



# ENVIRONMENTAL PROFILE

BASED ON ISO 14040 and ISO 14044 LIFE CYCLE ASSESSMENT (LCA)

# ITALO 1



**italo**  
FARARE È IL TACCO

# AEC FOR THE ENVIRONMENT

AEC Illuminazione is a manufacturer of luminaries that for more than 60 years has been working in the street lighting and outdoor lighting sector. Its action has always been focused on the search for the highest quality of the product without neglecting environmental responsibility as a manufacturer of lighting equipment.

The company's awareness of the environment and the effort to reduce the environmental impact of every business process, translates into designing efficient and sustainable products that minimize energy consumption and make rational use of resources, promoting technologies that protect the environment.

In AEC, it is the responsibility of each employee to manage natural resources in a sustainable way, from product design to production processes, in accordance with the principles and indications contained in the standard ISO 14001 of which the company holds the certification.



The company's commitment to the environment can be summarized in the following points:

- Comply with all laws, regulations and codes of practice relating to environmental issues related to our operations
- Minimize environmental disturbance actions in all our activities
- Making efficient use of natural resources, minimizing waste and saving energy and water
- Incorporating greater awareness of the environment in the commercial decision-making process, particularly during tenders and the launching of new contracts
- Promote awareness and understanding of environmental issues among all personnel so that their work activities are carried out in compliance with legislation, company policy and good practices of respect for the environment
- Work towards ensuring that our contractors and key suppliers are aware of and apply environmental standards that are compatible with us
- Regularly review the company policy towards the environment in order to guarantee the achievement of the set objectives
- Look for continuous improvements in the environmental performance of the company and its products

# THE PRODUCT

The ITALO series appliances consist of:

- An aluminum body
- LED modules
- Optical reflector modules for light distribution
- Electronic LED Driver
- Surge Protective Device
- Electric cables, terminal blocks, connectors, screws and everything necessary for the correct electrical connection and installation



# PRODUCT LIFE CYCLE ANALYSIS

The attention to environmental sustainability is a fundamental part in all phases of product development: design, acquisition of raw materials and components, production, sale, use, maintenance and disposal at the end of life. The entire life cycle of a product must have a minimal impact on the environment, in particular a reduced energy consumption.

The LCA study has been carried out following the indications of the series of norms ISO 14040 and ISO 14044 and of the General Program Instruction (GPI) 3.0 published by the International EPD® System.

The software used is OpenLCA, the database for secondary processes is Ecoinvent v.3.3.

The study carried out has a "cradle to grave" approach and includes the procurement of raw materials, transport, production, use and maintenance, management of the product at the end of life.

In the phases described below, the AEC choices to achieve the objectives of minimum environmental impact are highlighted.

## REFERENCE LUMINAIRE

For the life cycle analysis, the reference device (functional unit) with the highest weight, the highest power and the largest number of components of the series was considered. This report can therefore be considered valid for all the devices in the series. The support pole is not considered part of this study.

The life cycle considered is 25 years.

- Series: ITALO 1
- Reference device: ITALO 1 OF3 4.7-4M WL
- Total weight including packaging: 8.30kg

## DESIGN PHASE

### EFFICIENCY

The design of an efficient and appropriate optics for the application is the first step to achieve energy savings, that is to distribute the light where it is needed without wasting it. The appliances of the series are equipped with optical modules available in more than **30 versions** to allow the optimization of energy savings according to the environment to be illuminated. The AEC optics are also made by means of aluminium reflectors that maintain the characteristics of efficiency that are mainly unaffected throughout the life cycle (a maximum loss of 1% is estimated in 80.000hr of use). This choice allows to maintain over time a high efficiency of the product in antithesis with the market technologies based on polycarbonate or PMMA lenses that suffer from irreversible losses of efficiency at the expense of energy consumption and the consequent environmental impact.

