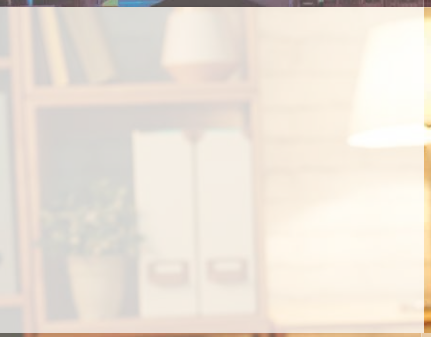




GLOBAL
LIGHTING
ASSOCIATION

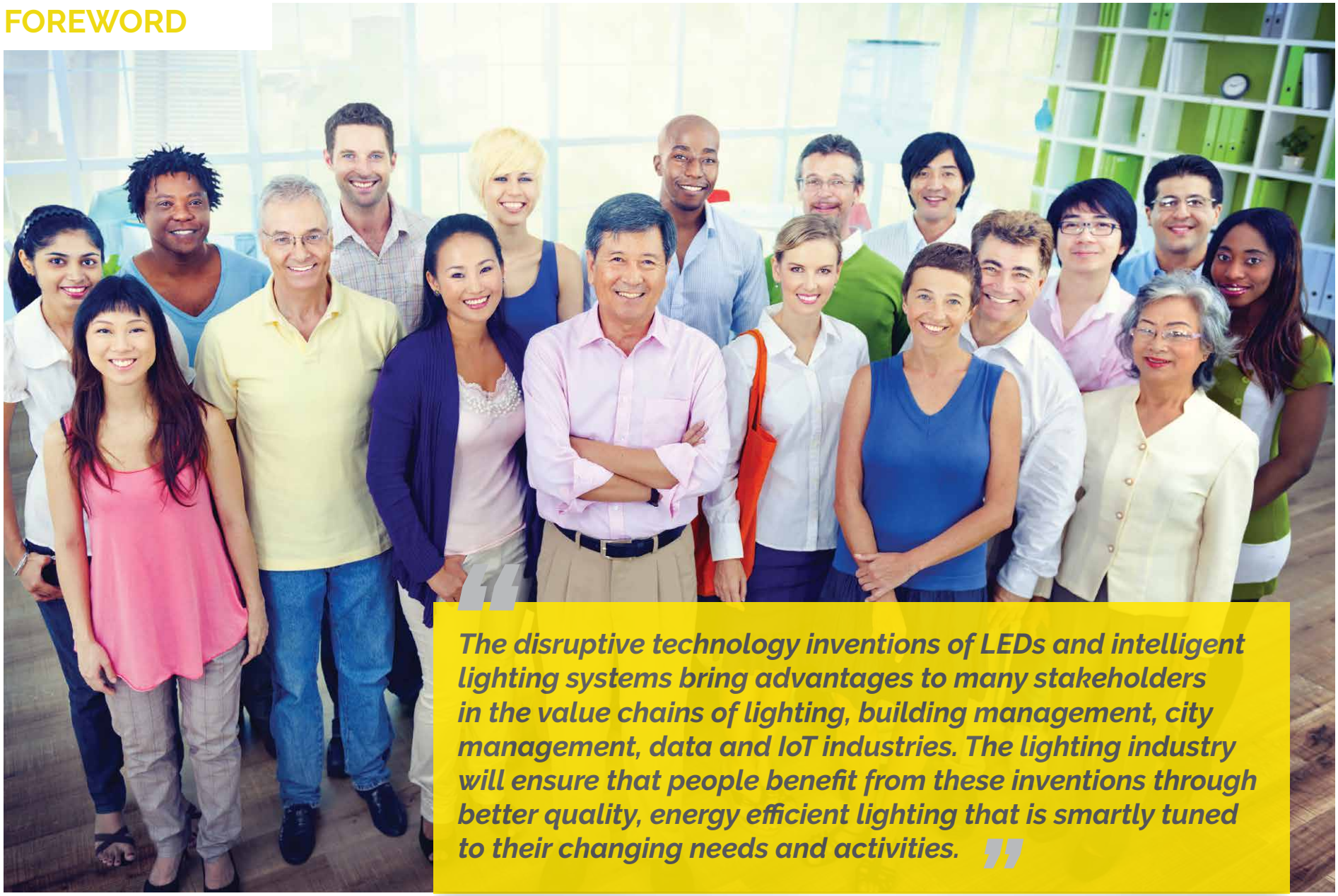
STRATEGIC ROADMAP OF THE GLOBAL LIGHTING INDUSTRY







FOREWORD



"The disruptive technology inventions of LEDs and intelligent lighting systems bring advantages to many stakeholders in the value chains of lighting, building management, city management, data and IoT industries. The lighting industry will ensure that people benefit from these inventions through better quality, energy efficient lighting that is smartly tuned to their changing needs and activities."

