# UNCTAD
## Ad Hoc Expert Meeting on Assessing Port Performance

Room XXVI
Palais des Nations
Geneva, Switzerland

**12 December 2012**

# Port Performance Indicators
# A case of Dar es Salaam port

by

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# DAR ES SALAAM PORT

## PORT PERFORMANCE INDICATORS,

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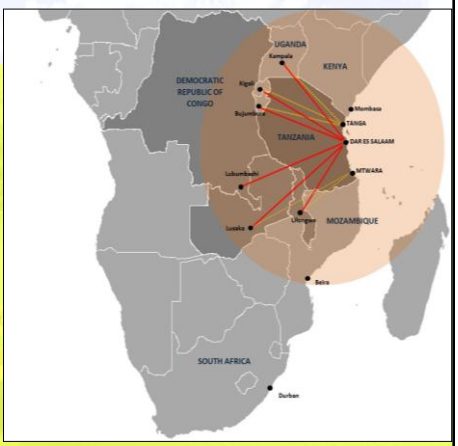
# INTRODUCTION

## Background

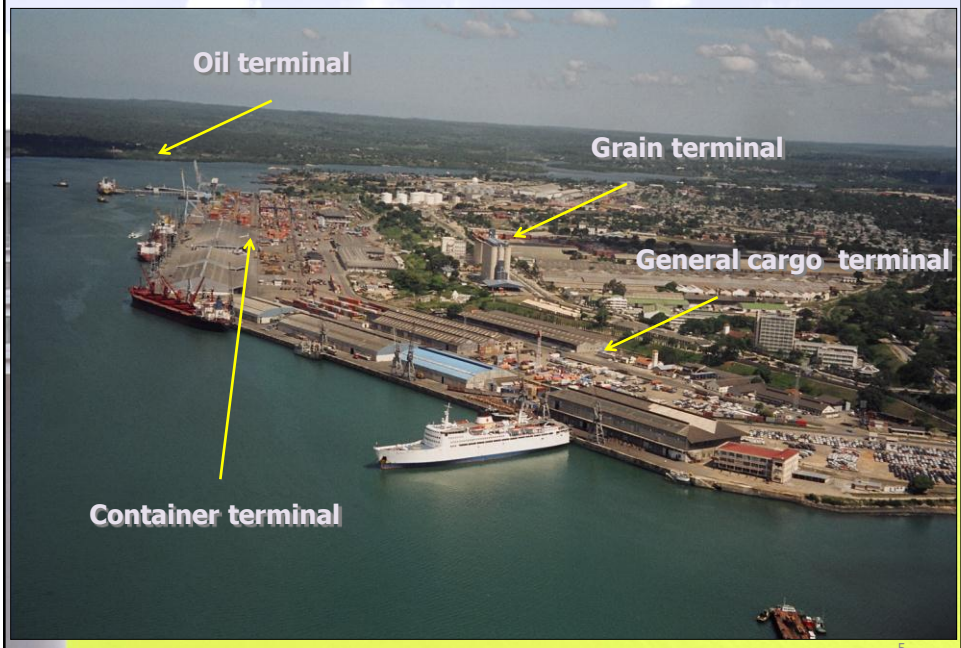
- TPA was established by the Ports Act No. 17 of 2004 as landlord port authority.
- It currently performs the role of both a landlord and operator with the function of promoting the use, improvement and development of ports and their hinterlands.




## Port Facilities

- Dar es Salaam is a major port managed by Tanzania Ports Authority (TPA).
- Handle over 90% of all trade.
- Handle transit traffic of about 30% of the total cargo traffic.
- Serve a big hinterland consisting of Tanzania and six land-linked countries (Zambia, Malawi, DR Congo, Burundi, Rwanda and Uganda)
- The port is a starting point for two major transport corridors; Central corridor served by TRL railway line (1.0m gauge) and DSM corridor served by TAZARA railway line ( 1.067m gauge).

## Port terminals

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## Port Capacities

| Facility | Annual Capacity | Attained in 2011 | % Utilization 2011 | Attained by Oct 2012 | % Utilization by Oct. 2012 |
|---|---|---|---|---|---|
| General Cargo Terminal | 3.1 *Mill. tons* | 3.4 *Mill. tons* | 109.7 | 3.9 *Mill. tons* | 151.2 |
| Oil Terminal (SPM & KOJ) | 6.0 *Mill. tons* | 3.7 *Mill. tons* | 61.7 | 3.2 *Mill. tons* | 64.0 |
| Container Terminal (TICTS) | 400,000 *TEUs* | 365,753 *TEUs* | 91.4 | 293,346 *TEUs* | *88.0* |

# PORT PERFORMANCE INDICATORS

## Introduction

- The main objective of any port is to provide high quality services to all port users and therefore must always aim to higher efficiency to minimize time spent by vessels in ports and hence minimize costs.

