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**Cost assessment and tariff determination:**

**Cargo handling experiences at a private port.**

The case is written by N. Bhanu Prakash, Tarun Dhingra, T. Bangar Raju, & B.V. Ramalingeswara Rao. It is intended to be used for class room discussion for students at post-graduation level. The case has been developed with the support of a private port in India.

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**Cost assessment and tariff determination: Cargo handling experiences at a private port.**

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*(This case is written based on personal observations, interactions, and information collected from authorities of a private port in Gujarat and is purely for academic discussions to suit post graduate students. Taking this objective as cue and as per suggestions of authorities, financial figures are tweaked and name of the port is not disclosed.)*

*Assessment of costs involved in handling a ship holds key for calculating tariff to be levied for services provided to client. A port provides numerous services to a ship that visits for loading and/or unloading of cargo and in the process incurs numerous costs. Precision in identifying costs incurred while providing services and charging clients accordingly help in maintaining confidence of clients and profits for port.*

*The present case deals with cargo handling process of a private port and costs determination for such services. A port attempts to provide reliable and speedy services at competitive prices for its clients so as to maintain client satisfaction and business. Ports in competitive market environment are investing huge amount of funds on infrastructural setup only to reduce stay time of both ship and cargo at the port.*

*Modern ports, often, maintain alternative mechanism to handle the cargo that they handle. This Case Study is based on the observations, interactions and subsequent data collection from a private port in Gujarat on west coast of India and covers assessment of costs involved in handling a ship arriving with coal that the port is to handle for one of its clients. A port also provides certain additional services as desired by client for further charges.*

*A decision on identifying a cost-effective alternative with ease of handling from among two modes of cargo handling process is to be made by the students. The case is well suited for students with ability to understand process costing concepts.*

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**Cost assessment and tariff determination: Cargo handling experiences at a private port.****Introduction:**

In the present competitive markets, the clients in the industry have numerous ports to opt basing on the tariff structure and service levels at different ports. A port is to maintain a balance between attracting and retaining clients and ending-up in profits. The advent of newer ports with sophisticated infrastructure is posing a threat to this port in the form of loss of clientele.

On a fine evening of March, 2014 Mr. Ashwin Metha, Operations Manager of the port during weekend meeting with key personnel involved in port operations emphasised on the need for reduction in costs involved. Stressing on it, Mr. Ashwin advised Mr. Pankaj Patil, Finance Officer to probe alternative ways and means to control costs involved for present and projected cargo volume. He cautioned the members present saying, “we look forward to handle more coal during this summer as we have many ships visiting us for unloading.”

GMPT, a premier private terminal in the state of Gujarat on the west coast of India is a fast growing private port. With an average YoY growth of 5%, the port is transforming itself as a hub for multi-cargo end-to-end service provider. With facilities such as 24X7 operations, in-house CFS, port railway, etc., the port has been able to attract business across different sectors of in the economy.

**Port Sector:**

Seaports are the link for foreign trade and provide much required support to the country's supply chain and distribution channels. Ports in India help in handling the imports and exports and help meet the demands of the vast hinterland. The reform process of the government of India has given scope for private sector to get involved in port sector and support the nation building. Private ports have bestowed customised services coupled with timely dispatch of cargo to clients. Foreign Direct Investment (FDI) investments through automatic route have given a greater scope for private participants to tie-up and foreign players and resulted in numerous private port investments in India.

The involvement of private sector into this segment of infrastructure has ensued in better and faster movement of in and out bound cargo at the Indian ports. The Private sector is expected to bring in efficient port and customized services with tariff structures that better suits the requirements of the shipping clients. Private ports ensure added advantage of improved and competent services, thanks to the investment patterns in the form of technological and equipment transfers from the foreign partner.