SUMMARY

Strategic Roadmap of the Global Lighting Industry

In recent decades the world has seen enormous changes in lighting.

The industry has witnessed **two highly disruptive technology developments**. Light emitting diodes **(LEDs)** from quality producers have developed to a level of performance and light quality to enable the rapid replacement of most conventional light sources. Secondly, LEDs have been integrated into **intelligent lighting systems**, making them capable of full integration with the digital world. Consequently the industry is now moving towards system solutions, in addition to better lighting quality than that previously offered by traditional technology.

A 3rd photo-receptor in the human eye has been discovered, providing scientific evidence that light not only enables vision, but also impacts performance and feelings of well-being. This enables lighting to add value to society from sustainability to quality of light.

The world has many challenges, and some are very relevant to the lighting industry. These include the challenges posed by **globalization, climate and demographic changes.**

The challenges confronted by the lighting industry are **digitalization, new applications of intelligent lighting systems** and the increasing demand for **buildings supporting human health, well-being and productivity**. Hence the value of lighting is moving from energy efficiency to the wider spectrum of quality of life and improved well-being.

This transition requires **new paradigms for all stakeholders** – the industry, customers and users and particularly governments and regulators, who need to view the capabilities and benefits of lighting within this wider context.

*An important role of the **Global Lighting Association** is to share knowledge on global trends, and for this reason we have prepared The Strategic Roadmap of the Global Lighting Industry. The Association also initiates policies and actions in areas of common interest and provides governments with relevant product and market information.*

DISRUPTIVE DEVELOPMENTS IN LIGHTING TECHNOLOGY

In recent years the world has seen enormous changes in lighting technology. Light emitting diodes (LEDs) have developed to a level of performance and light quality that enable the replacement of most conventional light sources.

The digitalization of lighting has enabled intelligent lighting systems, and integration with the Internet of Things. Consequently, the industry is now moving towards system solutions.

LEDs

HIGH EFFICIENCY

- in lumen output paired with the creation of white light

FLEXIBLE

- through use with smart sensors, forming the base for intelligent lighting systems
- due to size and arrangement possibilities, leading to creative luminaire design

TUNEABLE & DYNAMIC

- by integration with electronic systems which allows for dimming and brightening, change of colours and other control options

INTEGRATION

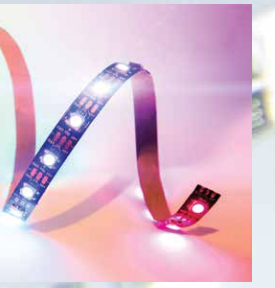
- can be used in conventional luminaires but also easily integrated in other products such as ceiling tiles, furniture, carpets, walls

LONG LIFE

- an intrinsic feature, with the consequence that customers do not always replace LEDs for improved models

COST EFFECTIVE

- due to global competition and enormous progress in manufacturing



Lighting Systems

CONNECTED

- as electronic components, increasingly connected wirelessly with drivers, making lighting control much easier

DATA

- can provide users of lighting the most optimal lighting conditions

SMART SENSORS

- enable automated collection of environmental data, allowing for monitoring and control in smart grids

IoT AND IoL(IGHTS)

- because lighting systems have become smart and connected, they may form the core of the "physical internet", the so-called *Internet of Things*.