- Ports have to create tools that will help in undertaking the right decisions at the right time for measuring performances and improving quality of services as well as deciding on investments needed. These tools are therefore the **Port Performance Indicators**.

- Port of Dar es Salaam categorize performance indicators into:
  - Operational indicators
  - Financial indicators.

- These indicators are normally quantified using mathematical models and the quality of these indicators depends largely on the correctness and reliability of the required information.

The operational performance indicators are directly related to port activities and facilities. These are categorised into:

**Service**

**Output (Production)**

**Utilization and**

**Productivity**

These indicators can easily be remembered as **SOUP.**

## Services indicators

Service indicators measure the quality of service provided to customers – ship owners, ship operators, importers, transport operators, etc. The most common indicators used by DSM port are:

- *Ship turnround time*
- *Truck turnround time*
- *Container dwell time*
- *Equipment availability*

## *Ship turnround time*

•Ship tunround time = Total time spent by a ship in port

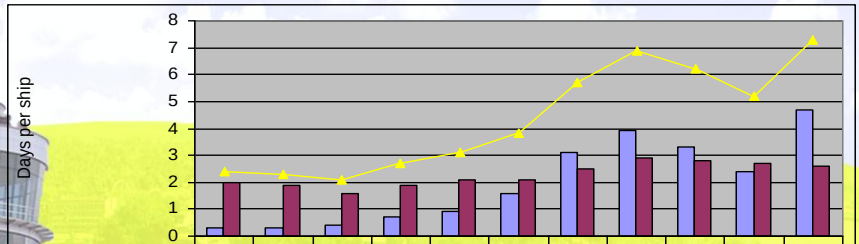
•Components of ship turnround time:

- *Waiting time*
- *Berthing/unberthing time*
- *Berth time (Service time)*

•Waiting time is normally a small proportion of turnround time. However, berth time is the component which when reduced can substantially reduce ship turnround time.

•The berth time depends on the quantity of cargo a vessel has to load or discharge, the type and characteristics of a vessel, the type of equipment and other resources used at berth.

**Chart 1: Ship Turnround (in days); 2001-2011**




| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Waiting time | 0.3 | 0.3 | 0.4 | 0.7 | 0.9 | 1.6 | 3.1 | 3.9 | 3.3 | 2.4 | 4.7 |
| Berth time | 2 | 1.9 | 1.6 | 1.9 | 2.1 | 2.1 | 2.5 | 2.9 | 2.8 | 2.7 | 2.6 |
| Turnround time | 2.4 | 2.3 | 2.1 | 2.7 | 3.1 | 3.8 | 5.7 | 6.9 | 6.2 | 5.2 | 7.3 |

Ship turnround time target for year 2011 was 4.0 days/ship.

Decrease in ship turnround time in 2010 was contributed by the transfer of containers to ICDs, clearance of documentation before ship arrival, acquisition of quay and yard equipment. Increase of ship turnround time in 2011 was contributed by increase of number of un-scheduled tanker calls.

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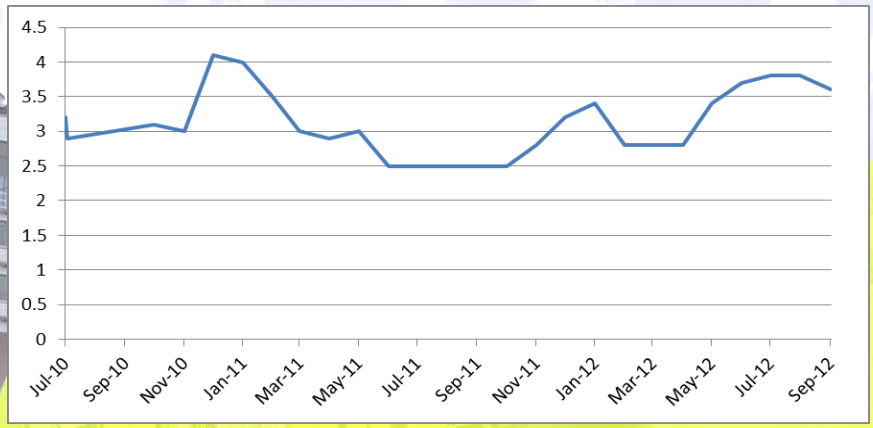
## *Truck Turnround time (Hours)*