Considering the environmental support in the country, numerous private ports have cropped up and are striving to excel. While they are not under the purview of the provisions of Tariff Authority for Major Ports (TAMP) in fixing their tariff, most ports struggle in fixing their own tariff structure. Competitive forces of market compel them to fix a competitive tariff to attract business. The ports, to maintain profitability, need to contain their operational costs to stay in the fray and cannot afford to miscalculate their own costs. This makes the process costing more challenging and meticulous for the port authorities. On the other hand, ports receive different type of ships with different cargo varieties and incur differentiated costs to handle each of these cargos. The private ports have the advantage of equipping themselves with the state of the art infrastructure and at the same time free to change their tariff structure to the dynamic market conditions.

Normally the services of the port would be starting from the time it receives a call from the ship waiting at the outer anchorage. Considering the size of the ship and the cargo it carries, the port employs one to three tugs and a captain to navigate the ship through the channel of the port to the berth.

#### **Port operations at a glance:**

Port services for a ship start with the receipt of Notice of Readiness (NoR) from the captain of arriving ship at the outer anchorage. Upon tendering of Notice of Readiness (NoR) from Captain of the ship at outer anchorage, the port deputes one of its harbor pilots for '*pilotage*' and helps vessel to get alongside after steaming through the channel. '*Pilotage*' is required for smooth navigation as the master of the calling ship would not know about water currents, draft, and other intricacies of the channel. '*Tug*' boats services are required to give the vessel pull-push assistance and safely maneuver ship to the designated berth.

Once the ship gets moored at designated berth the shipper goes for necessary regional legal and customary formalities including customs clearance. Loading and unloading procedures depended on the type of vessel and cargo being handled. For example if the vessel calling at the port is dry bulk ship, cargo is unloaded with the help of grab cranes and the cargo is transferred to yard either through trucks or conveyor belts. Vessel requires workforce (stevedores) to handle cranes or certain cargo handling equipment. The port also, wherever required, employs equipment such as hoppers, dumpers, Rubber Tired Gantry Cranes, pay-loaders, etc., for speedy handling of cargo operations.

When loading and/or unloading of cargo is completed, the ship guided till outer anchorage through pilotage operation by the port deputed pilot to culminate the ship turnaround time. The port imposes charges for all the services that it provided for this entire turnaround time.

Once the cargo is unloaded, it has to be transferred to the yard from where it is sent out to the mainland through rail or road ways. Internal movement of cargo can happened through trucks, conveyor belts, pipe-lines, etc. Cargo movement from yard may be taken up through railways, roadways, or even pipe-lines as per cargo and client specifications.

It may be noted that the port charges for port services is as per predetermined tariff structure. The entire sequence of services may be listed as pilotage, tug-boat, berthing, mooring, stevedoring, internal cargo movements and customs clearances.

The entire sequence of port operations are shown in figures 1 and 2.

The tariff structure of major ports in India is governed by Tariff Authority for Major Ports (TAMP). Non-major ports do not fall under gamut of TAMP and have their own independent tariff structure. However, cost calculation and tariff determination are vital for commercial and financial sustainability of a port.

#### **Sagar Hansa's visit to terminal:**

Sagar Hansa, a ship with 70,000 Gross Registered Tonnage (GRT) carrying 45,000 Metric Tons (MT) of coal, a monthly visitor on behalf of one of the regular client dealing in power generation, has reached the outer anchorage of a private port in Gujarat and has sent Notice

of Readiness (NoR) for berthing. The port, as a customary requirement, deputs one of its pilots to bring the ship from the outer anchorage to the Berth through its 4500 meters of channel. The entire pilotage is expected to last 1 hour and is supported by 2 tugs that help in the smooth berthing of the ship.

The costs of pilotage and usage of tugs for the port are as under:

| <b>Charge Head</b>          | <b>Cost</b>                 |
|-----------------------------|-----------------------------|
| Pilotage and Towage Charges | Rs. 32 per GRT              |
| Berth-hire charges          | Rs. 7.5 per GRT per day     |
| Tug-hire charges            | Rs. 21,000 per hour per tug |
| Channel Utility             | Rs. 700,000                 |
| Anchorage                   | Rs. 2 per GRT per day       |

Once the ship arrives it takes around one hour for customs clearance after which the cargo is to be unloaded from the ship. The average cargo handled at this berth, normally, is 4750 MT in a single day with an effective 20 working hours per day. The details regarding the services required and costs involved to handle the cargo are given in the following sections.

