Social Optimum Road Width and Traffic Volume

The short run average total cost of a road with a given number of lanes = private trip cost + average road cost.

Average Road Cost = Total Road Construction Cost
                    Number of Trips

The short run average total cost curve is U-shaped due to the road cost effect and the trip cost effect. Road Cost Effect - as traffic volume increases, average road cost declines. Since the road construction cost is constant, average road cost declines as the number of trips rises.

The Trip Cost Effect - as traffic volumes rises the resulting congestion increases travel times and private trip costs.

At low traffic volumes there is no trip cost effect so average total cost of the road decreases due to the road cost effect. At higher traffic volumes, average road cost is low and congestion is severe, so trip costs dominate and average total cost increases.

Long Run Average Cost - the minimum cost of serving various traffic volumes. It assumes:
1. Constant Returns to Scale - if the government doubles the construction cost to build a 4 lane road instead of a 2 lane road, it doubles the capacity of the road and LRAC is the same.
2. The government always builds the least cost width to serve a given traffic volume.
LRMC - marginal social cost of one more driver including the cost of widening the road to accommodate the driver.

Since the LRAC is constant, LRAC = LRMC

The optimum traffic volume is the one for which the marginal benefit of travel = LRMC of travel.