2nd condition for optimal depletion of Non renewable Resources:

Let us assume two periods — Present period (denoted by '0') and next (future) period (denoted by '1'). Let the price, the owner can obtain for a unit of the resource today be P_0 and the Price he expects to prevail for a unit in next period be P_1. The cost per unit of extracting the resources and delivering it to the buyer is c, which is not expected to vary between period '0' to '1', i.e., $C = MC$ (constant).

As the owner has a fixed stock of resources, any unit sold in period '0' will reduce the quantity than can be sold in period '1'.

If he sells the unit in present peri (period '0'), he will receive net revenue of is equal to

Net revenue in Period '0' = $P_0 - C$

At the same time, the owner will forgo the revenue in period '1' is $P_1 - C$ in next period. So, if the owner decide to sell the resources in present period, then his net revenue forgone in present period is $(P_1 - C)/(1+r)$, where 'r' is rate of discount. (The discount rate is the interest rate used to determine the present value of future cash flows in a discounted cash flow analysis).

Therefore, his return from selling a unit today will be

$$(P_0 - C) - (P_1 - C)/(1+r)$$

$(P_1 - C)/(1+r)$, is nothing but the opportunity cost of his decision to sell a unit today. It is the user cost of his decision. If

$(P_0 - C) > (P_1 - C)/(1+r)$,

the seller will be better of selling his resources in the current period.

If, on the other hand,

$(P_0 - C) < (P_1 - C)/(1+r)$,

he will be better off by leaving the resources for future. His optimum amount of current extraction is given where -

$$(P_0 - C) = (P_1 - C)/(1+r) \longrightarrow (1)$$

or $$P_0 = C + \frac{(P_1 - C)}{(1+r)} \longrightarrow (2)$$

where $C = MC$

$$\frac{P_1 - C}{(1+r)} = UC$$

This equation (2) states the 1st optimal condition of depletion that current price (P_0) of the resources, when extracted optimally, should be equal to marginal cost (MC) plus user cost (U

Now, from equation (1), we have,

$$(P_0 - C)/(P_1 - C) = 1 + r \longrightarrow (3)$$

or $$(P_1 - C) = (P_0 - C)/1+r \longrightarrow (4)$$

This

This equation ③ or ④ is the second condition of optimal depletion of non renewable resources. This equation is known as the fundamental equation of non resource depletion of non-renewable resources.

The conditions of optimal depletion states that along the optimum extraction path, the resource owner is indifferent of the options of extracting or leaving the resource in ground, the price of the resources, net of marginal extraction cost, that is user cost has to ~~raise~~ rise at a rate equal to the discount rate.