The port is equipped with three cranes to handle cargo with their capacities in Cubic Meters (CMB) depicted in the following table:

| <b>S. No.</b> | <b>Crane</b> | <b>Capacity</b> |
|---------------|--------------|-----------------|
| 1             | Old Gotwald  | 16.5 CBM        |
| 2             | New Gotwald  | 37.0 CBM        |
| 3             | Titan        | 13.5 CBM        |

The port authorities have assigned, as always for this client, Old Gotwald Crane to unload cargo from this ship. The actual cargo lifting capacity stands at 16 CBM per hook-cycle taking a full 5 minutes and the crane drops the lifted coal on to the wharf. The crane operations are supported by a supervisor who assists the crane operator in lifting the cargo.

Coal piled on wharf is lifted on to a truck by using 3 pay-loaders that collect 3 tons per move. A total of 8 workers are engaged to clear and consolidate spillage of coal at the wharf.

Expenses charged for the above berth operations are as follows:

| <b>Table 3</b>  |                              |
|---|------------------------------|
| Fuel (Diesel) for the Crane                               | 8 Liters per move            |
| Wages of Crane Operator                                   | Rs. 500 per shift of 8 hours |
| Wages for the supervisor on Wharf                         | Rs. 500 per shift of 8 hours |
| Charges for each Pay-loader (including wages of operator) | Rs. 1000 per hour            |
| Charges of Workers  | Rs. 300 per shift            |
| Berth-hire charges  | As given in Table 1          |

The port has allocated 26 dumpers to carry the cargo from the wharf to the storage yard situated at 1.2 kms from the berth. Each of the dumpers, on an average, takes 30 minutes to complete a round trip between wharf to yard and can carry 12 MT per trip. The dumpers are owned by an outsourced party for the port who charges a standard Rs. 35 per MT of cargo transported between wharf to the storage yard. However, the port pays the Rs. 250 per shift as wages to each of these drivers.

As per the standing orders of the client, the port takes the responsibility of transferring the cargo through railways. The client has entered into an agreement with Indian railways for the same and accordingly he would be bearing the railway charges.

The port takes the responsibility of transferring the cargo on to the railway rakes that arrive to collect the coal. Since there is time lag between the ship arrival at the port and the arrival of the railway sidings the port stores the cargo at its yard. The port incurs Rs. 5 per MT of coal stored at the yard for accumulation & shading, fire extinguishing, and moisture control.

Generally, a goods train with 15 rakes, with a capacity of 24 MT each, arrives one day after the arrival of ship to carry cargo to client's location. Once the rail rakes arrive the port transfers the cargo from yard to railway line that is 0.5 kms away. The port employs 15 dumpers to carry the cargo and each of the dumpers would need around 10 minutes on an average to make a round trip. The dumper charges here stand at a standard Rs. 15 per each

MT of coal handled. Wages for the drivers of dumpers are calculated separately. The dumper before reaching the railway line goes to the weigh bridge for recording of the cargo transferred and the charges for the weight bridge services stand at Rs. 20 per truck per visit. The port employs 3 pay-loaders to lift the coal from the ground to the dumpers and employs 15 workers to consolidate and clear coal on the ground. The charges for usage of each dumper stand of Rs. 1000 per hour and the wages for the workers are Rs. 250 per shift.

