Determining a product's environmental footprint

A scientifically-based full **Life Cycle Assessment (LCA)** is the standardised method for fairly comparing the environmental impacts of different products or services. This type of assessment involves systematically collecting and evaluating quantitative data on the inputs and outputs of material, energy and waste flows associated with a product over its entire life cycle. Therefore, a whole range of processes need to be assessed to calculate overall impacts, beginning with the manufacturing of raw materials, to transforming them into products; continuing through the product's transportation and installation, the product's lifetime of use, and ultimately, the product's disposal or re-processing at the end of life.

The results of **LCA assessments** are typically published in the form of **Environmental Product Declarations (EPDs)** to help communicate a product's overall environmental impact.

Environmental impact criteria

The environmental impact of each pipe material was assessed against seven different criteria across its full life cycle.

Abiotic Resources Depletion (non-fossil) ADPn: the over-extraction of minerals, fossil fuels and other non-living, non-renewable materials which can lead to exhaustion of natural resources.

Abiotic Resources Depletion (fossil) ADPf: the over-extraction of fossil fuels including all fossil resources.

Acidification Potential AD: emissions, such as sulphur dioxide and nitrogen oxides from manufacturing processes, result in acid rain which harms soil, water supplies, human and animal organisms, and the ecosystem.

Eutrophication Potential EP: increased concentrations of nitrates and phosphates can encourage excessive growth of algae and reduce oxygen levels. This increases mortality in aquatic fauna and flora, leads to loss of species dependent on low-nutrient environments, reduces biodiversity and has knock-on effects on non-aquatic animals and humans.

Global Warming Potential GWP: the insulating effect of greenhouse gases (GHG) - CO2 and methane - in the atmosphere preventing the earth losing heat gained from the sun. As global temperature rises, it is expected to cause climatic disturbance, desertification, rising sea levels and spread of disease.

Ozone Depletion Potential ODP: depletion of the ozone layer (O3) in the atmosphere caused by the emission of chemical foaming and cleaning agents allows the passage of greater levels of UV from the sun, causing skin cancer, damage to the immune system and reducing crop yields.

Photochemical Ozone Creation Potential POCP: creation of ozone in the presence of sunlight, nitrogen oxides and volatile organic compounds. Ozone leads to chemical smogs that affect human health, food crops and the ecosystem in general. The effects vary according to geography and climate and are especially problematic in heavily urbanised areas with existing pollution.

Environmental profile of the PE pipe system for pressurised water supply (cradle-to-grave) in absolute figures per functional unit

IMPACT CATEGORY	Abiotic Resources Depletion (non-fossil) ADPn	Abiotic Resources Depletion (fossil) ADPf	Acidification Potential AD	Eutrophication Potential EP	Global Warming Potential GWP	Ozone Depletion Potential ODP	Photochemical Ozone Creation Potential POCP
Life cycle phases	kg Sb eq	MJ	kg SO2 eq	kg PO4--- eq	kg CO2 eq	kg CFC-11 eq	kg C2H4 eq
Product Stage	4.33E-06	1.98E+02	1.72E-02	3.72E-03	5.78E+00	3.32E-07	2.00E-03
Construction Process Stage	4.09E-06	3.75E+01	1.60E-02	3.33E-03	2.45E+00	4.73E-07	4.95E-04
Use Stage	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of Life Stage	4.00E-08	-2.50E-01	-8.05E-05	1.46E-05	1.49E-01	-7.75E-10	-7.38E-06
TOTAL	**8.45E-06**	**2.36E+02**	**3.31E-02**	**7.07E-03**	**8.38E+00**	**8.03E-07**	**2.48E-03**

More detailed information about this material comparison can be obtained via www.teppfa.eu or by contacting TEPPFA at: info@teppfa.eu.

Other footprint values

GWP (Global Warming Potential) Product Stage details in Kg CO2 eq

Raw Material Production	4,37
Transport to Pipe Manufacturer	0,25
Pipe Production	0,88
Transport to Site	0,35
Total	5,78

CO2 Emmission - Polyethylene Pipe 480 Kg/ton

Energy based CO2 Emmission - Polyethylene Pipe 403 Kg/ton

CO2 Factor in +CO2 eq/+ - Polyethylene 1.92347

Natural Resources - It takes 1,75 liter petroleum (in terms of energy and raw material) to produce 1 Kg of polyethylene raw material