## RELIABILITY

The AEC devices are tested in accredited laboratories to check all the requirements of the European directives, in particular electrical safety, electromagnetic compatibility, radio devices. Moreover, aging tests are carried out in aggressive environments to verify their robustness and the maintenance of performance over time. For some parameters, the devices are tested beyond the minimum limits set by the standards, such as overvoltage protection, in order to provide the most reliable and long-lasting products. A reliable solution that maintains its performance throughout the entire product life cycle leads to a minimization of energy consumption and maintenance interventions for a lower environmental impact.

## MAINTAINABILITY

In case of intervention on the product, these are designed for easy maintenance in order to make assembly, replacement of internal components and disassembly quick and easy, in order to reduce the environmental impact during the maintenance and end of life phases.

## INTELLIGENT LUMINARIES

The regulation of the luminous flux during the night, automatically or remotely or adapting it to the various conditions of use conditions, allows to avoid the waste of energy. AEC devices are designed to be equipped with various types of remote management systems and adaptive lighting to allow maximum energy reduction and at the same time maintain the safety of visual perception.

## COMPACTNESS

The trend triggered by LED technology is that of designing increasingly compact devices. This brings numerous advantages in terms of reducing the quantities of raw materials used, greater processing speed and therefore lower energy consumption during production, reducing overall weight and therefore less impact in the transport and disposal phase.

## PURCHASE PHASE (A1-A2)

### MATERIAL SELECTION

The selection of raw materials and components of the appliance is a very important phase of product development and is also taken into consideration for the purposes of analysing the product's environmental impact. In fact, we take into account not only the quality of the product purchased, but also the origin of the raw materials and the impact of transport to the production factory.

AEC luminaries are produced by selecting mainly recyclable materials or recycled sources. The following table shows the list of materials and parts used in the appliances covered by this document.

Table 1 – List of Product Parts and Materials

Componente	% Peso	Materiale	% Riciclato	Made in
LED power supply	13%	Electronic device compliant with WEEE	-	POLAND/BULGARIA
LED	0%	Electronic device compliant with WEEE	0%	MALAYSIA
PCB	2%	AL - Ceramic - Copper	22%	IT
SPD	1%	Electronic device compliant with WEEE	0%	IT
TLC module with antenna	2%	Electronic device compliant with WEEE	0%	IT
Body frame	21%	AL die-cast	94%	IT
Cover frame	26%	AL die-cast	94%	IT
Post-top fixing tool	10%	AL die-cast	94%	IT
External closing hook	0%	AL extruded	20%	IT
Internal hinge	1%	Galvanized steel	0%	IT
Post-top internal accessory	1%	Galvanized steel	12%	IT/UE
External fixing accessories	0%	Stainless steel	0%	IT/UE
Optical reflector	0%	Aluminum for optical applications	0%	GERMANY/UE
Screws	2%	Stainless steel or galvanized steel	0%	IT
Gear Plate	0%	Sheet of aluminium	0%	IT/UE
Internal Connectors	2%	PA66 GF	0%	IT
Internal wiring	2%	Copper - Silicone - FEP	0%	IT
Optical Accessories	1%	Polycarbonate	0%	IT
Silicone optical screen	0%	Silicone	0%	UE
Wiring compartment gasket	0%	Polyol-Isocyanate (Polyurethane)	0%	IT
Glass fixing accessories	0%	PA66 GF	0%	IT
Cable gland + nut	0%	PA66	0%	IT
Optical Screen	5%	Clear tempered glass	24%	IT
Packaging box	10%	Corrugated cardboard	90%	IT
Assembly instructions	1%	Paper	0%	IT

## NOTE

Total percentual of input recycled material : **60.3% of the luminaire weight**

## COMPLIANCE WITH THE ROHS DIRECTIVE

AEC products are designed in compliance with the requirements of the European RoHS Directive 2011/65 / EU and its subsequent revisions, according to which the product does not contain, except in the authorized proportions, lead, mercury, cadmium, hexavalent chromium, slow combustion materials (polybromobiphenyl PBB, polybromodiphenylethers PBDE).



