metric. TM66 provides a detailed explanation of circular economy in lighting, encourages its adoption, sets out a sector-by-sector business case, includes case studies on early adopters, gives a comprehensive overview of legislation and ends with frequently asked questions.

TM66 CEAM was released as a beta version by way of an Excel download from the CIBSE Knowledge Portal, its cost is included with TM66. CEAM is split into four 'tabs' covering Product Design, Manufacturing,

Materials and Ecosystems. An effective taxonomy in sustainability metric delivers a transition tool that helps plan and report on the transition and direction of travel, thus the TM66 CEAM metric benchmarks a specific product against the typical related product in the base year 2021 – so a typical product with no particular circular economy capability will be scored 0.0. Across the four 'tabs', the user responds to 66 different criteria, each benchmarking a specific attribute, scoring is done by choosing from a range of radio buttons and very importantly the score has to be justified by the provision of evidence. TM66 CEAM scores range from 0.0 to 4.0, but as 4.0 is truly regenerative, then currently a score of 2.2 to 2.7 is deemed current best practice.

TM66 was written as a joint effort between manufacturers, specifiers, end users and lighting bodies. This has assisted its take up, with it becoming the 'go to' standard in the UK and has also seen its use in Europe and in the US.

BS8887

BS8887 is an existing series of standards that specifies the processes required to bring a used or obsolete product(s) back to the market. The standards are already in use in other sectors, such as automotive, computer peripherals and white goods.

A new section of BS8887 is currently in draft intended to act as a 'code of practice' identifying and giving guidance on the specific requirements that would facilitate the remanufacturing of luminaires and the technical documentation, testing and compliance assessments to support the remanufacturing process.

The aim of this part of BS8887 is to give the lighting sector the vocabulary and procedures for any work that is carried out on a luminaire beyond the initial production and installation, apart from that of regular maintenance.

This enables the user to understand the processes undertaken by the remanufacturer and the level of the final product's quality.

"Remanufactured Luminaires" range from being similar to a new product, having not been used and in original or unopened packaging, through to older products that have been used and are being sold to a second or third user in the product's lifecycle (refer to Annex 1 of the standard).

The purpose of these standards is to provide a framework within which such work can be done. They offer a methodology that will underpin the work of the remanufacturer whilst providing confidence to the purchaser / end-user of the remanufactured equipment that the remanufacturing work has been done to accepted industry norms.

Remanufacturing is an important link in the Circular Economy. The longer that we are able to keep luminaires in active use and reduce the amount of equipment being sent for recycling, the less reliance there will be on the extraction of virgin materials and unnecessary energy expenditure on material recovery processes.

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7. LIA AND THE CIRCULAR ECONOMY

The LIA is well placed to track and contribute to Circular Economy developments for the UK lighting industry. At a standards level, the LIA is active in the national committees of BSI, this participation escalating with LIA staff/members also working directly at the levels of CENELEC and IEC; the close links the LIA has with government reach out in the UK to the Department for Energy Security and Net Zero and via LightingEurope into the European Parliament and Commission. The LIA has set up a technical committee concerned with the Circular Economy and Life Cycle Analysis. It feeds into LightingEurope Task Forces covering these two issues (mandated from WG Sustainability).

TM66 Circular Economy Assured is a joint venture between the LIA and CIBSE, whereby manufacturers can submit their self-assessed TM66 scores for third party quality assurance and the awarding of a quality mark. This work is in line with EU moves to require third party verification of all sustainability claims.

The LIA supports measures toward the Circular Economy, agreeing with the business benefits and is already involved with studies and initiatives, some previously detailed, and discussing the various challenges we see before our industry.

The LIA track record of engagement with environmentalism has in the past embraced REACH, RoHS, WEEE and conflict mineral compliance, as well as efficacy initiatives.

The LIA will continue to advise its members on all aspects of the Circular Economy in our lighting industry.

