

# paintistanbul TURKCOAT CONGRESS

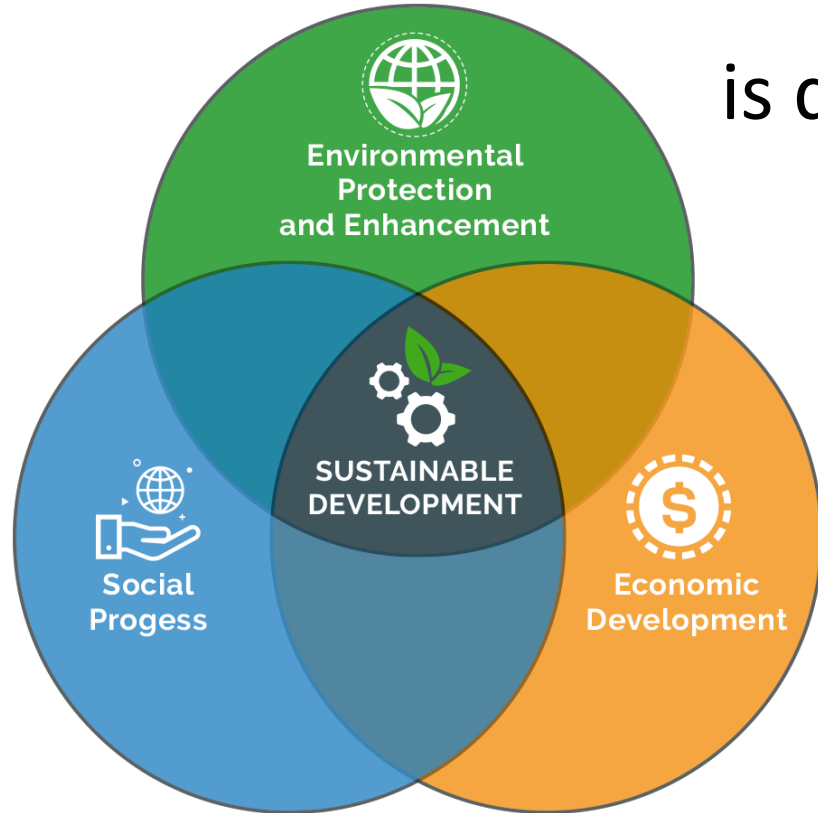
## Investigation of Carbon Footprint Studies on Waterborne Architectural Paints