The AEC effort translates into a careful selection of suppliers and the control of purchased materials.

## PRODUCTION PHASE (A3)

Automation in production means optimization of local resources, energy, time, labor force. The high quality of the workplace means efficiency in processing. The intelligent use of resources and work tools is one of our goals. The use of electronic media (e-mail, cloud storage units, etc.) instead of paper or the purchase of electronic magazines instead of hard copies, are important rules that minimize the impact on the environment.

For the purposes of the analysis of the life cycle of this phase, we take into account all the processes carried out within the company, those carried out at external suppliers and waste arising from the production cycle destined for disposal centers.

## DISTRIBUTION PHASE (A4)

AEC optimizes the packaging of products based on their weight and volume to reduce energy consumption during transport. The packaging of the considered series results to have the following weights:

- Series: **ITALO 1**
- Weight Cardboard packaging: **900g**
- Instruction sheet weight: **60g**

The packaging is made of cardboard made of recycled paper fibrous material in the percentage of at least 90% of the weight. The packaging is 100% recyclable and biodegradable and complies with Legislative Decree no. 152/2006 and to the EC Directive 94/62 on packaging and packaging waste.

For the purposes of life cycle analysis, appropriate scenarios were hypothesised for this phase based on the real distribution of AEC products in Italy, in Europe and in the World.

## USAGE PHASE (B2-B6)

### ENERGETIC CONSUMPTION

This phase of the product's life is the one with the greatest impact on the environment as the lighting product throughout its life records a continuous consumption of electricity. In addition to this impact, the luminaires do not generate any other type of environmental pollution that requires the adoption of specific measures (e.g. noise, emissions, etc.).

The annual energy consumption of the reference device is evaluated below.

Table 2 – Energetic Data of the Product

Parameter	Value
Luminaire	ITALO 1 0F3 4.7-4M WL
Full Power Consumption	102 W
Annual Operating Hours	4000h
Annual Energetic Consumption	408 kWh/year

### MAINTENANCE

The analysis of the life cycle also includes the assessment of the maintenance phases, due to possible component failures and the impact of the consequent operations such as the transport of the spare parts by the maintenance technician.

## END OF LIFE DISPOSAL (C-D)

### WEEE DIRECTIVE

End-of-life disposal operations of the appliance also aim to reduce the environmental impact of electrical and electronic components used on human health and the environment. According to the European Directive WEEE (Waste Electrical and Electronic Equipment) 2012/19 / EU, luminaires are considered a waste of electronic equipment, so they must be separately disposed from other waste. This requirement is highlighted by the symbol at side which is present in all assembly / maintenance instructions, shipped together with each appliance.







AEC Illuminazione also participates in a Italian consortium for the disposal of products, responsible for waste treatment: **the ECOLIGHT consortium.**

Outside the national borders, the user is responsible for transporting the appliance to the appropriate collection center at the end of its useful life, in order to guarantee the correct disposal and recycling of the materials constituting the product.

At this stage the transport of materials to the collection center is taken into consideration.

### MATERIALS RECYCLABILITY AND REUSE AT THE END OF LIFE (D)

The recyclability of materials at the end of their life is also a factor to be taken into account in the LCA study of the product.

On the basis of the data declared by the ECOLIGHT consortium, it is taken into account how much of the product is destined for recovery (of materials in the form of recycling and energy if destined for the incinerator) and how much is destined for disposal.

The table below summarizes the weight percentages of the materials used divided by type according to their potential recyclability.

Table 3 – Recyclable material composition of the product

MATERIALE	% in peso su ITALO 1
WEEE Electronic Devices	19.0%
Paper and Carton	10.6%
Metal	62.0%
Plastic	3.7%
Glass	4.7%
LUMINAIRE RECYCLING *	95%

\*On the basis of Social Report 2017 of ECOLIGHT

## PRODUCT LCA STUDY RESULT

The main environmental indicators calculated on the basis of the LCA analysis carried out on the product and divided in each life phase are shown below.