DIGITALIZATION

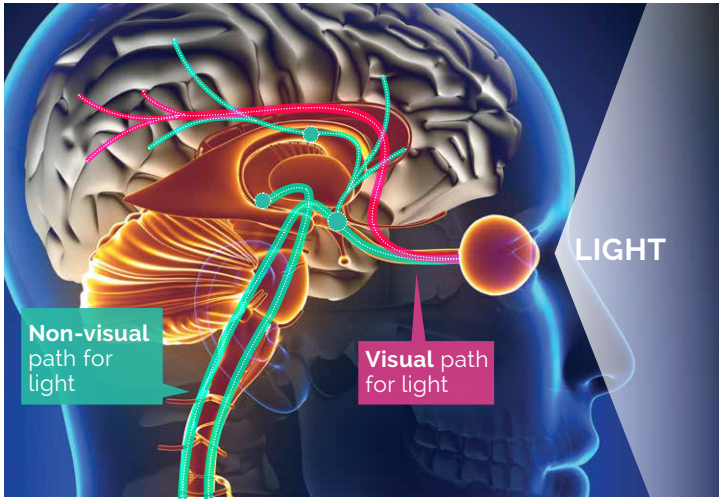
- converting the industry from components and hardware driven to a digitalized software industry

NEW APPLICATIONS

- above developments lead to new applications, such as LiFi (instead of WiFi), indoor positioning, light as a service or light leasing

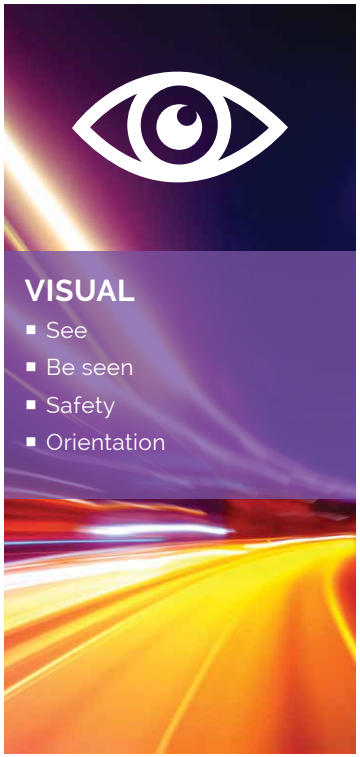
IMPORTANT DISCOVERY:
LIGHT PROVIDES MORE THAN VISION

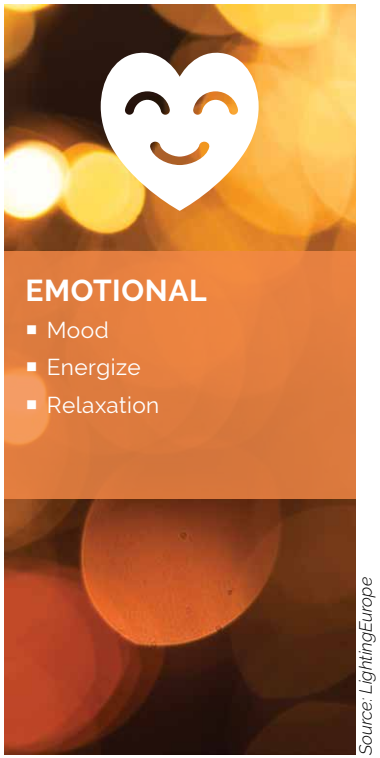
3rd photo receptor



Around the year 2000 a third photo-receptor (photoreceptive retinal ganglion cells) in the eye, in addition to rods and cones, was discovered. With this discovery it became apparent that **human biological rhythms and cognitive performance are influenced by light conditions.**

The effects of lighting on people





Source: LightingEurope

Towards better vision, well-being and performance

HUMAN CENTRIC LIGHTING

PROMOTE BIOLOGICALLY EFFECTIVE LIGHTING IN BUILDINGS

Daylight is dynamic from sunrise to sunset

On a sunny day people outside receive **100 000 LUX**

On a cloudy day **10 000 LUX**

High biological effect

Electric lighting is static from wake-up to go-to-sleep

Indoor in offices people receive **500 LUX**

and in schools only **300 LUX**

Low biological effect

Source: LightingEurope

Human centric lighting supports health, well-being and performance of humans by combining visual, biological and emotional benefits of light