Dumpers dump coal next to each of the railway rakes where the port employs 250 daily labors who would lift the cargo and drop it in the railway rakes. Of them, 150 would be carrying the coal into the railway rakes and remaining 100 are responsible to fill the bags with coal to be carried. Each of the labor can lift 50 kgs per trip and each round trip would last for 5 minutes. Wages to the labor used at the railway siding stand at Rs. 300 per shift. The port also employs 15 gang men who are responsible for the smooth and speedy lifting of coal on to the rail rakes and each of these gang men are paid Rs. 500 per shift. Generally, the process takes around 4 hours to get completed and the port handles 3 trains per day.

The costs involved for providing these services are calculated by the accounts department and are based on the information provided by the operations department of the port. As a policy the port maintains 16% profit margin and sets its tariff accordingly.

### **Challenges:**

Puzzled with the sudden advice of operations manager, Mr. Patil went to Mr. Anil Biswas, Yard Manager to have a thorough understanding on the yard operations. They have visited each of the processes involved in the entire chain of operations involved in handling a ship. During their visit they interacted with all possible persons and tried to take their opinion. Interactions with executives and workers at the facilities gave them the confidence in the processes but could not lead any idea on how the costs could be reduced.

However, during his visit to the berths they observed that the conveyor belt facility, connecting the berth and storage yard, acquired by the port is lying idle. They recollected that due to inadequate and interrupted power supply the usage of the facility is put on hold.



Mr. Biswas, immediately called the maintenance manager to know the possibility of the usage of the conveyor belt. The discussions lead them to the conclusion that the conveyor belt can be put to use with negligible re-operational cost as the port has access to power at Rs. 15 per unit and power availability for the port is also encouraging to restart the operations through conveyor belt. They assessed that with the capacity of 1200 MT per hour, the conveyor belt would be economical even if it can work at 70% of its capacity consuming 600 units of power per hour.

The assurances of Mr. Anil have made Mr. Patil, now, left with the task of undoing the present format and redo the cost calculations assuming 70% operational capacity of the conveyor belt. He aims to arrive at an encouraging conclusion and help solve the problem on hand. Since he is to convince Mr. Ashwin Mehta, Mr. Patil started calculations of all the costs involved under both the alternatives and prove the reductions in costs if conveyor belt is opted.

**Note:** Assume a standard average of 1.2 Cubic Meter as the size of the coal.

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## Exhibit – I – Pricing Objectives of Ports

: The formulation of pricing policies and subsequent tariffs of ports often cover the following pricing objectives<sup>1</sup>:

- a. Promotion of the most efficient use of the facilities wherein the pricing system can influence the utilization of assets particularly when the demand for the services is price elastic. If the demand for a service is inelastic, other measures, generally more authoritative than pricing, have to be found;
- b. Retention of benefits resulting from investment within the country whereby the port charges are fixed at a level that tends to retain the benefits arising from port improvements within the country;
- c. Recover sufficient revenue to meet financial objectives whereby financial reserves may be built-up to meet unexpected future contingencies.

Indian ports set their tariff on 'cost-plus' basis wherein the port can set its tariff structure on the basis of the costs that it expends to handle the cargo. Unfortunately the costs incurred by most major ports to handle the cargo are very high due to numerous inherent constraints faced by them and so they are forced to charge higher rate from the agents. At the same time the major ports are compelled by the tariff structure imposed by Tariff Authority for Major Ports (TAMP).

However, private ports have the advantage of getting started in the recent past and are equipped with the latest infrastructural setup. The usage of modern equipment brings down their costs by a great extent and so their tariff is generally competitive. This gives an opportunity to the private provide additional services to their clients and enhance their satisfaction.

Even at the international level, tariff setting at ports is a complicated task and is a major challenge where ports generally impose numerous charges for their services that they offer. They are generally segregated into three categories namely general tariffs, facility tariffs, and service tariff which are further divided into a series of individual charges as given in the following table.