Su Bazlı İnşaat Boyalarında Karbon Ayak İzi Çalışmalarının İncelenmesi

Onur Uygun, Burçin Hülya Güzel, Gökçen Alev Çiftçioğlu

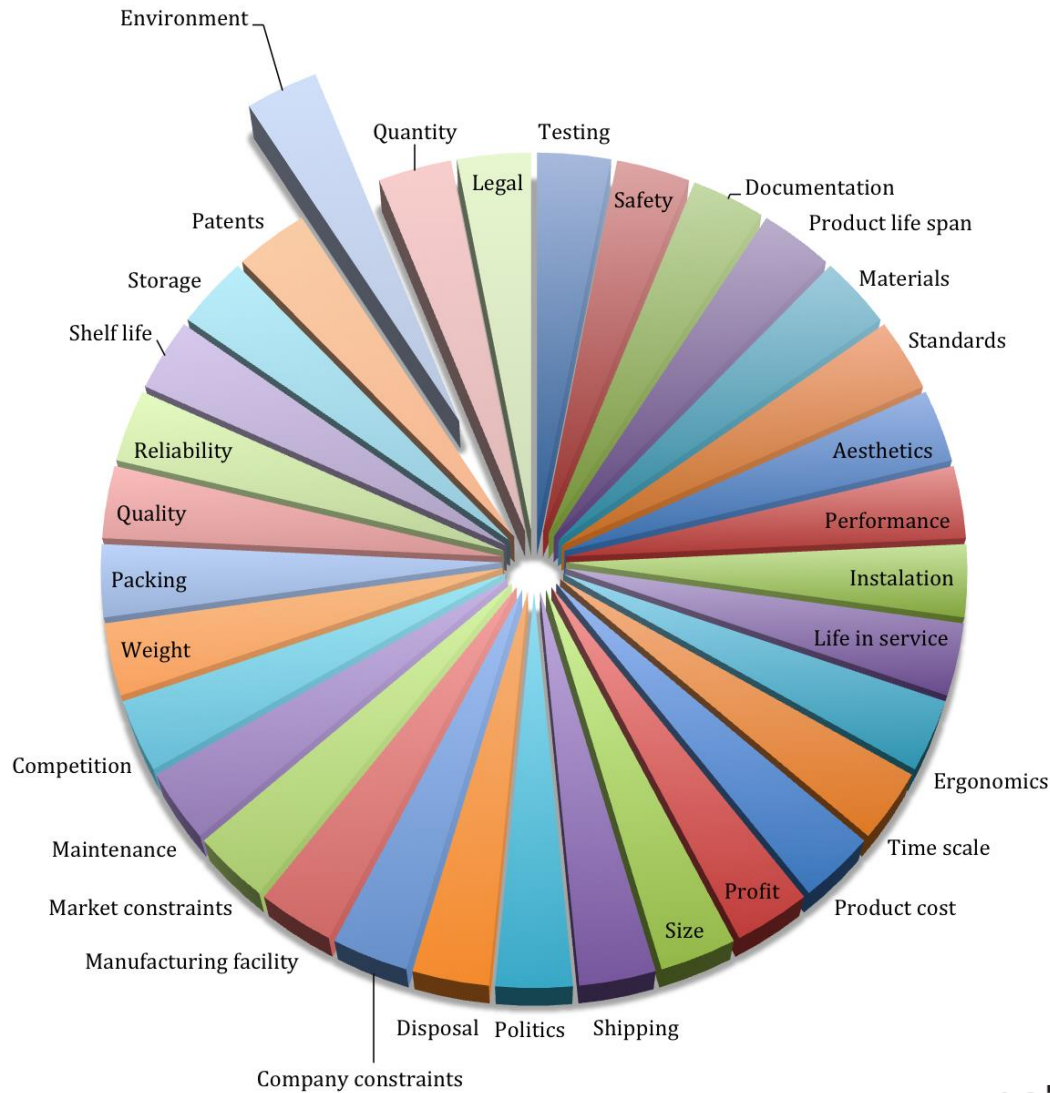
DYO / Marmara University

# Sustainable Development



is development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Sürdürülebilir kalkınma, gelecek nesillerin kendi ihtiyaçlarını karşılama kabiliyetinden ödün vermeden bugünün ihtiyaçlarını karşılayan kalkınmadır.



# Design for Environment (DfE)

A practice by which environment considerations are integrated into product and process engineering design procedures

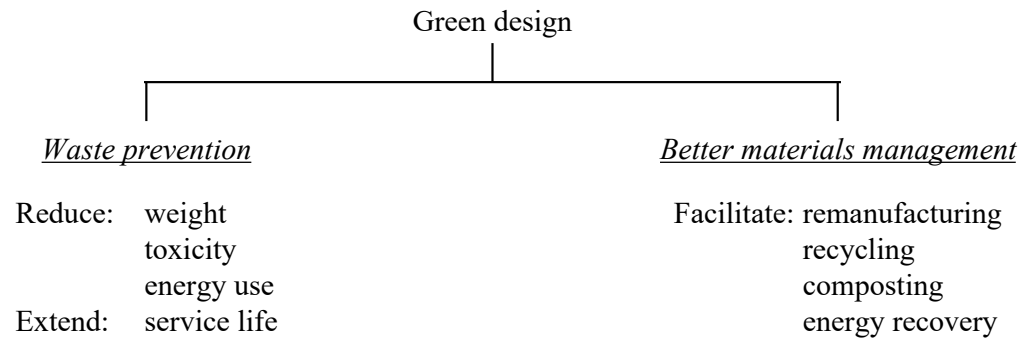
Çevreyle ilgili hususların ürün ve süreç mühendisliği tasarım prosedürlerine entegre edildiği bir uygulamadır.

Allenby B.R., Fullerton A., 1991/1992, 'Design for Environment - A new strategy for environmental management'.