LIGHTING NEEDS TO BE DYNAMIC AND TUNEABLE ACCORDING TO USE


School


Hospital


Elderly home


Home

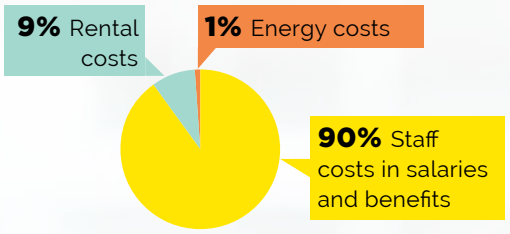

Office


Factory

We need the right light at the right time to support our activities

ESSENTIAL FOR BUILDINGS

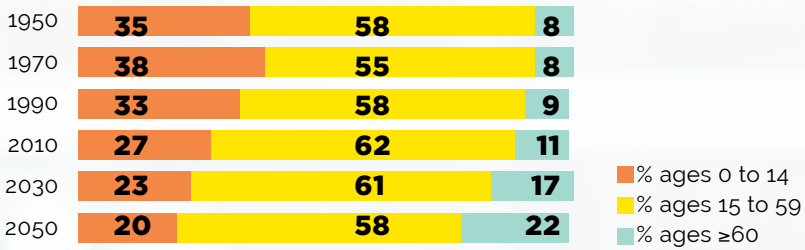
People spend up to **90%** of their time indoors



Look beyond energy efficiency
human centric lighting increases vision, performance and well-being

source: http://bregroup.com/services/research/the-biophilic-office/

AGE BREAKDOWN OF WORLD POPULATION, 1950-2050



sources: United nations; World Population Prospects; The 2010 Revisions; The Future of World Religions; Populations Growth Projections, 2010-2050. Figures may not add to 100% due to rounding.

GLOBAL TRENDS OF SIGNIFICANCE TO LIGHTING

Globalisation, climate change and demographic changes provide challenges and opportunities for the lighting industry.

Globalisation

Bigger markets, more opportunities

Heavy regulation with poor enforcement

Global product and interface standards

Climate change & resource scarcity

Energy efficient products & systems

Food & water treatment

Circular economy & materials efficiency

Demographic shift

Growing and ageing population

Working longer hours, later retirement age

Increasing urbanisation

IMPLICATIONS FOR THE LIGHTING INDUSTRY

The challenges confronting the lighting industry are digitalization, new applications of intelligent lighting systems and the increasing demand for buildings supporting human health, well-being and productivity. Hence there is a need to move from energy efficiency as the key driver of lighting technology towards a combined approach which adds value to society through lighting for health and well-being.

Digitalisation

Working with software providers and companies in sensor and data industry

Being part of the Internet of Things

New applications

Thinking beyond light for vision

Offering new value propositions and business models

Healthy buildings

Promoting lighting with beneficial biological effects

Caring for older eyes that need more - and different - light

ABOUT HEALTHY BUILDINGS

The focus for building design shifts from cost and energy to well-being of occupants as we move towards the middle of the 21st century