8. REFERENCES

[1] https://www.gov.uk/government/publications/circular-economy-package-policy-statement/circular-economy-package-policy-statement

[2] https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

[3] https://www.ellenmacarthurfoundation.org/circular-economy/concept

[4] https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

[5] https://www.ellenmacarthurfoundation.org/circular-economy/concept/infographic (simplified)

[6] https://www.lightingeurope.org/images/publications/position-papers/LightingEurope_-_White_paper_-_Serviceable_luminaires_in_a_Circular_Economy_-_October_2017.pdf

[7] https://www.repro-light.eu/download/569/

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9. GLOSSARY

The below sources are used in the glossary:

Source	
1	https://www.ceguide.org/Glossary
2	https://www.ellenmacarthurfoundation.org/
3	https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp https://www.investopedia.com/terms/c/corp-social-responsibility.asp
4	https://spot.ul.com/blog/embodied-vs-operational-carbon/#:~:text=Operational%20Carbon%3A%20The%20amount%20of,for%2028%25%20of%20global%20GHG.
5	https://www.oneclicklca.com/simple-epd-guide/
6	https://en.wikipedia.org/wiki/Lighting_as_a_service
7	https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/
8	https://ec.europa.eu/environment/archives/eussd/pdf/footprint/PEF%20methodology%20final%20draft.pdf
9	https://sciencebasedtargets.org/
10	https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf
11	https://www.epa.gov/sustainability/learn-about-sustainability
12	TM66 Creating a circular economy in the lighting industry | CIBSE

A	Source
Additive manufacturing Manufacturing objects by adding material (instead of removing material)	1
B	Source
Biodegradable materials A material which microorganisms can break down into natural elements (i.e. water, biomass, etc.).	1
C	Source
Circular Economy A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems.	2
Closed-loop recycling Recycling a product and manufacturing it into the same product again and again.	1
Corporate Social Responsibility (CSR) A self-regulating business model that helps a company be socially accountable—to itself, its stakeholders, and the public.	3
Cradle-to-Gate An LCA that evaluates the environmental impacts of a product or process from raw material extraction through manufacturing.	1
Cradle-to-Grave An LCA that evaluates the environmental impacts of a product or process from raw material extraction up through disposal.	1
Cradle-to-Cradle An LCA that evaluates the environmental impacts of a product or process from raw material extraction beyond end of life to remanufacturing using end of life material as secondary raw materials.	-

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D	Source
Dematerialization Delivering a product using a percentage or none of the mass compared to the conventional product.	1
Design for disassembly Design principle that calls for the end-of-life options of how the product, components and materials can be deconstructed.	1
Design for flexibility Design principle (most commonly applied in building design and construction) that calls for use of interstitial space, programmed soft space, shell space, expansion capacity, demountable partitions and mobile or modular furnishings.	1
Design for recyclability Design principle that calls for the end-of-life accounting of how the product will be collected and recycled.	1
Design for repairability Design principle that calls for products to be manufactured using fasteners, materials and processes that allow them to be easily fixed.	1
Design for sustainability Design principle that calls for the optimization of environmental and social benefits across a product or service's life cycle.	1
Downcycling Use of secondary materials that results in a lower economic value of that material that cannot be recovered.	1
Durability Product characteristic that determines the length of time over which it maintains its value or functionality	1
E	**Source**
Eco-design Design principle that calls for the minimization of negative environmental and health impacts across a product or service's life cycle.	1
Electronic waste (E-waste) Disposed electronic and electrical products. These products typically contain hazardous materials and require certified handling and recycling.	1
Embedded impacts The environmental and social impacts of a product, from material extraction through the use phase.	1
Embodied Carbon: The amount of carbon emitted during the making of a building. This includes extraction of raw materials, manufacture and refinement of materials, transport, the building phase of the product or structure, and the deconstruction and disposal of materials at the end of life.	4
End-of-life The life cycle stage during which a product no longer has value to its original owner and is then disposed of.	1
Environmental Product Declaration (EPD) A document which transparently communicates the environmental performance or impact of any product or material over its lifetime. Construction EPDs are based on the ISO 14040/14044, ISO 14025, EN 15804 or ISO 21930 standards.	5
Environmental Social Governance (ESG) Environmental, social, and governance (ESG) criteria are a set of standards for a company's operations that socially conscious investors use to screen potential investments.	3
F	**Source**
Footprint The impact of a product or service across its life cycle. One can calculate a product's carbon, water, energy and material footprints, for example. This is similar to an LCA except that footprints typically only evaluate one environmental issue.	1
G	**Source**
Green public procurement A policy in which governments commit to buying products and services with environmentally-preferable characteristics.	1