# Green Design

- signifies a design process in which environmental attributes of a product are treated as ***design opportunities***, rather than ***design constraints***
- *incorporates environmental objectives with minimum loss to product, useful life or functionality*
  - bir ürünün çevresel özelliklerinin **tasarım kısıtlamaları yerine tasarım fırsatları** olarak ele alındığı bir tasarım sürecini ifade eder.
  - çevresel hedefleri ürün, kullanım ömrü veya işlevsellikte minimum kayıpla birleştirir.

# Dual Goals of Green Design





# Green Chemistry

- synthesis, processing and use of chemicals that reduces risks to human health and the environment
- synthetic chemistry designed to use and generate fewer hazardous substances
- aims at reducing the use of endangered resources by switching to more plentiful or renewable resources
  - insan saęlıęı ve evreye ynelik riskleri azaltan kimyasalların sentezi, iřlenmesi ve kullanımı
  - daha az tehlikeli madde kullanmak ve retmek iin tasarlanmıř sentetik kimya
  - daha bol veya yenilenebilir kaynaklara geerek nesli tkenmekte olan kaynakların kullanımını azaltmayı amalar

*What environmental impact does one object have on the world?*

# Life Cycle Assessment (LCA)

LCA is defined as the systematic analysis of the **potential environmental impacts** of products or services during their entire life cycle.  
(from obtaining raw materials all the way through making it in a factory, selling it in a store, using it in the home, and disposing of it)

LCA, ürün veya hizmetlerin tüm yaşam döngüleri boyunca potansiyel çevresel etkilerinin sistematik analizi olarak tanımlanmaktadır.  
(hammaddelerin elde edilmesinden fabrikada üretilmesine, mağazada satılmasına, evde kullanılmasına ve bertaraf edilmesine kadar)

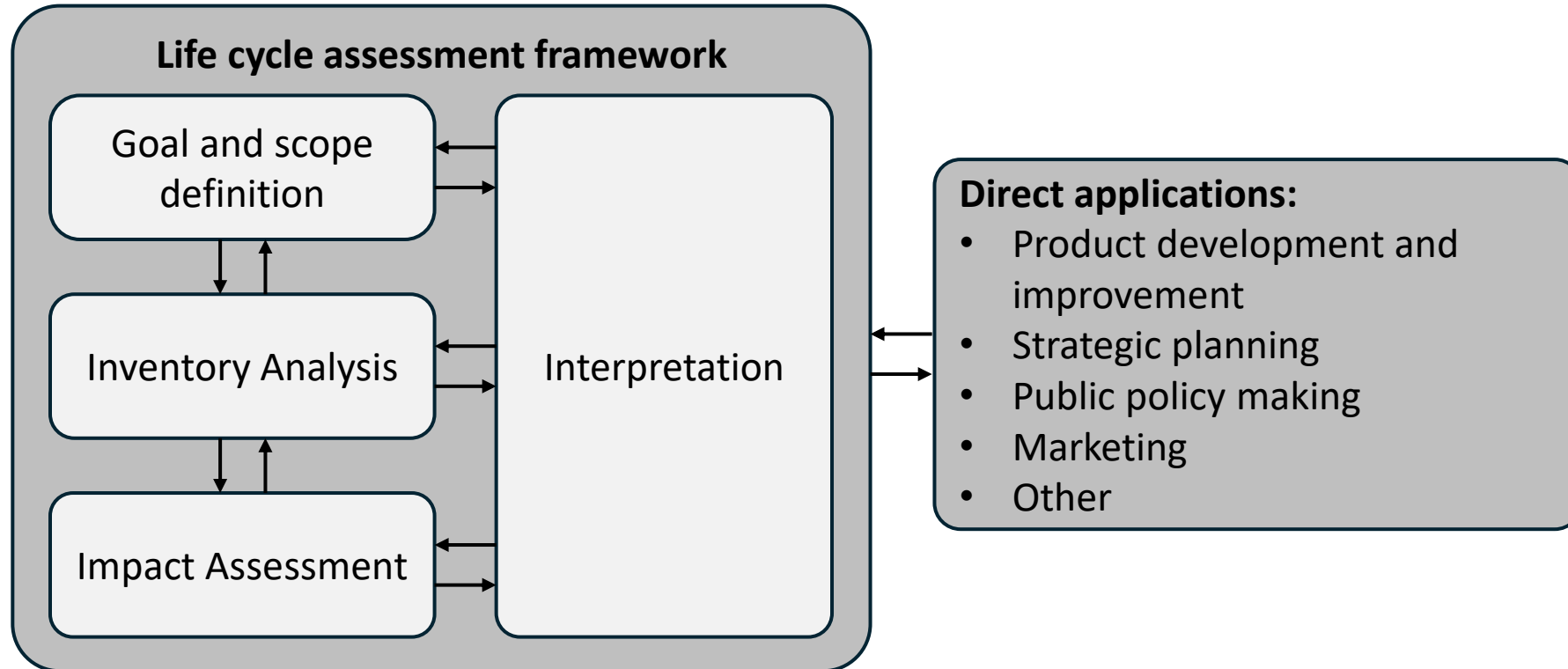
There is a standardized tool for conducting a multi-media, cradle-to-grave assessment