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<sup>1</sup> United Nations Conference on Trade and Development, Port Pricing, 1975, pp. 9-10.

| <b>Table – 1</b>  |  |   |   |
|---|--|---|---|
| <b>Different tariff categories</b>  |  |   |   |
| <b>Categories</b>   | <b>Type of charges</b>   | <b>Charging units</b>   | <b>Differentiation</b>  |
| General tariffs   | <ul style="list-style-type: none"> <li>• Conservancy, port dues</li> <li>• Wharfage</li> </ul>   | <ul style="list-style-type: none"> <li>• Vessel GRT, NRT, length, beam, draft</li> <li>• Freight or metric ton, cubic metre, TEU</li> </ul>   | <ul style="list-style-type: none"> <li>• Type of vessel</li> <li>• Type of commodity</li> </ul>   |
| Facilities tariffs  | <ul style="list-style-type: none"> <li>• Berth hire</li> <li>• Transit storage (short term)</li> </ul>   | <ul style="list-style-type: none"> <li>• Metre-hour, berth-hour, berth-day</li> <li>• Day</li> </ul>  | <ul style="list-style-type: none"> <li>• Type of berth</li> <li>• Open or closed storage, days in storage</li> </ul>  |
| Service tariffs   | <ul style="list-style-type: none"> <li>• Pilotage</li> <li>• Towage</li> <li>• Berthing/unberthing mooring</li> <li>• Stevedoring, wharf-handling, receiving/delivery</li> <li>• Equipment hire</li> <li>• Cargo processing</li> <li>• Warehousing (long term)</li> <li>• Fuel, utilities</li> </ul> | <ul style="list-style-type: none"> <li>• Vessel movement</li> <li>• Vessel movement</li> <li>• Vessel movement</li> <li>• Freight ton, metric ton, cubic meter, TEU, box</li> <li>• Half-hour, hour, shift, half-day</li> <li>• Freight ton, metric ton, cubic meter</li> <li>• Week, month</li> <li>• Kg, metric ton, cubic meter</li> </ul> | <ul style="list-style-type: none"> <li>• Location of pilotage</li> <li>• Vessel GRT, NRT, length, beam, draft</li> <li>• Vessel GRT, NRT, length, beam, draft</li> <li>• Form of cargo</li> <li>• Type of equipment</li> <li>• Form of cargo before and after</li> <li>• Type of storage (open, closed, frozen)</li> <li>• Capacity provided</li> </ul> |
| Source: <a href="http://www.unescap.org/ttdw/Publications/TFS_pubs/pub_2190/pub_2190.pdf">http://www.unescap.org/ttdw/Publications/TFS_pubs/pub_2190/pub_2190.pdf</a> , page 8. |  |   |   |

The coverage of the types of charges in the above three categories may be as follows:

- a. Conservancy and port dues – charges covering the costs incurred by the port for providing facilities and services, including safe navigation of vessels. It, further, includes dredging, provision of breakwaters, training walls, navigational aids and harbor surveillance facilities, but excludes pilotage and tow services as these are charged separately.

Port dues on ships are based on the type and size of vessel wherein the charges are based on carrying capacity of the vessel measured in GRT, NRT, and DWT or some combination of length, beam and draft, and the unit of differentiation should be the type of vessel.

- b. Wharf-age – a cargo-linked imposed to recover the costs associated with the provision of the basic infrastructure and superstructure of the port to facilitate the movement of cargo from shipside to hinterland and vice versa. It includes costs for services like roadways, railways, quays, parking areas, transit shed facilities, police surveillance etc., These charges are charged on the basis of freight ton, metric ton, cubic meters or TEU, and its differentiation unit is the type of cargo.
- c. Berth hire – levied for the usage of berth that is parked for some period at the berth side of the port. Expenses such as provisions, maintenance and operation of docks, maintenance of dredged depths alongside and in the dock basin, fendering, provision of quays and facilities provided on the quay apron are considered. The charges are linked to the meter-hours, computed as the length of the vessel multiplied by the hours that he vessel is berthed.
- d. Transit storage – cost of storing goods at the sheds or open yard of the port and the charging unit is the amount of storage occupied multiplied by the period of storage measured in days. The storage of goods can be differentiated on the basis of dwell time. The charges, generally, differ on the basis of type of storage, and cargo stored.
- e. Pilotage – most often a compulsory, calculated on GRT of the vessel or a charge per ship. It can be differentiated with the location where the pilotage starts and ends.
- f. Towage – normally included in pilotage itself. Towing charges diverge with the size of tugboat used and the time taken. However, some ports have a fixed rate for towage irrespective of time taken for the operation and changes with type and size of vessel.
- g. Mooring/unmooring (berthing/un-berthing) – charged for the vessel movement, but can be differentiated by the vessel's size measured in GRT, NRT or some combination of length, beam, and draft.