- Truck Turnround time is the time between the vehicle's arrival at the terminal entrance gate and its departure from the terminal exit gate.
- It measures the terminal's service quality to road transport operators.
- DSM port container terminal has used this indicator since July 2010 for the purpose of speeding up time of service at service points and reducing waiting hours and congestion at entry/exit gates.

**Chart 2: Trucks Turnround time (in hours): July 2010 – Sept. 2012**



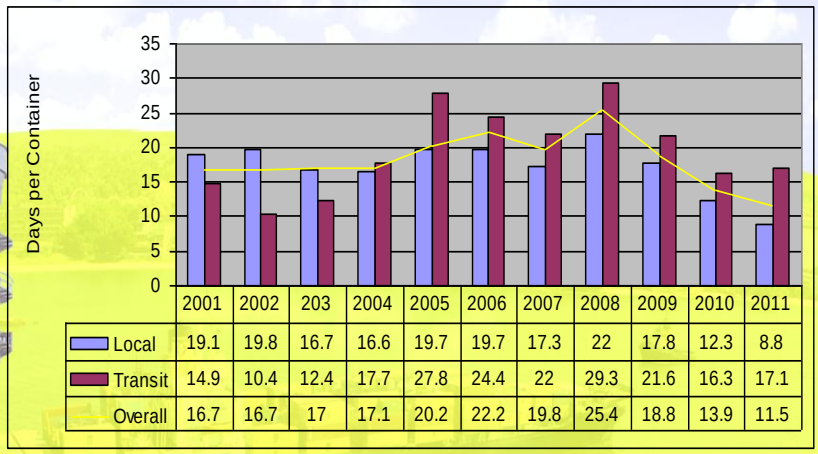

Truck Turnround time is still high compared to target of 1 hour because of the delays during scanning operations, gates layout, availability of equipment during delivery operations as most equipment are deployed during quay operations (discharging and loading).

## *Container Dwell time*

•Dwell time is the period (in days) containers stay at the terminal.

•Dwell time for DSM port is calculated on imports, exports and empties. Dwell time greatly influence terminal capacity of any container terminal.

**Chart 3: Import Container dwell time (in days); 2001-2011**




| | 2001 | 2002 | 203 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Local | 19.1 | 19.8 | 16.7 | 16.6 | 19.7 | 19.7 | 17.3 | 22 | 17.8 | 12.3 | 8.8 |
| Transit | 14.9 | 10.4 | 12.4 | 17.7 | 27.8 | 24.4 | 22 | 29.3 | 21.6 | 16.3 | 17.1 |
| Overall | 16.7 | 16.7 | 17 | 17.1 | 20.2 | 22.2 | 19.8 | 25.4 | 18.8 | 13.9 | 11.5 |

Decrease in dwell time from 2009 todate is due to transfer of containers to ICDs and increase in importers' awareness to clear their cargo in time.

***Equipment availability***

•Equipment availability=(available machine hours/possible hours)*100. It is the proportion of time that a machine is accessible to operations.

•Port workshop and operations officers meet every day at 9.00 hours to go through the list of available equipment from the workshop and deploy as per operations requirement

**Chart 4: Example of Equipment availability (%); Jan-Sept 2012**

| Month | Mobile Harbour crane (9) | Reachstackers (13) | Tractors (21) |
|---|---|---|---|
| Jan | 69 | 29 | 53 |
| Feb | 75 | 100 | 71 |
| Mar | 50 | 83 | 62 |
| Apr | 83 | 100 | 57 |
| May | 100 | 62 | 52 |
| June | 83 | 54 | 19 |
| Jul | 67 | 71 | 50 |
| Aug | 67 | 57 | 50 |
| Sept | 83 | 70 | 43 |
| Target | 90 | 85 | 85 |

# Output (Production) indicators

•Measure the level of activity of the business in a period of time, but do not indicate efficiency of the business.