® ISO 14040 “Life Cycle Assessment – Principles and Framework” 1997  
ISO 14044 “Life Cycle Assessment – Requirements and Guidelines” 2006

# Phases of an LCA

ISO 14040 “Life Cycle Assessment – Principles and Framework” 1997





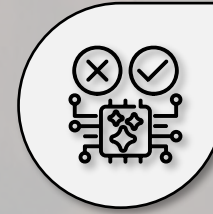
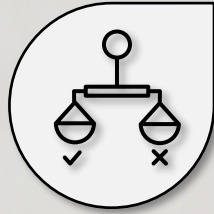
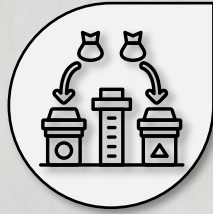
# LCA Tools

- Altermaker
- Askor
- bAwear-score
- Brightway
- CarbonBright
- Carboncloud
- Carbonfact
- Carbongraph
- CarbonSync
- Cerclos
- Dayrize
- dCycle
- Eandox
- Earthshift
- Earthster
- Ecochain
- Emvide
- Goodlab
- Greenly
- Greenstory
- iPoint (see Umberto)
- LCA Calculator
- Makersite
- **OneclickLCA**
- **OpenLCA**
- Peftrust
- Pickler
- Pilario
- PIQET
- ROOT
- **SimaPro**
- Solidworks Sustainability (Xpress)
- **Sphera** LCA for Experts (fka GaBi / Thinkstep)
- Sustainable Minds
- Terrascope
- Trazable
- Umberto (iPoint)
- Yook

# LCA Databases

- HESTIA (University of Oxford)
- soca
- EuGeos' 15804-IA
- NEEDS
- CarbonCloud
- **ecoinvent**
- IDEMAT
- PSILCA
- ESU World Food
- GaBi
- ELCD
- LC-Inventories.ch
- Social Hotspots
- ProBas
- bioenergiedat
- Agribalyse
- USDA
- Ökobaudat
- Agri-footprint
- Comprehensive Environmental Data Archive (CEDA)

# LCA is an environmental management tool to:



- Apply a system-wide examination
  - Use a multi-media approach (air, water, solid waste)
  - Identify trade-offs among alternatives
  - Identify opportunities to improve systems
  - Support environmental decision making
  - Achieve sustainable development
- Sistem çapında bir inceleme yapılması
  - Multimedya yaklaşımının kullanılması (hava, su, katı atık...)
  - Alternatifler arasındaki avantajların / dezavantajların belirlenmesi
  - Sistemleri iyileştirmek için fırsatların belirlenmesi
  - Çevresel karar verme sürecini destekleyen
  - Sürdürülebilir kalkınmaya ulaşmak