- h. Stevedore-age – linked to the costs involved to loading or/and unloading of cargo.
- i. Warehousing – applicable to goods that need to remain longer in the port and are transported to special premises reserved for that purpose. Ports provide the service free for some period beyond which the port imposes demurrage charges of the over stay. This is to discourage unnecessary pileup and for speedy movement of cargo.
- j. Other tariff – ports further levy for fuel, water and electricity supply, labor supply, rent of equipment and cargo processing provided to the client.

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**Exhibit – II – ESCAP/UNDP Model Port Tariff Structure**

It may, however, be noted that there exists no universally acceptable and implemented standard set of rules and policies for setting the tariff structure.

| <b>Table – 2</b>                                      |                                   |  |                               |                         |                             |
|---|-----------------------------------|--|-------------------------------|-------------------------|-----------------------------|
| <b>Table : ESCAP/UNDP Model Port Tariff Structure</b> |                                   |  |                               |                         |                             |
| <b>Service group</b>                                  | <b>Component/ type of service</b> | <b>Charging System</b>                 |                               |                         |                             |
|   |                                   | <b>Basis</b>                           | <b>Units</b>                  | <b>Payer</b>            | <b>Recipient</b>            |
| Navigation  | Conservancy                       | Size of Ship                           | GRT                           | Shipping line           | Port/Other responsible body |
|   | Port Dues                         | Size of Ship                           | GRT                           | Shipping line           | Port                        |
|   | Pilotage                          | Size of Ship Time                      | GRT Hours                     | Shipping line           | Port/Pilotage Association   |
|   | Tug Services                      | Tug time involved<br>Size of Ship      | Number<br>GRT                 | Shipping line           | Port/Tug owner              |
|   | Mooring/unmooring                 | Size of Ship                           | GRT                           | Shipping line           | Port                        |
| Berth   | Berth Hire                        | Time of ship alongside<br>Size of ship | Hours<br>GRT                  | Shipping line           | Port                        |
|   | Wharfage                          | Volume/weight/size of cargo            | Tonnes/<br>TEU/m <sup>1</sup> | Consignee/<br>Consignor | Port                        |
|   | Ancillary services                | Amount consumed                        | Various                       | Shipping line           | Port                        |
| Cargo Operations                                      | Stevedorage                       | Volume/weight/size of cargo            | Tonnes/<br>TEU/m <sup>1</sup> | Shipping line           | Provider of service         |
|   | Wharf handling                    | Volume/weight/size of cargo            | Tonnes/<br>TEU/m <sup>1</sup> | Consignee/<br>Consignor | Provider of service         |
|   | Extra-movement                    | Volume/weight/size of cargo            | Tonnes/<br>TEU/m <sup>1</sup> | Consignee/<br>Consignor | Provider of service         |
|   | Special cargo handling            | Volume/weight/size of cargo            | Unit<br>Types                 | Shipping<br>Line        | Provider of service         |