Table 4 – Environmental Profile. Product Environmental Indicators

INDICATOR	PRODUCTION (A1-A3)	DISTRIBUTION (A4)	USAGE (B6)	MAINTENANCE (B2)	END OF LIFE (C)	RECOVERY (D)	TOTAL	MEASUREMENT UNIT
ADPeI	43,0%	0,1%	55,4%	1,4%	0,0%	-40,7%	2,82E-04	kg Sb eq
ADPfossil	1,2%	0,1%	98,6%	0,1%	0,0%	-0,7%	2,20E+03	MJ
AP	1,5%	0,0%	98,3%	0,1%	0,0%	-1,2%	1,04E+00	kg SO2 eq
GWP	1,1%	0,0%	98,8%	0,1%	0,0%	-0,7%	2,13E+02	kg CO2 eq
Ecotoxicity	15,0%	0,1%	81,8%	3,0%	0,1%	-10,7%	4,45E-01	CTUe
EP	1,6%	0,0%	98,3%	0,0%	0,0%	-1,4%	6,32E-01	kg PO4--- eq
WSI	2,3%	0,0%	97,6%	0,1%	0,0%	-1,8%	1,65E+00	m3
Human toxicity	10,8%	0,1%	86,6%	2,4%	0,1%	-10,1%	3,05E-08	CTUh
Hazardous waste	29,5%	0,0%	70,1%	0,4%	0,0%	-27,1%	4,72E-03	kg waste
ODP	1,1%	0,1%	98,7%	0,1%	0,0%	-0,6%	2,14E-05	kg CFC-11 eq
POCP	1,9%	0,0%	97,9%	0,1%	0,0%	-1,5%	4,42E-02	kg C2H4 eq

The graph below shows, for each indicator (horizontal axis), the relative impact (in percentage) of each phase of life.

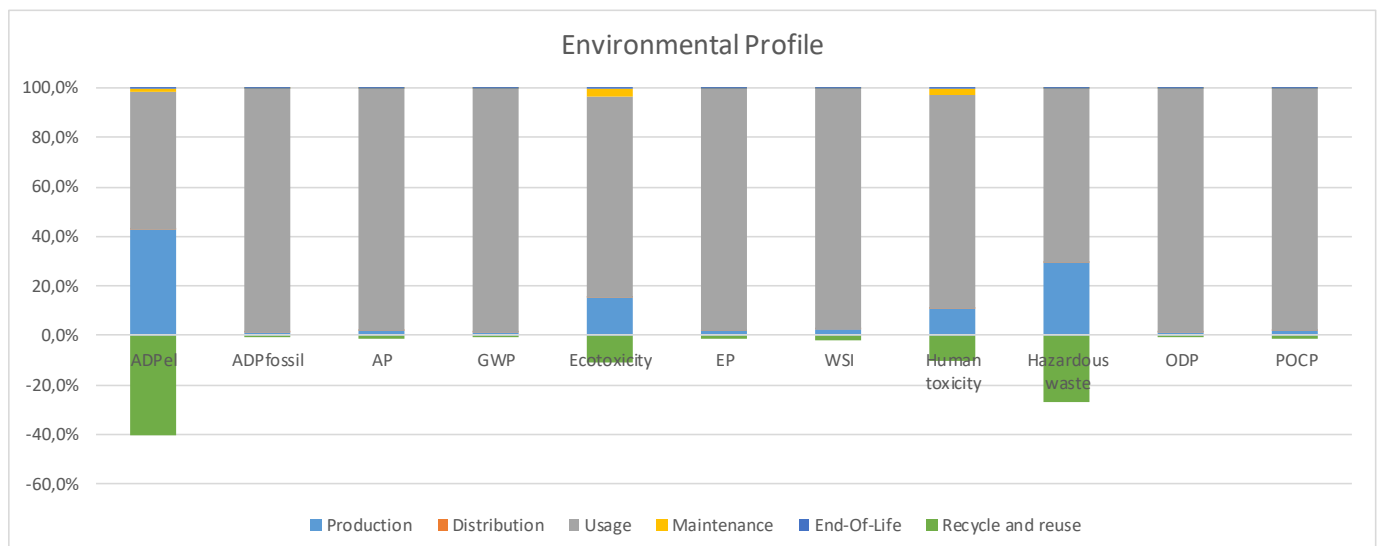


Figure 1 - Environmental Profile. Impact of the Life Cycle Phases on the Environmental Indicators