# Who needs an LCA? And why?



## Product Management / Research & Development (R&D)

Comply with regulations

New product development

Develop sustainable products



## Supply Chain Management / Procurement

Evaluating suppliers

Finding better raw materials

Find better suppliers



## Marketing & Sales

Communicate competitive edge

Meet customer demands

Prove sustainable claims



## Executive Level & Strategic Management

Avoid risks

Lead strategically

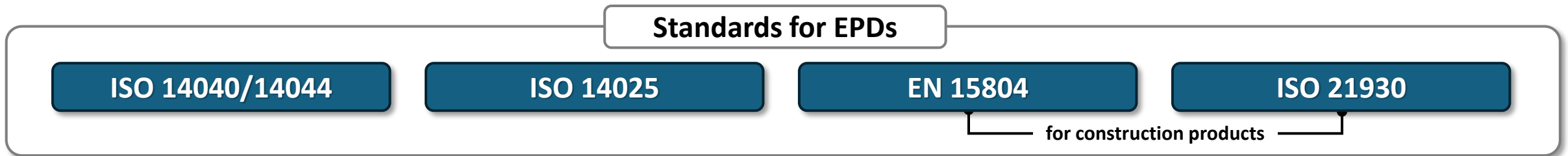
Make sustainable decisions

must be verified by an independent third-party before publication

# Environmental Product Declarations (EPDs)

EPD, is a document that transparently reports the environmental impact of a product or material, based on a **product life cycle assessment (LCA)**.

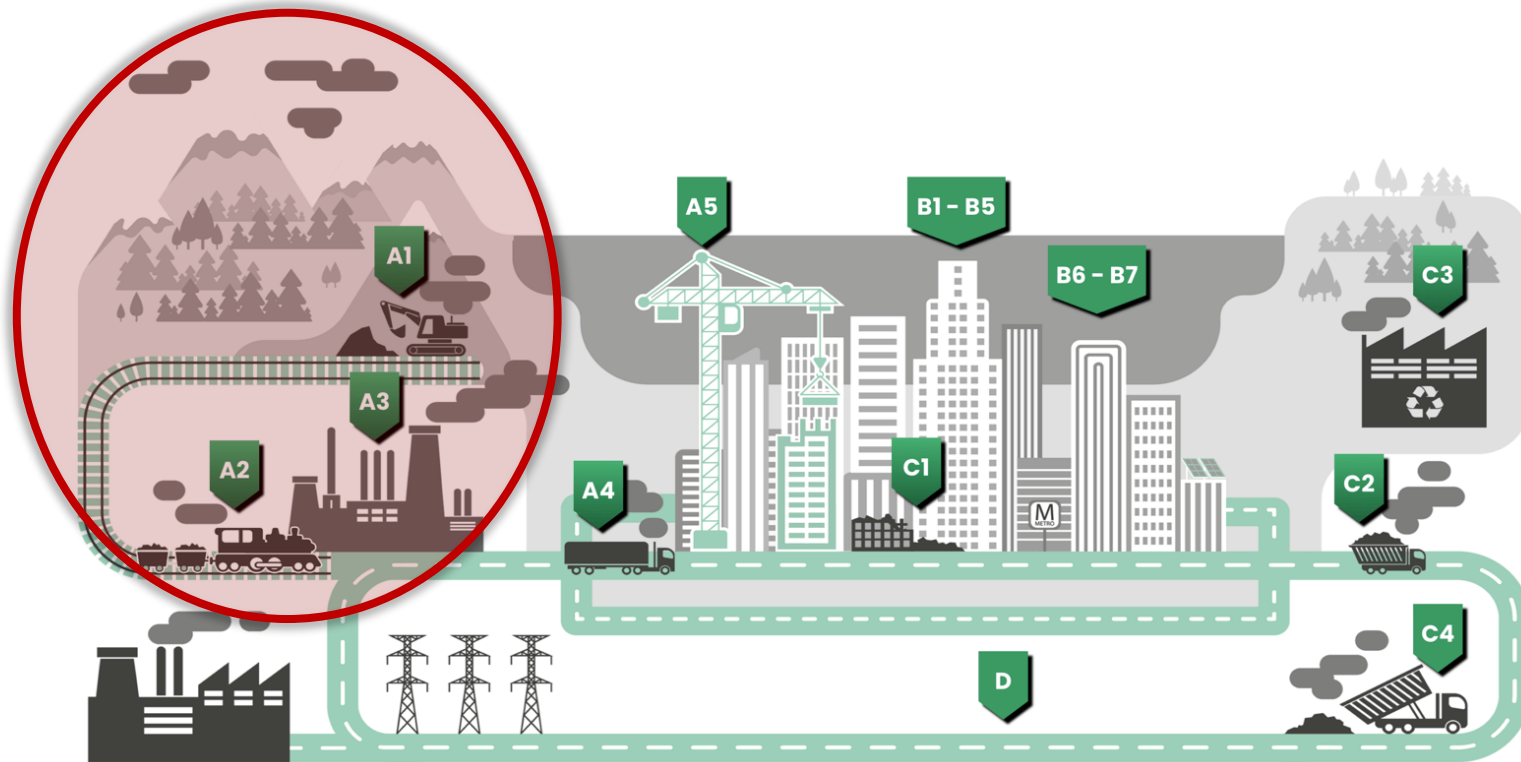
- ✓ Architects, engineers and designers are able to choose the most sustainable option for their project.
- ✓ Manufacturers are able to optimize the impact of their products and market their carbon transparency.
- ✓ EPDs help to achieve EPD and LCA credits in certification schemes, like LEED, BREEAM, and others.