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H	Source
Hazardous materials A material or substance that has the potential to harm humans, animals or the environment.	1
I	**Source**
Impact analysis The second phase of an LCA in which environmental impacts are determined.	1
Inventory analysis The first stage of an LCA in which the inputs and outputs (materials, energy, water, economic value, etc.) of the system are identified.	1
Improvement analysis The third stage of an LCA in which solutions are evaluated for mitigating environmental impacts.	1
J	**Source**
Just-in-time manufacturing Manufacturing strategy to reduce wasted time and resources by providing products or services as they are needed by the next step in the production process.	1
L	**Source**
Landfilling The disposal and burying of solid waste. The degradation of the waste results in the creation of local air and water pollution.	1
Leasing A service model in which the customer pays for continuous access to a product over an agreed period of time.	1
Life cycle All of the stages that a product goes through in its lifetime: raw material extraction, processing, manufacturing, use, end-of-life and transportation.	1
Life cycle assessment A method to evaluate the environmental impacts of a product or system over its life cycle. An LCA is typically done in three parts: (1) Inventory Analysis, (2) Impact Assessment, (3) Improvement Analysis.	1
Life cycle cost A method to evaluate the financial impacts of a product or system over its life cycle.	1
Lighting as a Service (LaaS) A service-based business model in which light service is charged on a subscription basis rather than via a one-time payment.	6
Linear Economy A linear economy traditionally follows the “take-make-dispose” step-by-step plan. This means that raw materials are collected, then transformed into products that are used until they are finally discarded as waste.	7
Linear risk The risk a company faces when depending on the conventional "take-make-dispose" economic model.	1
Local materials Materials that are extracted and processed within the same region they are being purchased. Specific distances depend on the material, process and objectives.	1
M	**Source**
Modular design Design principle that calls for products to be manufactured using a set of components that can be individually replaced, preventing entire products from becoming redundant.	1
O	**Source**
Open loop recycling Recycling product A and manufacturing it into product B.	1

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Operational Carbon The amount of carbon emitted during the operational or in-use phase of a building.	4
P	Source
Packaging (Primary) Packaging in contact with the product (plastic sack holding cereal).	1
Packaging (Secondary) Packaging that contains one or more primary packages (cereal boxes).	1
Packaging (Tertiary) Packaging that contains one or more secondary packages (plastic wrap for a palette of cereal boxes).	1
Product Environmental Footprint (PEF) A multi-criteria measure of the environmental performance of a good or service throughout its life cycle.	8
R	Source
Recovery Process of extracting material, energy or water from the waste stream for reuse or recycling.	1
Recyclable materials Materials that can be recycled.	1
Recycled content The portion of a product that is made from recovered and recycled materials.	1
Recycling The collection, sorting and processing of disposed materials for use in another manufacturing process.	1
Refurbished materials Discarded materials or products that are typically repaired, refinished and sanitized to serve their original function.	1
Regenerative design A design principle that calls for products or services to contribute to ecosystem health.	1
Regenerative economy A scenario in which products and services replenish their own sources of energy, water and materials in a closed-loop system.	1
Remanufacturing Process of recovery, disassembly, repair and sanitizing components or parts for resale and reuse.	1
S	Source
Science Based Targets Science-based targets show companies how much and how quickly they need to reduce their greenhouse gas (GHG) emissions to prevent the worst effects of climate change.	9
Scope 1 Emissions Direct emissions from owned or controlled sources.	10
Scope 2 Emissions Indirect emissions from the generation of purchased energy	10
Scope 3 Emissions Indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.	10
Social life cycle assessment A method to assess the social and sociological impacts of a product or service across its entire life cycle.	1
Sustainability Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations.	11

TECHNICAL STATEMENT

T	Source
Take-back program An initiative to collect used products or materials from consumers and reintroduce them to the original processing and manufacturing cycle.	1
Taxonomy The practice and science of categorisation, or from a sustainability perspective a classification system to help investors, companies and policymakers identify economic activities that can be considered sustainable.	12
Technical nutrients Man-made materials designed to be long-lasting and reused.	1
U	**Source**
Upcycle Use of secondary products, components or materials that results in a higher economic value for that material.	1
W	**Source**
Waste Electrical and Electronic Equipment (WEEE) See "Electronic waste"	1
Waste hierarchy The priority order available for managing wastes, ranked in descending order of preference, based on the best environmental outcome across the lifecycle of the material. (1) Prevention, (2) Reduce, (3) Reuse, (4) Recycle, (5) Incineration, (6) Landfill.	1
Z	**Source**
Zero waste Program to divert all (at least 95%) waste from landfill. The scope of zero waste may or may not include incineration depending on reference.	1

< END >