medcem

# ENVIRONMENTAL PRODUCT DECLARATION

TURKEY EPD®
ENVIRONMENTAL PRODUCT DECLARATIONS

EPD®
THE INTERNATIONAL EPD® SYSTEM

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## CEM I 52,5 N Portland Cement

| PROGRAMME | PROGRAMME OPERATOR | GEOGRAPHICAL SCOPE |
|---|---|---|
| The International EPD® System | EPD Turkey | Global |
| **EPD REGISTRATION NUMBER** | **PUBLICATION DATE** | **VALID UNTIL** |
| S-P-06766 | 2023-02-09 | 2028-02-09 |

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at: www.environdec.com

# Programme Information

## Programme Information

**Programme:** The International EPD® System
**Address:** EPD® International AB Box 21060 SE-100 31 Stockholm, Sweden
**Website:** www.environdec.com
**E-mail:** info@environdec.com

**Programme Operator:** EPD Turkey, managed and run by: SÜRATAM A.S. www.suratam.org
**Address:** Nef 09 B Blok No: 7/15 34415 Kagithane/Istanbul, Turkey
**Website:** www.epdturkey.org
**E-mail:** info@epdturkey.org

**Information about verification and reference PCR:**

*CEN standard EN 15804 serves as the Core Product Category Rules (PCR)*

**Product category rules (PCR)**
*PCR 2019:14 Construction products (EN 15804:2012+A2.2019/AC:2021) Version 1.2.5*

**PCR review was conducted by**
The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

Independent verification of the declaration and data, according to ISO 14025:2021:

☐ EPD process verification ☑ EPD verification

**Third party verifier**
Ing. Luca Giacomello. PMP®
Via Leonardo Fea 35 10148 Torino - Italy

**Approved by**
The International EPD® System Technical Committee, supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☑ No

**LCA Study & EPD Design Conducted by**
Semtrio Sustainability Consulting
BUDOTEK Teknopark, No 8/27
Umraniye / Istanbul Turkey
www.semtrio.com

**Medcem Madencilik ve Yapi Malzemeleri San Tic A.Ş.** has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

# Company Information

## Owner of the EPD

**Medcem Madencilik ve Yapı Malz. San. Tic. A.Ş.**

Akdere Mahallesi, Bağalanı Mevkii, Fabrika Küme Evleri No:1 Silifke/Mersin - İstanbul, Türkiye

*www.medcem.com.tr*

**Contact:** Burçin Boğa

**burcin.boga@medcem.com.tr**

Medcem Cement factory was built by Medcem Madencilik ve Yapi Malzemeleri San Tic AŞ with the highest environmental awareness by using the latest technological systems and started its production activities in the second half of 2015.

Medcem Cement has an annual clinker production capacity of 3.5 million tons.

Our factory, whose production is mostly planned for export, aims to become a rapidly expanding and recognized brand in the world by steadily increasing its market share in the global market.

Medcem Cement is preparing to become one of the world's largest cement producers by multiplying its strength in the international market with its second line investment, the foundation of which was laid in August 2021.

With its new investment planned to be completed in 20 months, Medcem Cement will increase its annual clinker production capacity of 3.5 million tons to 6.5 million tons, resulting in a capacity increase of approximately 90%. The new investment, together with the increase in capacity, will provide an increase of approximately 30% in personnel employment.

Medcem Solid Waste Incineration Facility was established as Turkey's first Solid Waste Incineration Facility in Corlu with a total investment of 110 million dollars in 2015.

Our Solid Waste Incineration facility enables the conversion of paper wastes, treatment sludge and wastes from other paper mills in the vicinity, which are generated in the paper production process of Modern Karton, one of the group companies.

The facility makes a great contribution to the environment, the industrialists in the region and the country's economy with the disposal of wastes. The facility has a total capacity of 27.6 mw/h of electricity or 100 tons/h of steam.

# Product Information

## Product Name:
## CEM I 52,5 N Portland Cement

It is pure Portland Cement with normal early strength and high final strength, obtained by grinding Portland Cement clinker with set-regulating gypsum in accordance with EN 197-1 standards.

### Production

Cement production process begins with mining of the main raw materials, such as limestone and clays. These raw materials are excavated from open mines. After drilling and blasting, they are loaded on to trucks and transported from quarry to the plant.

Besides limestone and clays, some other raw materials are also used for different purposes. For instance, in order to achieve the desired material composition for the kiln process, iron and aluminium sources, such as iron ore and bauxite, are supplied from the related sources. Gypsum is also supplied and used in the final stage of the cement production as a set regulator.