# Product Life Cycle Analysis Stages

## Environmental Product Declarations



### A1 – A3 Product stage

- A1 Raw material extraction
- A2 Transport to manufacturing site
- A3 Manufacturing

### A4 – A5 Construction stage

- A4 Transport to construction site
- A5 Installation / Assembly

### B1 – B5 Use stage

- B1 Use
- B2 Maintenance
- B3 Repair
- B4 Replacement
- B5 Refurbishment
- B6 Operational energy use
- B7 Operational water use

### C1 – C4 End of life stage

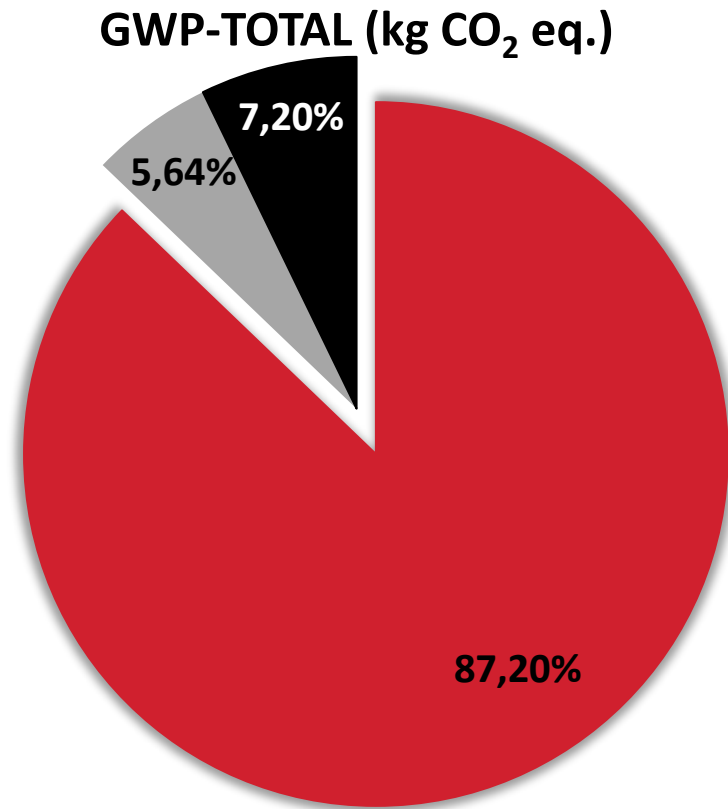
- C1 Deconstruction & demolition
- C2 Transport
- C3 Waste processing
- C4 Disposal