Main focus

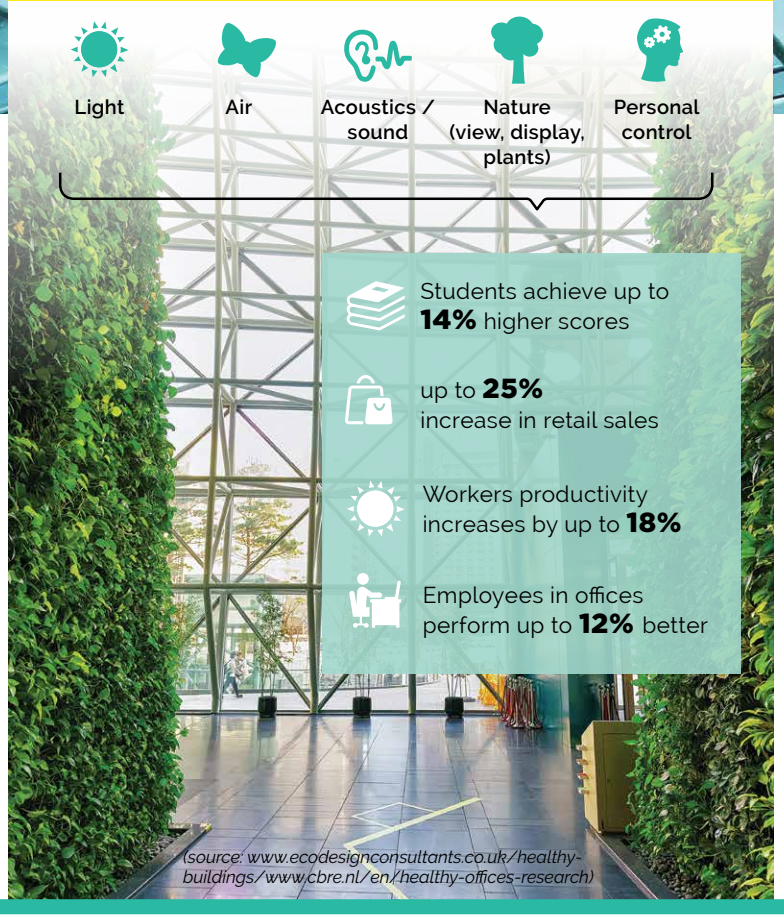
Time

Building
Cost reduction

Green Building
Energy efficiency

Healthy Buildings
Well-being of users

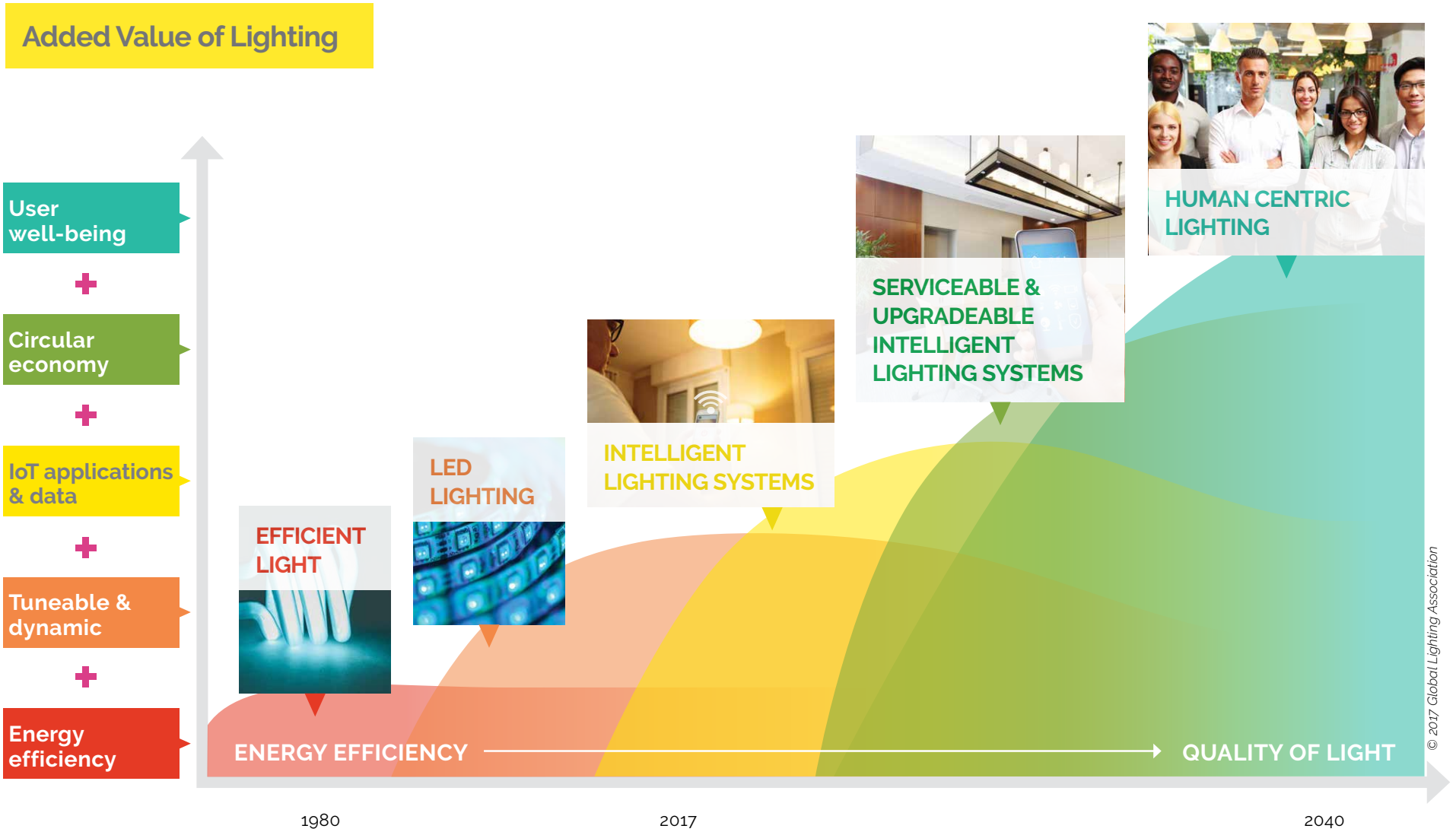
Light | Air | Acoustics / sound | Nature (view, display, plants) | Personal control



