Coillte Teoranta (The Irish Forestry Board) have a problem of extracting timber from isolated areas where the cost of building a road would be uneconomical in relation to the actual volume of timber to be sold. At present, large articulated vehicles cause extensive damage to the roads or tracks in attempting to extract timber. This is because these roads were never designed to carry such loads. The problem areas of particular interest are low ground pressure areas within forests and the poor Non-national roads outside.

The primary objective of this project was to prepare a design proposal for a hydraulically-independent power-driven trailer. It should be equipped with a crane and used in tandem with a suitably powered tractor and have a load-carrying capacity of 15 tonnes. It is required to extract timber from isolated areas within the forest, to a loading bay outside, for transport by an articulated vehicle. It must be suitable for short distance haulage (< 20 miles) if required. Maneuvrability of this unit is an important aspect as turning areas within the forest are quite small.

A secondary objective was to modify the design to allow the trailer to carry 20 tonnes of timber, with the following specifications. This unit will be a dedicated unit, i.e. the same tractor will work in tandem with the trailer at all times. This trailer may also work within the forest but will have a greater importance in the transporting of timber on public roads. It will be required to transport timber to nearby sawmills, railway stations etc. eliminating the need for heavy duty 42 tonne articulated vehicles.

It was important to design the trailer around the guidelines, set out by the Irish Government's Dept. of the Environment, on Maximum weight and dimensions of Mechanically propelled vehicles and trailers. This was to ensure road-worthiness. To determine the hydraulic components required to power the trailer, severe terrain and soil conditions were outlined. This ensured that the trailer would operate comfortably during all seasons. Design features such as incorporating a steering drawbar and using low ground pressure tyres were examined and introduced as they showed theoretical improvements in manoeuvrability and ground damage respectively. A 'walking beam' bogie suspension was included in the design to the 15 tonne capacity trailer working in the forest, to overcome obstacles such as tree stumps. A 'leaf spring' bogie suspension was included in the design to the 20 tonne capacity trailer to minimise pavement damage (up to 30 % of existing systems) whilst travelling on tarred roads.

The final trailer designs showed theoretical improvements in the manoeuvrability of the unit, in the extraction rates and also improved design features. More importantly, the wider low ground pressure tyres (sizes 700/50-26.5 and 850/50-30.5) reduces forest floor damage, and the sprung bogie suspension and reduced damaging effect of an axle (related to the fourth power law) reduces pavement damage.

Comparing the forwarder/articulated truck with the tractor/short-haul trailer showed the cost-effectiveness of using this design unit for haulage distances up to 24 km. It was also shown that for a large extraction distance outside the forest (>6 km) and a haulage distance up to 30 km, the tractor/short-haul trailer unit was more economical than existing systems. Increasing the load-carrying capacity of the short-haul trailer from 15 to 20 tonnes increases this haulage distance up to 60 km.

Overall, it was shown that investment in the manufacturing of a short-haul trailer, whether it had a load-carrying capacity of 15 or 20 tonnes, would reduce the cost of extracting timber (up to 41%) and improve production levels over short-haul distances. Although the cost of a prototype tractor/trailer unit is equivalent to a forwarder, this cost would decrease with mass production.