### D – Benefits and loads beyond system boundary

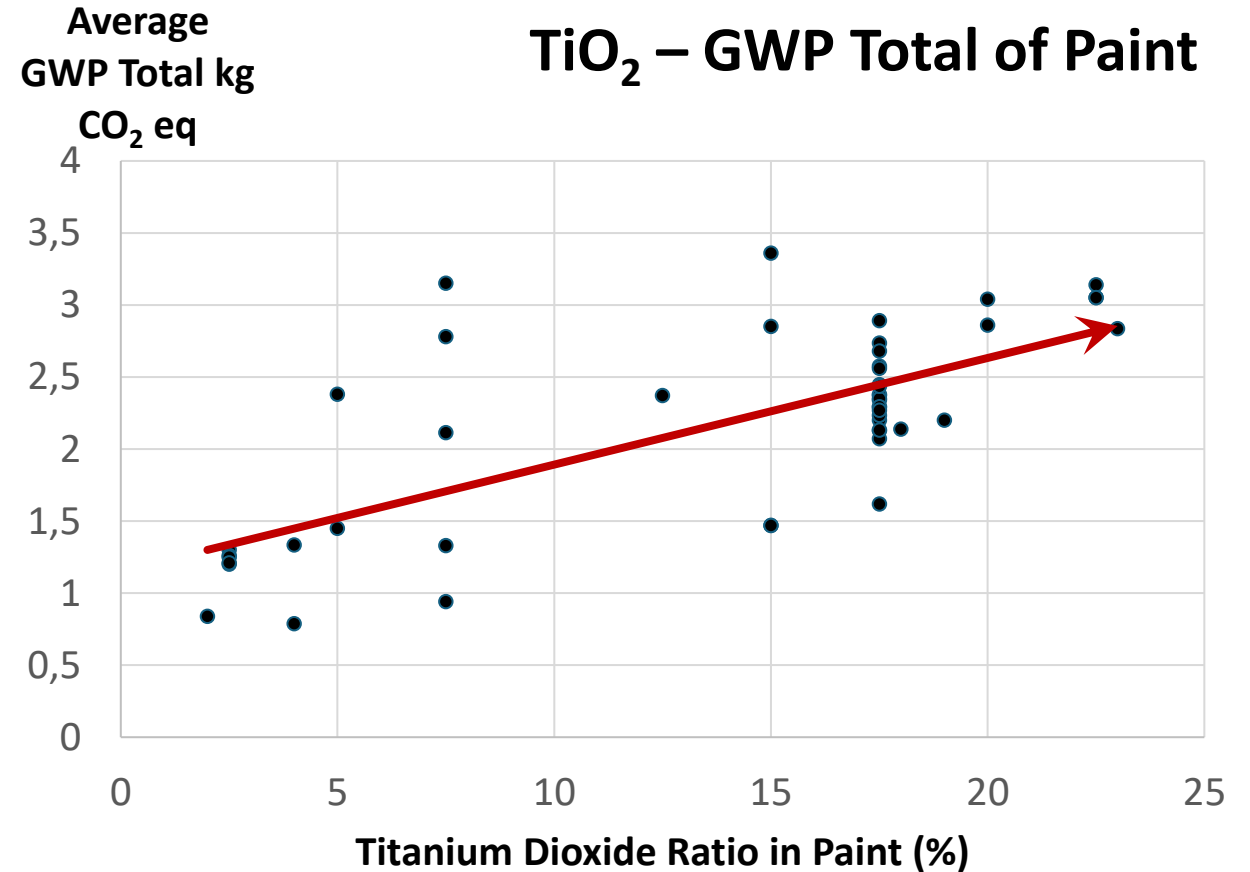
Reuse, recovery and/or recycling potentials, expressed as net impacts and benefits