- Students achieve up to **14%** higher scores
- up to **25%** increase in retail sales
- Workers productivity increases by up to **18%**
- Employees in offices perform up to **12%** better

(source: www.ecodesignconsultants.co.uk/healthy-buildings/www.cbre.nl/en/healthy-offices-research)

THE TRANSITION OF LIGHTING... MORE THAN VISION



NEW PARADIGMS

This transition requires new paradigms for all stakeholders - the industry, customers and users. It is particularly so for governments and regulators who need to view the capabilities and benefits of lighting within this broader context.

New paradigms in the lighting industry

Energy efficiency

+

Quality of light & human centric lighting

Cost of ownership

+

Benefit of use: improved lighting for users

Products & controls

+

Connected systems, software & data

New paradigms for

Lighting for vision

Lighting controls

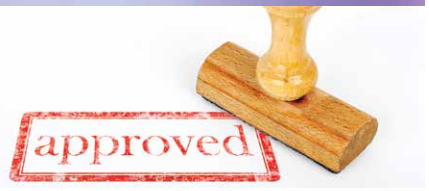
Product efficiency & longer life time

stakeholders*

Paradigm shifts for regulators

Lighting for well-being and comfort

Many rules, poorly enforced



Few rules - well-enforced

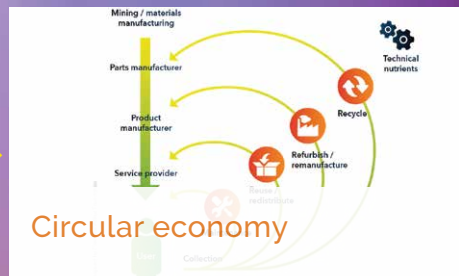
Connected lighting systems

Green buildings

Healthy buildings

System efficiency & circular economy

Waste management

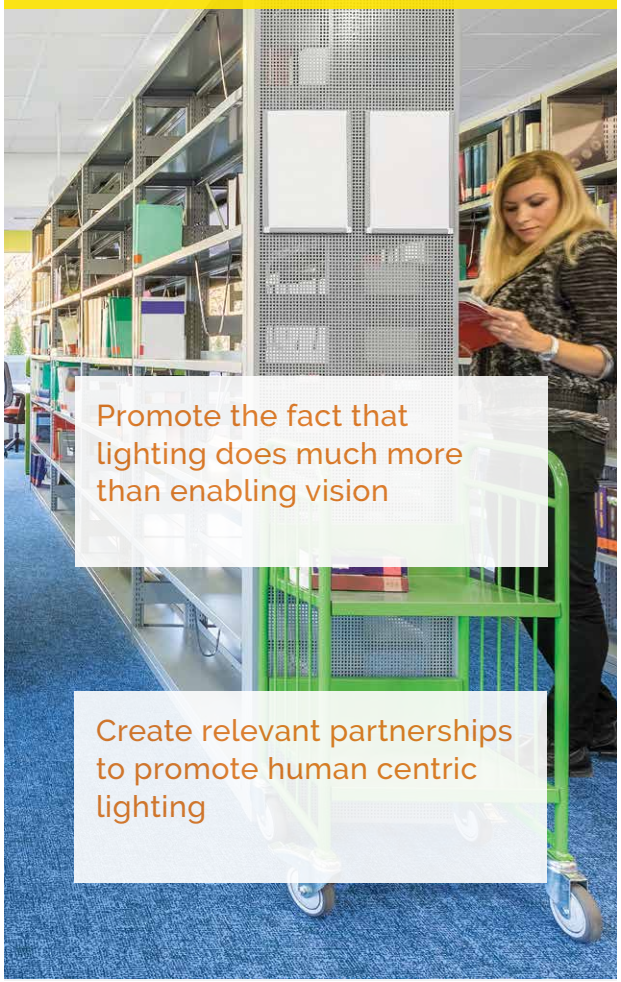


Circular economy

** Users, decision-makers, governments*

ENGAGEMENT – THE ACTIONS OF THE GLOBAL LIGHTING INDUSTRY