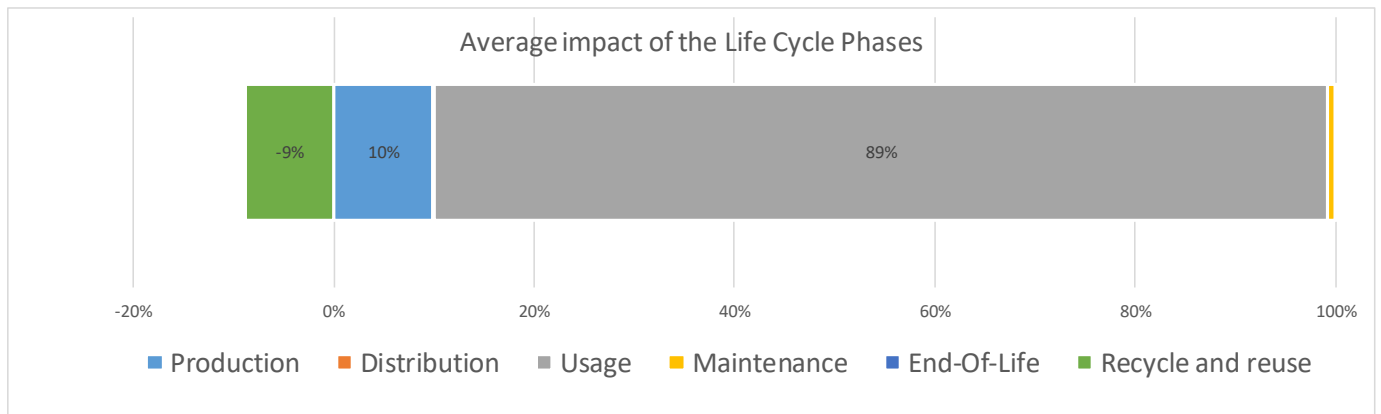


Figure 2 - Environmental Profile. Average impact of the Life Cycle Phases on the Environmental Indicators

As can be seen from the graphs shown, the most important weight on all the environmental indicators is that relative to the phase of use due to the consumption of electricity, which weighs on average 90% on all environmental indicators.

This result confirms that the continuous search for the greatest energy saving in the installation is the key to reducing the environmental impact of lighting luminaires.

The negative impact (Recovery EOL) is due to the benefits derived by the recycling and reuse of the matters of the disposed luminaires.

It is interesting to note how this benefit (mainly due to recycling and reuse of materials) goes to cover almost all the impact that the production cycles of the appliance have.

## LEGEND OF ENVIRONMENTAL INDICATORS

Name	Indicator	MEASUREMENT UNIT	Method
ADPeI	Abiotic Depletion (elements)	kg Sb eq	CML-IA baseline
ADPfossil	Abiotic Depletion (fossil fuels)	MJ	CML-IA baseline
AP	Acidification	kg SO <sub>2</sub> eq	CML-IA baseline
GWP	Climate change - GWP 100°	kg CO <sub>2</sub> eq	CML-IA baseline
Ecotoxicity	Ecotoxicity	CTUe	USEtox -recommended
EP	Eutrophication	kg PO <sub>4</sub> --- eq	CML-IA baseline
WSI	Water Scarcity Index	m <sup>3</sup>	Hoekstra et al 2012 (Water Scarcity Index)
Human toxicity	Human toxicity (non cancer)	CTUh	USEtox -recommended
Hazardous waste	Land filling - Hazardous waste	kg waste	EDIP 2003
ODP	Ozone layer depletion	kg CFC-11 eq	CML-IA baseline
POCP	Photochemical oxidation	kg C <sub>2</sub> H <sub>4</sub> eq	CML-IA baseline