•Output indicators collected by DSM port include:

- ***Berth output*** *– total tonnage of cargo handled at berth (cargo traffic, cargo throughput)*
- ***Ship output*** *– rate at which cargo is handled to and from a vessel at a berth (tons/ship-day worked, tons/ship hour at berth)*
- ***Gang output*** *– average tons of cargo handled by one gang (tons/gang-shift, tons/gang-hour, motor vehicle units/shift).* Gang output is useful in monitoring labour performance.

Dar es Salaam port

TANZANIA INTERNATIONAL CONTAINER TERMINAL SERVICES LIMITED
DAR ES SALAAM CONTAINER TERMINAL

SHIP PERFORMANCE REPORT

| | |
|---|---|
| Vessel: | BALTRUM TRADER |
| TICTS Ref. No: | MSKC/BALTRA/1207 |
| Rotation No: | 3260 |
| Voyage No: | 1207 |
| Shipping Line: | MSK |
| Arrived (Date/Time): | 18-10-2012/0955 |
| Operation Completed (Date/Time): | 21-10-2012/1700 |
| Sailed (Date/Time): | 21-10-2012/1800 |

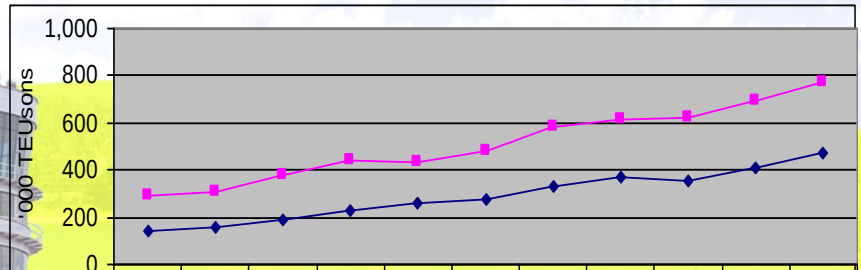
1 VOLUMES

| ACTIVITY | FULL | | EMPTY | | TOTAL BOXES | | SUMMARY | SSG | | SUMMARY | SC & MHC | | SUMMARY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20' | 40' | 20' | 40' | 20' | 40' | | 20' | 40' | | 20' | 40' | |
| DISCHARGED | 112 | 109 | 0 | 0 | 112 | 109 | 221 | 105 | 76 | 181 | 7 | 33 | 40 |
| LOADED | 122 | 55 | 769 | 302 | 891 | 357 | 1248 | 881 | 312 | 1193 | 10 | 45 | 55 |
| SHIFTING ON-BOARD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 |
| SHIFTING VIA BERTH | | | | | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 |
| HATCH COVERS (OPENED/CLOSED) | 0 | 26 | 0 | 0 | 0 | 0 | 26 | | | 26 | | | 0 |
| GRAND TOTAL (BOXES) | 234 | 190 | 769 | 302 | 1003 | 466 | 1469 | 986 | 388 | 1374 | 17 | 78 | 95 |
| GRAND TOTAL (UNITS) | 234 | 190 | 769 | 302 | | | 1,495 | 986 | 414 | 1400 | 17 | 78 | 95 |
| GRAND TOTAL (TEUs) | 234 | 380 | 769 | 604 | 1003 | 932 | 1,935 | 986 | 776 | 1762 | 17 | 156 | 173 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | TOTAL SSG & SC WORKING HOURS | 139.25 | | | 100.00 | | 39.25 |
| | Less Vessel Delays | 14.50 | | | 11.67 | | 2.83 |
| | Less External Delays | 16.58 | | | 13.58 | | 3.00 |
| | Less Hatch Cover Off/On Delays | 6.17 | | | 4.50 | | 1.67 |
| | Less Over-dimensional Handling Delays | 1.17 | | | 0.67 | | 0.50 |
| | Gross SSG & SC Hours | 100.83 | | | 69.58 | | 31.25 |
| | | | | | | | |
| | Less Operational Delays | 17.83 | | | 17.83 | | 0.00 |
| | Less SSG & SC Downtime | 2.42 | | | 1.83 | | 0.59 |
| | Net SSG & SC Hours | 80.58 | | | 49.92 | | 30.66 |
| 3 | TOTAL SHIP WORKING HOURS | 77.41 | | | 64.50 | | 39.25 |
| | Less Vessel and External Delays | 17.58 | | | 25.25 | | 5.83 |
| | Ship Working Hours | 59.83 | | | 39.25 | | 33.42 |
| 4 | AVERAGE PRODUCTIVITY PER HOUR | | | | | | |
| | Moves Per Gross SC Hour | 14.83 | | | 20.12 | | 3.04 |
| | Moves Per Net SSG & SC Hour | 18.55 | | | 28.04 | | 3.12 |
| | Moves Per Ship Working Hour | 24.99 | | | 35.67 | | 2.84 |

