

Question: Suppose that there are only two fishermen, Zach and Jacob, who fish along a certain coast. They would each benefit if lighthouses were built along the coast where they fish. The marginal cost of building each additional light house is K100.00. The marginal benefit to Zach of each additional lighthouse is $90 - Q$, and the marginal benefit to Jacob is $40 - Q$, where Q equals the number of lighthouses.

TASK

(a). Explain why we might not expect to find the efficient number of lighthouses along the coast.

Answer:

It is not possible to find the efficient number of lighthouses along the coast. It is because neither Zach nor Jacob would be willing to pay for a lighthouse at along. According to marginal benefit schedule of Zach, the marginal benefit for him starts at K90 and then decline. But, the starting level of marginal benefit for Jacob is K40. The marginal cost of building each additional unit of lighthouse is K100, which is greater than the amount of expected marginal benefits received by each one.

(b). (Showing all calculations) what is the efficient number of lighthouses? What would be the net benefits to Zach and Jacob if the efficient number were provided?

Answer:

Marginal benefit of Zach: $MB_{Zach} = 90 - Q$

Marginal benefit of Jacob: $MB_{Jacob} = 40 - Q$

Total benefit = Sum of marginal benefits

$$= MB_{Zach} + MB_{Jacob}$$

$$= 90 - Q + 40 - Q$$

$$= 130 - 2Q$$

The level of an activity where marginal benefit equals to marginal cost, the quantity of lighthouses would be efficient number.

Marginal benefit (MB) = Marginal cost (MC)

$$130 - 2Q = 100$$

$$2Q = 130 - 100$$

$$Q = 15$$

As per this, the efficient number of lighthouses is 15.

Net benefit (or consumer surplus) can be measured as the area between the demand curve and the marginal benefit of the 15th unit. In this way, the following formula can be useful to determine net benefit:

$$A = \frac{1}{2}bh$$

Where,

b = 15 units (efficient quantity of lighthouses)

h = K15 per unit of lighthouse

Then, net benefit would be:

$$A = \frac{1}{2} * 15 * 15 \Rightarrow K112.5$$

Total net benefit = Net benefit to Zach + Net benefit to Jacob

$$= 112.5 + 112.5 \Rightarrow K225$$

From this, it can be determined that net benefit would be \$112.5 for each person. It means total net benefit would be K225 for Zach and Jacob if the efficient number were provided.

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