## GLOSSARY

Life Cycle Assessment	LCA	Life Cycle Assessment (also known by the acronym LCA) is a method that evaluates the interaction of a product or service with the environment and the impact that comes from these interactions. The Life Cycle Assessment considers the entire life cycle, from the pre-production phases (therefore also extraction and processing of raw materials), production, distribution, use (therefore also reuse and maintenance), recycling and final disposal. The LCA procedure is internationally standardized by the ISO 14040 and ISO 14044 standards.
Electric waste	WEEE	Waste of Electrical and Electronic Equipment or simply electronic waste. They are waste of a particular type present in any electrical or electronic equipment. These products must be treated correctly and destined for the differentiated recovery of the materials they are made of, avoiding waste of resources and encouraging reuse to create new devices.
Acidification	AP	Part of the waste produced can contain acidifying substances for the environment. These substances, once dispersed in the environment and diffused in the atmosphere, can be transported from the rain (acid rain) to the ground and damage the present vegetation. Acidification is expressed in kilograms of H + equivalents.
Energy consumption	ADP <sub>fossil</sub>	It is an inequator directly linked to energy consumption in the various phases of the product. It expresses the quantity of non-renewable energy sources (fossils) of various kinds consumed by the product during its life: gas, oil, uranium or other sources. It is formally an energy quantity and is measured in MJ.
Eutrophication	EP	It is an indicator that quantifies the consumption of energy raw materials during the life cycle of the product, reducing its availability for future generations. It is expressed in reserve-person, that is as quantity of the resource available for general citizen.
Greenhouse effect	GWP	Eutrophication is the enrichment of nutrients in an aquatic or terrestrial environment and is typically due to wastewater and fertilizers. Eutrophication creates imbalance in the ecosystem causing various reactions up to its destruction. (For example, the accelerated growth of algae in an aquatic environment decreases photosynthesis in the lower layers, hence oxygen depletion and anaerobic death of fish that produces methane and hydrogen sulfide, which are destructive to the environment). The impact is expressed in equivalent grams of PO43-.
Production of hazardous waste	Hazardous Waste	This is the so-called overheating of the atmosphere due to the excessive presence of greenhouse gases, which reflect solar thermal radiations and spread heat into the atmosphere. These gases are typically carbon dioxide, methane, chlorofluorocarbons (CFCs). This indicator is expressed in equivalent grams of CO2.
Toxicity for humans	Human Toxicity	Indicates the amount of special treatment waste generated during all phases of the life cycle, for example special industrial waste in or waste associated with the production of electricity. It is expressed in kg.
Ozone reduction	ODP	It expresses the level of damage to the environment of the substances produced in the various phases of life of the product. This indicator is expressed in CTU (unit of chronic toxicity).
Creation of photochemical ozone	POCP	This parameter expresses the contribution to the reduction of ozone content in the atmosphere due to the emission of some specific gases. The effect is expressed in kilograms equivalent of CFC-11.
Exhaustion of non-renewable resources	ADPel	This parameter expresses the contribution to the phenomenon of "smog", ie the generation of low-level ozone, considered harmful to plants. It is expressed in grams equivalent to NMVOC (Non-Methane Volatile Organic Compounds).
Water consumption	WSI	It is the volume of water consumed, drinkable and from industrial resources, during the various phases of life of the product. It is expressed in m <sup>3</sup> .
Water Toxicity	Eco-toxicity	It expresses the potential level of toxicity to the environment by residual substances produced during the various stages of life. The eco-toxic substances alter the composition of species and ecosystems. It is expressed in CTU (unit of chronic toxicity).