At the plant, first, all the raw materials are crushed with crushers and after crushing each material is stored and homogenized in the allocated storage unit. Then, the required materials (limestone, clay, iron ore, bauxite) to produce half product (Clinker, the main component of the cement) are taken to dosing hoppers and the proportion of each material is arranged with the weigh feeders below these hoppers.

Then, the formed Raw Mix. is fed to the Raw Mill Unit for fine grinding in order to increase the reaction surface area of the material and it becomes Raw Meal and this fine material is stored and homogenized in the Raw Meal Silo.

After the Silo, Raw Meal is first preheated and calcined at the preheater and calciner section of the pyroprocessing system. Then, at the kiln section of the system, the calcined material is heated to a sintering temperature as high as 1450 °C and suddenly cooled by bursts of air where the chemical bonds of the calcined materials are broken down and then they are recombined into new compounds. By this way, Cement Clinker (the half product), the basic material required for the production of all cements, is produced and then it is stored in concrete silos.

In order to create Cement (the final product), clinker is ground to a fine powder in a Cement Mill Unit with a small amount of gypsum (3-5%) to regulate how the cement will set. During this phase, different mineral materials, called “cement additives”, may be added alongside the gypsum. Used in varying proportions, these additives, which are of natural or industrial origin, give the cement specific properties such as reduced permeability, greater resistance to sulfates and aggressive environments, improved workability, or higher-quality finishes.

Finally, the cement is stored in silos before being shipped in bulk or in bags to the sites where it will be used.

### Intended Use of Product

CEM I 52,5 N cement is widely used in a wide variety of applications. It is used in concrete production in the most difficult reinforced and non-reinforced structures such as bridges, tunnels and viaducts. CEM I 52,5 N type cement, which has a high strength class, is used in the construction of difficult buildings and structures that require rapid removal of molds due to technology and business dynamics. Although not limited to these, it is suitable for use in ready mixed concrete plants, high strength precast casting applications, shotcrete, grout concrete, joint, mortar, plaster and screed.

# Technical Specifications

| Chemical Requirements | Units of Measurement | Std. Limits | Test Results |
|---|---|---|---|
| $SiO_2$ | % | | 18.7-21.60 |
| $Al_2O_3$ | % | | 4.0-6.50 |
| $Fe_2O_3$ | % | | 3.2-4 .70 |
| CaO | % | | 61.7-66.60 |
| MgO | % | | 1.0-3.70 |
| $SO_3$ | % | Max. 4.00 | 2.0-3.60 |
| Cl | % | Max 0.1 | 0.01-0.04 |
| Loss on Ignition (LOI) | % | Max 5.00 | 0.7-3.00 |
| Insoluble Residue | % | Max 5.00 | 0.05-1.00 |
| Free CaO | % | | 0.30-3.00 |
| Cr (VI) | ppm | | 2-30 |
| $Na_2O$ | % | | 0.02-0.32 |
| $K_2O$ | % | | 0.30-1.10 |
| $Na_2O$Eq. ($Na_2O$ + 0.658*$K_2O$) | % | | 0.30-0.90 |
| Lime Saturation Factor(LSF) | - | | 96.00-105.30 |
| Silica Modulus (SM) | - | | 1.90-2.50 |
| Alumina Modulus (AM) | - | | 0.90-2.00 |

**UN CPC Code :** 37440, Portland cement, aluminous cement, slag cement, and similar hydraulic cements, except in the form of clinkers

# Technical Specifications

| Chemical Requirements | Units of Measurement | Std. Limits | Test Results |
|---|---|---|---|
| Specific Gravity (ISO 17892-3) | $gr/cm^3$ | | 3.11-3.21 |
| Specific Surface (EN 196-6) | $cm^2/g$ | | 3600-4500 |
| Residue on 0.045 mm (EN 196-6) | % | | 0.1-3.0 |
| Residue on 0.090 mm (EN 196-6) | % | | 0.0-1.0 |
| Initial Setting Time (EN 196-3) | Minute | Min. 45 | 90-220 |
| Final Setting Time (EN 196-3) | Minute | Max. 4.00 | 130-320 |
| Soundness (EN 196-3) | mm | Max. 10.0 | 0.0-4.0 |
| Normal Consistency (EN 196-3) | % | | 26.0-31.0 |

| Compressive Strength Method, EN 196-1 | Units of Measurement | Std. Limits | Test Results |
|---|---|---|---|
| 2 Days | MPa | Min. 20.0 | 24.0-35.5 |
| 28 Days | MPa | Min. 52.5 | 54.0-65.0 |

# LCA Information

### Declared Unit

1000 kg CEM I 52,5 N Portland Cement manufactured in Silifke, Mersin facility (TR)

### Reference Service Life

Not applicable.

