

# SAFE AND SUSTAINABLE: THE FUTURE OF PIPING SYSTEMS

## A growing body of evidence is identifying plastic pipes as the sustainable choice for development — now and in the future.

Plastic piping systems are strong, durable, light-weight and flexible, requiring significantly less energy to fabricate, transport and install than either the metal or concrete alternatives.

Safe raw materials are used in the production of plastic pipes — instead of the non-renewable fossil fuels used in producing some other pipes — and they have a long service life. Their light weight makes for fuel-efficient transportation and, overall, the product lifecycle of plastic pipes has a low carbon footprint when compared to alternative pipe materials.

## SUSTAINABLE LIFE-CYCLE

Research undertaken by the Flemish Institute for Technological Research (VITO) has shown plastic is a more sustainable choice for pipe systems with plastic pipelines outperforming the alternatives at each stage, from manufacture through to installation and usage.

The researchers completed a life-cycle assessment study of plastic pipes compared to traditional piping materials such as iron, copper and concrete. Plastic pipes were found to be more sustainable based on a range of different factors including:

- depletion of resources
- acidification and eutrophication based on leaks
- overall contribution to global warming and ozone layer depletion.

Following the release of the study's findings, the European Plastic Pipe and Fittings Association (TEPPFA) stated that plastic pipes have a major role to play in achieving the objectives of a large number of the United Nations Sustainable Development Goals (SDGs) by 2030.

<p><b>3</b> GOOD HEALTH AND WELL-BEING</p> 	<p><b>6</b> CLEAN WATER AND SANITATION</p> 
<p><b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE</p> 	<p><b>7</b> AFFORDABLE AND CLEAN ENERGY</p> 
<p><b>11</b> SUSTAINABLE CITIES AND COMMUNITIES</p> 	<p><b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION</p> 
<p><b>13</b> CLIMATE ACTION</p> 	<p>Best practice for pipelines: Plastic pipes can play a role in achieving the objectives of a number of the United Nations Sustainable Development Goals by 2030.</p>

## TRACK RECORD

PE has been used for pipes since the 1950s. PE pipes were first installed in the mid-1950s and many are still in successful operation nearly 65 years later.

A number of studies from Japan, Europe, Russia, the Middle East, Africa and South America have looked at PE buried pipe and have proven a real expected service life in excess of 100 years. This service life was calculated based on lower real pressure levels (stress) over the lifetime of the pipe, lower real temperatures in the ground, consistent zero-to-plus range tolerances for wall thicknesses and safety factors applied in the design stages.

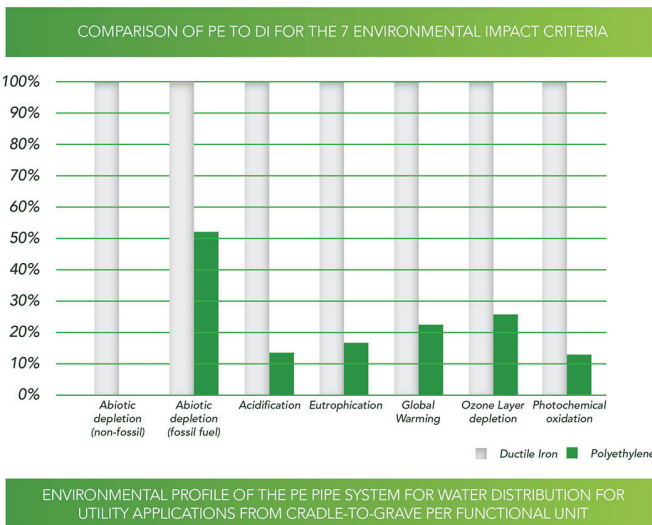
These cumulative studies, and many dig-up reports from Europe and worldwide, have shown that PE pipes continue to provide safe and long-lasting service with no significant age-related degradation.