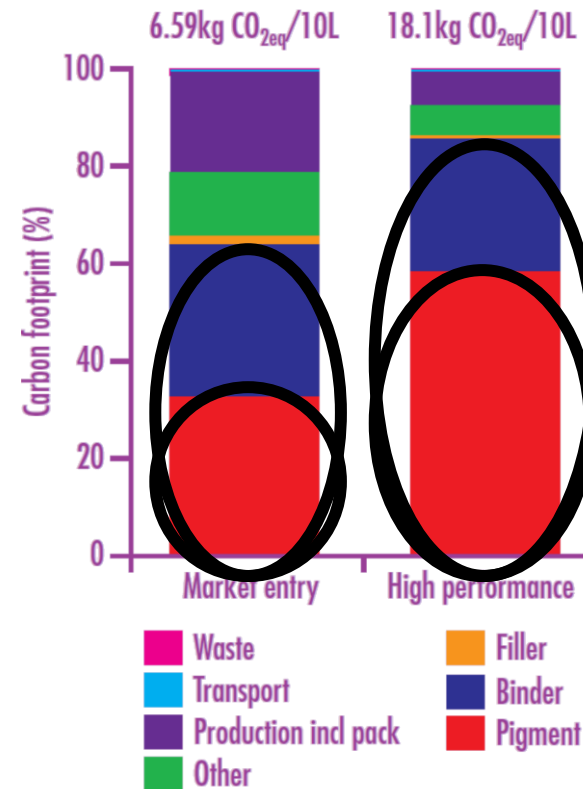
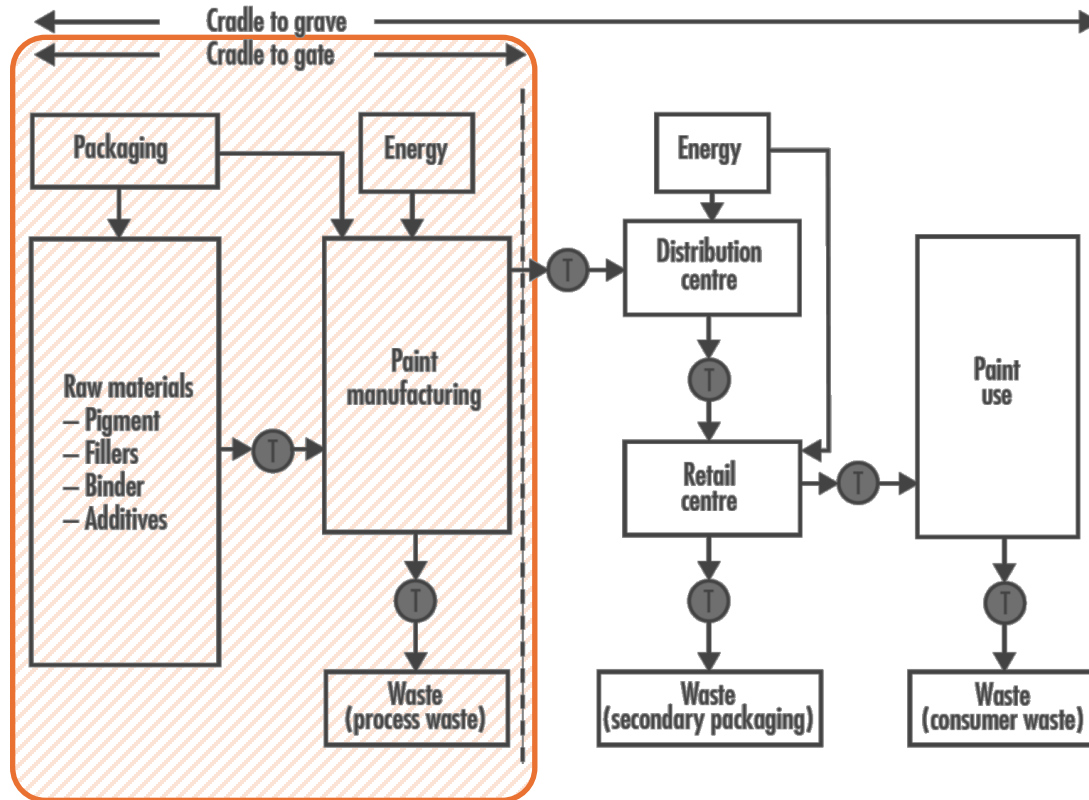
# EPD Database Search and Product Comparison



■ Average of A1 (%) ■ Average of A2 (%) ■ Average of A3 (%)



# Carbon footprint of market entry and high performance water-based interior wall paints



Ingredients	Market entry paint (%)	High-performance paint (%)
Pigment	5	25
Binder	10	25
Filler	25	10
Others (incl water)	60	40

The carbon footprint is strongly influenced by the composition of the **pigment and the binder** contributing more than **60%** and **80%** of the impact for the ME and HP paints, respectively.

Source: Stichnothe et al., Estimating the carbon footprint of paints: some important considerations, Surface Coatings International, Issue 2011/3, pg. 108-114.

“

**If we fail to convert our self-destructing economy into one that is environmentally sustainable, future generations will be overwhelmed by environmental degradation and social disintegration. Simple stated, if our generation does not turn things around, our children may not have the option of doing so.**

**– Lester Russell Brown**



"Kendi kendini yok eden ekonomimizi çevresel açıdan sürdürülebilir bir ekonomiye dönüştürmeyi başaramazsak, gelecek nesiller çevresel bozulma ve sosyal çözülme ile boğuşacaktır. Basitçe ifade etmek gerekirse, eğer bizim neslimiz işleri tersine çevirmezse, çocuklarımızın bunu yapma seçeneği olmayabilir."



# Thank You!

Onur Uygun  
[onur.uygun@dyo.com.tr](mailto:onur.uygun@dyo.com.tr)