### Time Representativeness

The inventory for the LCA study is based on the period of 1st January 2021 and 31st December 2021

### Database(s) and LCA software used

SimaPro v9.4.0.2 LCA software and Ecoinvent 3.7.1

### Description of System Boundaries

Cradle to Gate (A1-A3)

### Data Quality and Data Collection

According to EN 15804:2012+A2.2019/AC:2021 specific data was used for module A3 (Processes the manufacturer has influence over) and was gathered from manufacturing plant. Specific data includes actual product weights, amounts of raw materials used. product content, energy consumption, transport figures, water consumption and amounts of wastes.

### Allocation

The total values for the plant's raw material, energy consumption, water consumption, and waste output over a one-year period have been divided by the annual output of each product to provide a value per kg of cement produced.

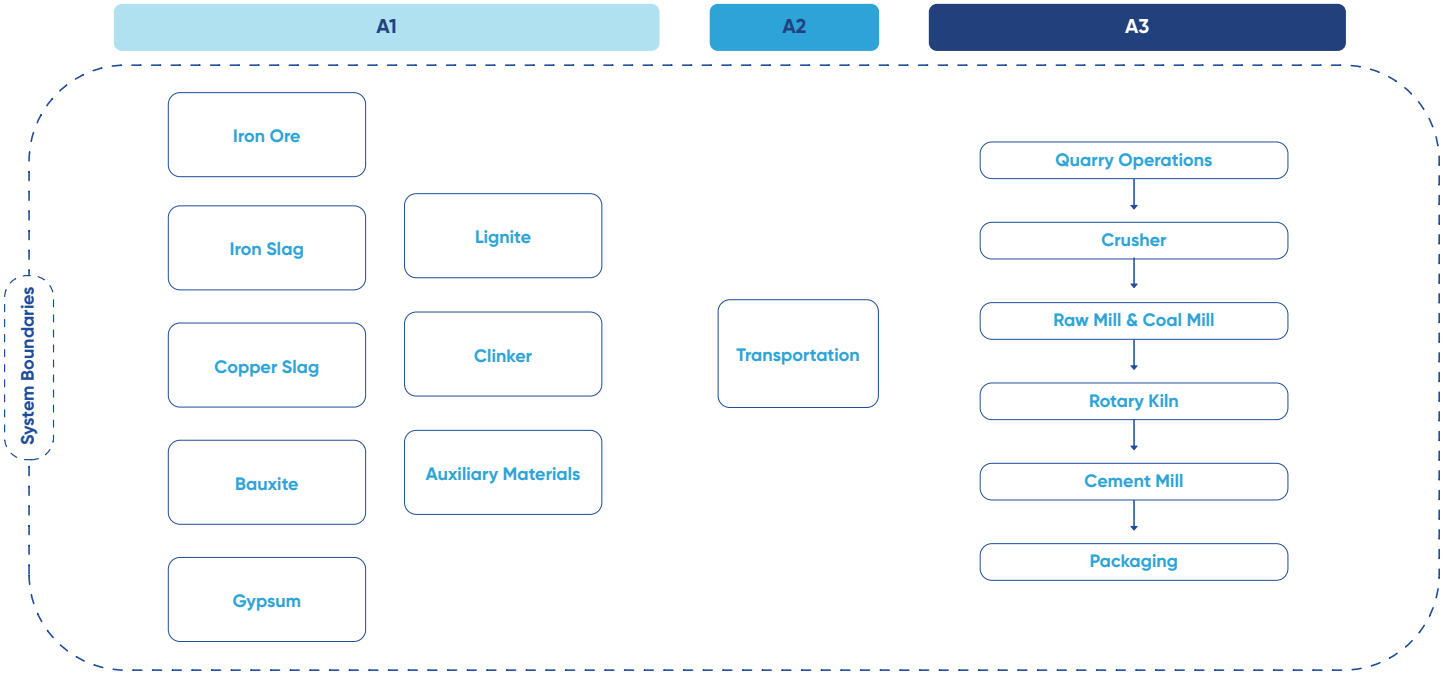
### Cut-off Rules

Life Cycle Inventory data for a minimum of 99% of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied.

### Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

| | PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | RESOURCE RECOVERY STAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintanence | Repair | Replacement | Refurbishment | Operaitional energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Recycling Potential |
| MODULES | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Module declared | X | X | X | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Geography | GLO | GLO | TR | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Specific data used | >99% | | | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Variation-products | Not Relevant | | | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| Variation-sites | Not Relevant | | | – | – | – | – | – | – | – | – | – | – | – | – | – | – |

# System Diagram




# Description of Declared Modules

### A1 - Raw Materials Supply

This module takes into account raw material extraction, processing and energy used in the production process.

### A2 - Transport to the Manufacturer

This module includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as seaway and roadway.

### A3 - Manufacturing

This stage includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered in this module. The processing of any waste arising from this stage is also included. Followed production processes are as;

- Quarry Operations
- Crusher
- Raw Mill & Coal Mill
- Rotary Kiln
- Cement Mill
- Packaging

### Information on which life cycle stages are not considered

This EPD only covers the Cradle to Gate (A1-A3) stages. According to EN 15804:2012+A2.2019/AC:2021, the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end-of-life so the end-of-life scenarios are excluded from this study. End-of-life scenarios for cement can be found in EPDs for concrete and mortar.

# Content Declaration

## Content Declaration of 1000 kg of CEM I 52,5 N Portland Cement

| PRODUCT | CLINKER, WEIGHT-% | GYPSUM, WEIGHT-% | AUXILIARY MATERIALS, WEIGHT-% | RENEWABLE MATERIAL, WEIGHT-% | BIOGENIC CARBON, WEIGHT-% |
|---|---|---|---|---|---|
| **CEM I 52,5 N Portland Cement** | 95%-97% | 3%-5% | <1% | 0 | 0 |

**The product does not contain any substance included in the "Candidate List of Substances of Very High Concern (SVHC).*

*The main input of the product, clinker, contains clay, limestone, iron ore, iron slag, copper slag, and bauxite.

## Packaging Materials

CEM I 52,5 N Portland Cement is sold in bulk form.

# Environmental Performance

## Potential Environmental Impact *Mandatory Indicators According to EN 15804*

| RESULTS FOR 1000 KG CEM I CEM I 52,5 N PORTLAND CEMENT | | |
|---|---|---|
| Indicator | Unit | Total A1-3 |
| **GWP-fossil** | kg $CO_2$ eq | 857 |
| **GWP -biogenic** | kg $CO_2$ eq | 1.19 |
| **GWP-luluc** | kg $CO_2$ eq | 0.335 |
| **GWP-total** | kg $CO_2$ eq | 859 |
| **ODP** | kg CFC 11eq | 5.20E-06 |
| **AP** | mol H+ eq | 0.435 |
| **EP-Freshwater** | kg P eq | 0.283 |
| **EP-marine** | kg N eq | 0.142 |
| **EP-Terrestrial** | kg N eq | 0.956 |
| **POCP** | kg NMVOC eq | 0.262 |
| **ADP-minerals & metals*** | kg Sb eq | 1.38E-04 |
| **ADP-fossil*** | MJ | 1730 |
| **WDP** | $m^3$ | 27.8 |

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

**Acronyms**

**GWP-fossil =** Global Warming Potential fossil fuels; **GWP-biogenic =** Global Warming Potential biogenic; **GWP-luluc =** Global Warming Potential land use and land use change; **ODP =** Depletion potential of the stratospheric ozone layer; **AP =** Acidification potential, Accumulated Exceedance; **EP- Freshwater =** Eutrophication potential, fraction of nutrients reaching aquatic freshwater end compartment; **EP-marine =** Eutrophication potential, fraction of nutrients reaching marine end compartment; **EP-terrestrial =** Eutrophication potential, Accumulated Exceedance; **POCP =** Formation potential of tropospheric ozone; **ADP-minerals&metals =** Abiotic depletion potential for non-fossil resources; **ADP-fossil =** Abiotic depletion for fossil resources potential; **WDP =** Water (user) deprivation potential, deprivation-weighted water consumption

