A new, independent study has shown that steel is the best material to use in bridges.

By Joanne McIntyre

The study, Comparative Life Cycle Analysis of Bridges, analysed road and bicycle bridges. Carried out by the environmental consultancy Beco on behalf of Rijksdienst voor Ondernemend Nederland - a Dutch governmental organization - the study included input from suppliers of wood, concrete, plastics and steel.

The study revealed that steel is more than twice as sustainable as plastic composites or other materials when used to build bridges. Steel performed the best in road bridges thanks to its low environmental footprint which is due to its relatively low weight as well as its excellent recycling properties, the study explained: “Compared to plastic composites, a steel road bridge has a 60% lower environmental footprint. Wood on the other hand scores best for bicycle bridges, followed by steel, concrete and (at a distance) plastics.”

Steel can be endlessly recycled without loss of quality and is a true cradle-to-cradle material. It is used but never consumed because it is recycled in a closed loop that can continue forever. The findings will be of great significance to designers and architects, construction companies and those responsible for materials purchasing for projects.

Stainless bridges

Stainless steel is gaining popularity as a building material for bridges, as the following examples demonstrate.

The 280m long Helix Bridge in Singapore comprises two delicate helix structures that act together as a tubular truss to resist the design loads. This approach was inspired by the form of the curved DNA structure. The helix tubes only touch each other in one position, under the bridge deck. The two spiralling members are held apart by a series of light struts and rods, as well as stiffening rings, to form a rigid structure. The Helix is fabricated from approximately 650 tonnes of Duplex Stainless Steel and 1000 tonnes of carbon steel used in the temporary structure and also helping the bridge to get the helix shape.

The Cala Galdana Bridge is a steel arch bridge over Algendar Creek on the island of Minorca, Spain. It was the first vehicular bridge constructed in duplex stainless steel. The main structure weighs 165 metric tons (182 short tons) and is made of duplex stainless steel with a grade of 1.4462, which exhibits a high resistance to corrosion by chlorides. The deck is made of reinforced concrete, connected to a series of transverse beams. It was completed at a cost of €2.6 million.

The Gider bridge over the Sickla Canal in the south of Stockholm, Sweden provides pedestrian and cyclist access to a new residential district. Because of the high salt content in the water flowing in from the Baltic, the bridge frame is made of high-strength duplex steel (grade: 1.4462). A single gently arched longitudinal girder, braced horizontally by stainless steel cables running down both sides, spans 62m across the canal.