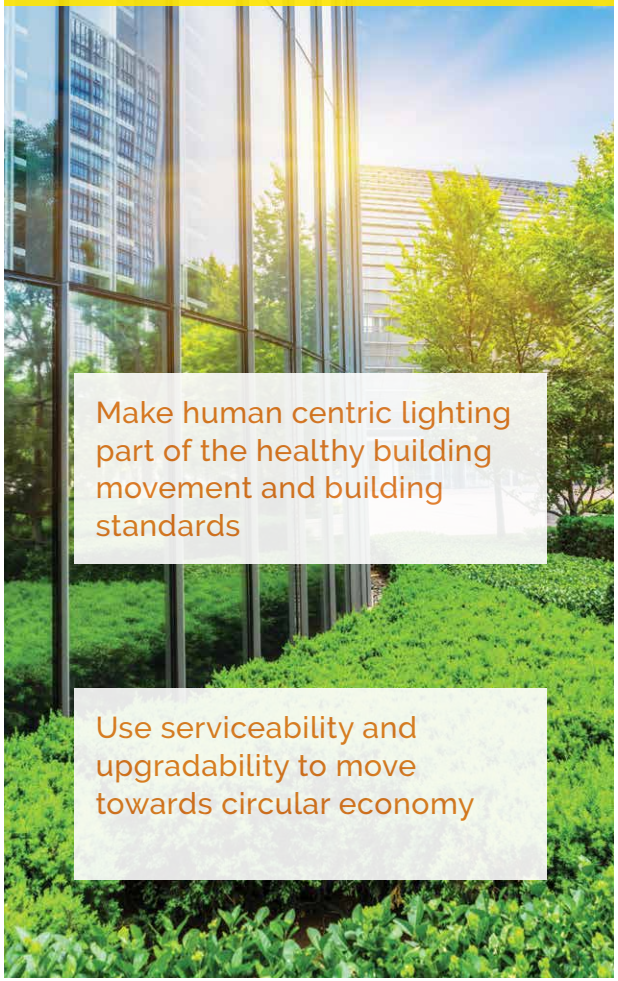
Lighting for well-being and comfort



Promote the fact that lighting does much more than enabling vision

Create relevant partnerships to promote human centric lighting

Healthy buildings & human centric lighting



Make human centric lighting part of the healthy building movement and building standards

Use serviceability and upgradability to move towards circular economy

Few rules, harmonized, well-enforced

Define limited set of product and system requirements for global use

Exchange best practices on successful enforcement and harmonisation

THE GLOBAL LIGHTING ASSOCIATION

Our members around the globe

The Global Lighting Association is a grouping of leading national and regional lighting associations representing **over 5000 lighting manufacturers and over US $75 billion annual sales.**

Our mission

Represent the interests of **all industry stakeholders**

Promote **energy efficient** lighting and improve the **quality of light** and **human centric lighting**

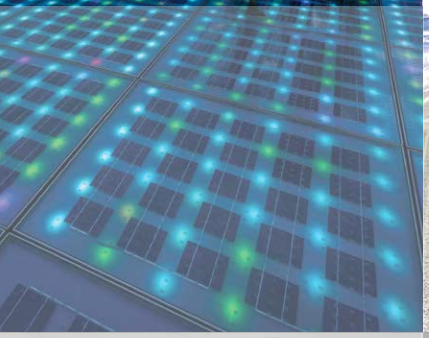
Provide a **forum for exchange and formulation** of technical and policy information

Be a **recognized authority** on issues of concern to the global lighting industry

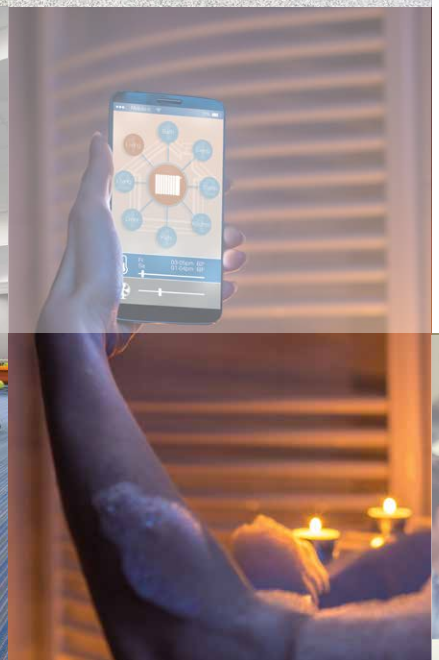
Our partners









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