## Potential Environmental Impact *Additional Mandatory and Voluntary Indicators*

| RESULTS ACCORDING TO PCR 2019:14 FOR 1000 KG CEM I 52,5 N PORTLAND CEMENT | | |
|---|---|---|
| Indicator | Unit | Total A1-3 |
| **GWP-GHG**[1] | kg $CO_2$ eq | 857 |
| **RESULTS ACCORDING TO PCR 2019:14 FOR 1000 KG CEM I 52,5 N PORTLAND CEMENT** | | |
| **PM** | [disease inc.] | 3.10E-06 |
| **IRP** | [kBq U235 eq] | 3.01 |
| **ETP-fw** | [CTUe] | 1250 |
| **HT-C** | [CTUh] | 2.09E-08 |
| **HT-nc** | [CTUh] | 7.30E-07 |
| **SQP** | [pt] | 234 |

**Acronyms**

**GWP-GHG =** Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; **PM=** Potential incidence of disease due to PM emissions; **IRP =** Potential Human exposure efficiency relative to U235; **ETP-fw =** Potential Comparative Toxic Unit for ecosystems; **HT-C =** Potential Comparative Toxic Unit for humans; **HT-nc =** Potential Comparative Toxic Unit for humans **SQP =** Potential soil quality index (SQP)

[1] *The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A2:2019/AC:2021.*

*Disclaimer 2: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*

*Disclaimer 3: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.*

# Use of Resources

| RESULTS FOR 1000 KG CEM I 52,5 N PORTLAND CEMENT | | |
|---|---|---|
| Indicator | Unit | Total A1-3 |
| **PERE** | MJ | 112 |
| **PERM** | MJ | 0 |
| **PERT** | MJ | 112 |
| **PENRE** | MJ | 1730 |
| **PENRM** | MJ | 0 |
| **PENRT** | MJ | 1730 |
| **SM** | kg | 0 |
| **RSF** | MJ | 0 |
| **NRSF** | MJ | 0 |
| **FW** | $m^3$ | 4.44 |

**Acronyms**

**PERE =** Use of renewable primary energy excluding renewable primary energy resources used as raw materials; **PERM =** Use of renewable primary energy resources used as raw materials; **PERT =** Total use of renewable primary energy resources; **PENRE =** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; **PENRM =** Use of non-renewable primary energy resources used as raw materials; **PENRT =** Total use of non-renewable primary energy resources; **SM =** Use of secondary material; **RSF =** Use of renewable secondary fuels; **NRSF =** Use of non-renewable secondary fuels; **FW =** Use of net fresh water

# Waste Production

| RESULTS FOR 1000 KG CEM I CEM I 52,5 N PORTLAND CEMENT | | |
|---|---|---|
| Indicator | Unit | Total A1-3 |
| **Hazardous waste disposed** | kg | 0 |
| **Non-hazardous waste disposed** | kg | 0 |
| **Radioactive waste disposed** | kg | 0 |

# Output Flows

| RESULTS FOR 1000 KG CEM I 52,5 N PORTLAND CEMENT | | |
|---|---|---|
| Indicator | Unit | A1-3 Total |
| **Components for re-use** | kg | 0 |
| **Material for recycling** | kg | 0.240 |
| **Materials for energy recovery** | kg | 0 |
| **Exported energy, electricity** | MJ | 0 |
| **Exported energy, thermal** | MJ | 0 |

# References

**ISO 14040** 2021 Environmental management - Life cycle assessment - Principles and framework

**ISO 14044** 2021 Environmental management - Life cycle assessment - Requirements and guidelines

**ISO 14025** 2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

**ISO 14020** 2000 Environmental labels and declarations - General principles

**EN 15804:2012+A2.2019/AC:2021** Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

**The International EPD® System** www.environdec.com

**The International EPD® System** The General Programme Instructions v4

**The International EPD® System** PCR 2029:14 Construction products v1.2.5 (EN 15804:2012+A2.2019/AC:2021)

**Ecoinvent 3.7** www.ecoinvent.org

**SimaPro LCA Software** www.simapro.com

**Medcem Madencilik ve Yapi Malzemeleri San. Tic. A.Ş.** www.medcem.com.tr

# Contact

**Third party verifier**
Ing. Luca Giacomello. PMP®
Via Leonardo Fea 35
10148 Torino - Italy

**Owner of Declaration**
Medcem Madencilik ve Yapı Malz. San. Tic. A.Ş.
Akdere Mahallesi, Bağalanı Mevkii, Fabrika Küme Evleri No:1
Silifke/Mersin - İstanbul, Türkiye
www.medcem.com.tr

**LCA Study & EPD Design Conducted By**
Semtrio Sustainability Consulting
BUDOTEK Teknopark, No 8/27
Umraniye / Istanbul Turkey
www.semtrio.com

medcem