## HDPE PIPE “THE GREENEST PIPE AVAILABLE”

In its earliest applications, high density polyethylene — or HDPE — was used in gas pipelines but it is now commonly used for drainage and storm water culverts, with strength, durability and the availability of large diameter pipes contributing to its popularity.

HDPE pipes are increasingly being seen as the smart choice in piping materials. This type of flexible plastic piping not only has a smaller carbon footprint than other common pipe materials, it has proven to be very durable with a high level of impermeability and low corrosion. Its strong molecular bonds also make it suitable for high pressure pipelines.

A US paper *Environmental Benefits of HDPE Pipe*, produced by the Plastics Pipe Institute, details HDPE’s growing reputation as “the greenest pipe available”. The paper is focused on the use of HDPE pipes in municipal water and wastewater systems and talks about its wide use as a “sustainable, low-cost, leak-proof alternative to other piping”. The paper details multiple benefits of HDPE pipes and their performance in relation to alternative pipe materials.



**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.

**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.

**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.

**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.

The environmental benefits that accompany the use of HDPE in water and wastewater systems begin with its manufacturing. Pipe produced from HDPE resin uses significantly less energy to manufacture when compared to other materials such as iron and concrete.

Transporting HDPE piping to municipal water and wastewater job sites requires far less fuel than competing materials which are much heavier. HDPE is lightweight yet extremely durable ... HDPE offers superior piping to traditional piping alternatives that require more energy to manufacture and are susceptible to corrosion.”

## RESPONSIBLE CHOICES

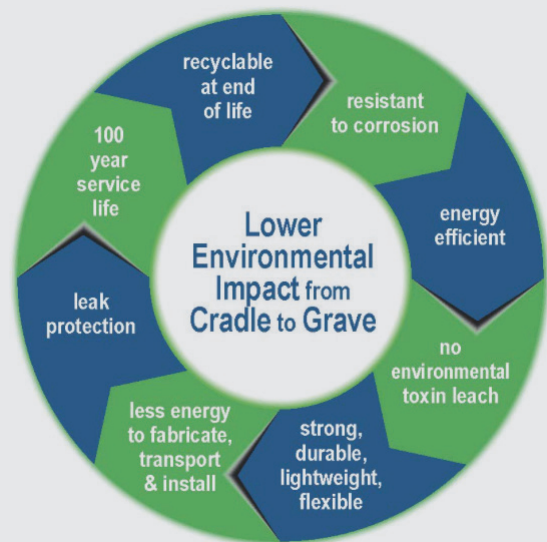
In the Plastics Pipe Institute’s sustainability statement they describe plastic piping systems as the “sustainable and environmentally responsible choice that will serve generations to come”.

In New Zealand where plastic pipe is readily available - including an increasingly wide range of HDPE pipe systems in large diameters and different SN ratings - it would seem to be the easy choice for drainage too.

New Zealand companies like P&F Global have a growing number of case studies outlining the successful use of HDPE pipes in civil, rural, commercial and industrial projects. The case studies show that the environmental performance of these pipes is matched by their performance over their service life: strong, durable, peak protection from contamination or leaking with excellent joint performance, and superior resistance to corrosion and abrasion.

## WHY CHOOSE PLASTIC PIPES?

- Plastics require less energy to manufacture and process than other materials, such as metals and glass
- Plastic pipes do not use non-renewable fossil fuels in their production
- Plastic pipes, including HDPE, have a proven lifespan of 50 years and a projected lifespan of 100 years
- Plastic pipes, including HDPE, have a long lifespan and require minimal maintenance, resulting in very limited additional consumption of energy, raw materials, chemicals and labour to ensure their ongoing function
- Plastic pipes are strong, durable, light-weight and flexible — these piping systems require significantly less energy to fabricate, transport and install than either the metal or concrete alternatives.



### United Nations

<https://www.un.org/sustainabledevelopment/news/communications-material/>

### The European Plastic Pipe and Fittings Association

<https://www.teppfa.eu>

### Plastic Pipes Industry

<https://plasticpipe.org/drainage/sustainability.html>