|   |  |                                |  |                         |                                 |
|---|--|--------------------------------|--|-------------------------|---------------------------------|
|   |  | Type of special handling       |  |                         |                                 |
|   | Storage  | Time                           | Tonnes/<br>TEU/m <sup>1</sup><br>Days      | Consignee/<br>Consignor | Provider of<br>service          |
|   | Packing/unpacking  | Volume/weight/size<br>of cargo | Tonnes/<br>TEU/m <sup>1</sup><br>Unit type | Shipping<br>Line        | Provider of<br>service          |
|   | Equipmen/service/<br>facility hire                                   | Hours of use by item           | Hours                                      | Stevedore               | Equipment/<br>services<br>owner |
| Other<br>Business   | Real estate licensing<br>management services<br>and consultancy etc. | Various                        | Various                                    | Hirer                   | Port                            |
| <b>Notes:</b> GRT = Gross Registered Tonnage; TEU = Twenty-foot Equivalent Units  |  |                                |  |                         |                                 |
| <b>Source:</b> <a href="http://www.unescap.org/ttdw/Publications/TFS_pubs/pub_2190/pub_2190_ch2.pdf">http://www.unescap.org/ttdw/Publications/TFS_pubs/pub_2190/pub_2190_ch2.pdf</a> , page 10. |  |                                |  |                         |                                 |

### Exhibit – III - Approaches for Port Pricing

As given in the above Table – 2, the tariff structure is classified into four service groups - Navigation, Berth Side, Cargo Operations, and Others. Each of these groups is further described in relation to the charging mode, and parties to be charged in the following sections.

- a. Cost-based pricing – services like pilotage, towage, berthing/unberthing, mooring, stevedoring, wharf-handling, receiving/delivery, cargo processing etc. are charged on the basis of costs expended by the port. This costing method can further be classified as:
  - i. Average cost pricing – calculated by adding the total fixed and variable costs and dividing this sum by the projected demand for the service. This method has the advantage of revenues that cover the total costs, assuming the projected demand will be realized. This method has the drawback of setting high prices during low demand and lower prices when demand is high.
  - ii. Variable cost pricing – calculated by dividing the total variable costs by the projected demand for the services and the facilities. This approach would be appropriate where variable costs are large in share, of the total costs as in labor-intensive break-bulk cargo handling operations due to the use of casual labor.
  - iii. Marginal cost pricing – calculated by dividing the marginal costs by the projected marginal demand for the services. Tariff based on the unit marginal costs mandates for the relationship between variable costs and expected throughput demand be known for the period during which the price will prevail. However, it is challenging and time-consuming to obtain this information. The difficulty in correlating the changing variable costs in long-term with demand variations has demotivated ports from applying this approach.
  
- b. Performance-based pricing – applied for services offered such as berths and storage facilities. Performance-based pricing is subject some rules that include: (i) increase the tariff with the level of utilization is above the optimum, and (ii) decrease the tariff if the level of utilization is below the optimum. With high levels of utilization, congestion builds up leading to the facility becoming expensive in terms of delay costs. To avoid this discomfort, the tariff must increase with the level of asset utilization else during peak periods surcharges have to be introduced. If the level of utilization is far less than



the optimum level, priority is to be given to building up trade, and performance-based pricing results in a price that covers only variable or marginal costs. This suggests that the cost of the facility is recovered with other tariffs, or even a subsidy. Subsidy, however, will result in unwarranted user behavior. So, it is better to set a minimum price that stands higher than that suggested by the variable or marginal cost to ensure efficient behavior by the users.

- c. Value-based pricing – tariff items like port dues and wharf-age are determined under this method. This method is intended to generate enough revenues that can cover all costs incurred in providing services and facilities, including those not covered through a variable cost based tariff for services. This method is a common feature of pricing policy within a service sector whose benefits are heterogeneous. The effectiveness of value-based tariff is relied upon how successfully the structure of the tariffs differentiates among potential users. Individual tariffs for different cargos that the port handles can be used to differentiate among different cargos according to their value and price sensitivity.
- d. Market-based pricing – correlating the port tariffs to potential market demand and sensitivity in order mainly to maximize cash flow, attain good utilization of facilities, counter competition, stimulate market growth and improve profitability.

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