## Berth Output

**Chart 5: Container traffic (in '000 TEUs) DSM & MSA ports; 2001-2011**




| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DSM | 142 | 154 | 186 | 227 | 258 | 279 | 334 | 374 | 354 | 410 | 469 |
| MSA | 291 | 305 | 380 | 439 | 437 | 479 | 585 | 616 | 619 | 696 | 771 |

% Increase per annum:

- Dar es Salaam port (DSM) – 12.7%
- Mombasa port (MSA) - 10.2%

Dar es Salaam port

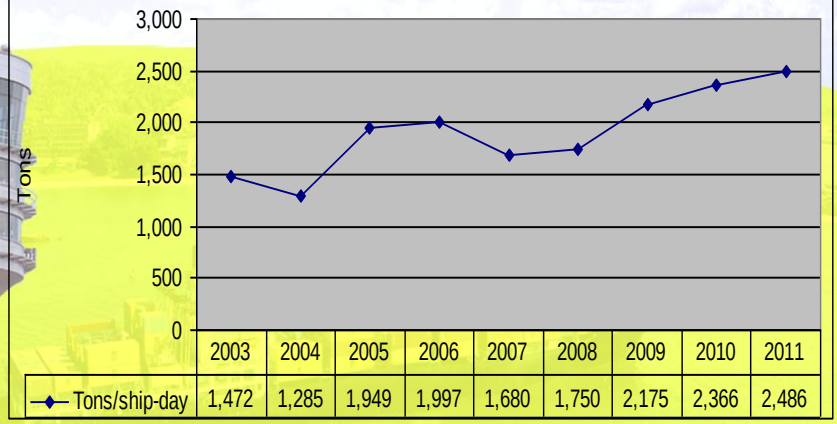
### SHIP PERFORMANCE SUMMARY

For the Month Of Sep-2012 Deep Sea Only

| Rotation | Ship's Name | Berth | Break Bulk Date time | Finishing Date Time | Days | Import Class | Commodities | Tons | Export Class | Commodities | Tons | Total Tons | Gangs | Tons/ gang | Men |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1212755 | Provider | Berth 7 | 01-Sep-12 | 03-Sep-12 | 2.39 | BU | Wheat in Bulk | 13306 | | | | 13306 | 11 | 1209.6 | 175 |
| 1212755a | Provider | Berth 2 | 04-Sep-12 | 06-Sep-12 | 2.69 | BU | Wheat in Bulk | 14016 | | | | 14016 | 18 | 778.7 | 233 |
| 1212759 | Eurosky | Berth 5 | 08-Sep-12 | 12-Sep-12 | 3.28 | BU | Wheat in bulk | 22197 | | | | 22197 | 26 | 853.7 | 417 |
| 1212786 | Grand Pavo | Berth 4 | 01-Sep-12 | 01-Sep-12 | 0.66 | CC | Motor Vehicles | 2761 | | | | 2761 | 3 | 920.3 | 151 |
| 1212794 | Smarty | Berth 7 | 18-Sep-12 | 20-Sep-12 | 2.37 | BU | Wheat in Bulk | 18427 | | | | 18427 | 22 | 837.6 | 308 |
| 1212794b | Smarty | Berth 5 | 20-Sep-12 | 23-Sep-12 | 2.77 | BU | Wheat in Bulk | 18679 | | | | 18679 | 19 | 983.1 | 312 |
| 1212798 | Angy R | Berth 3 | 01-Sep-12 | 02-Sep-12 | 1.58 | GC | Iron Steel | 3843 | | | | 3843 | 8 | 480.4 | 117 |
| 1212803 | Jolly Perla | Berth 3 | 02-Sep-12 | 03-Sep-12 | 0.85 | RO | Containers and Motor Vehicles | 4741 | | | | 4741 | 3 | 1580.3 | 75 |
| 1212803 | Jolly Perla | Berth 3 | 02-Sep-12 | 03-Sep-12 | 0.85 | RO | | | | | 251 | 251 | 2 | 125.5 | 12 |

## Ship Output

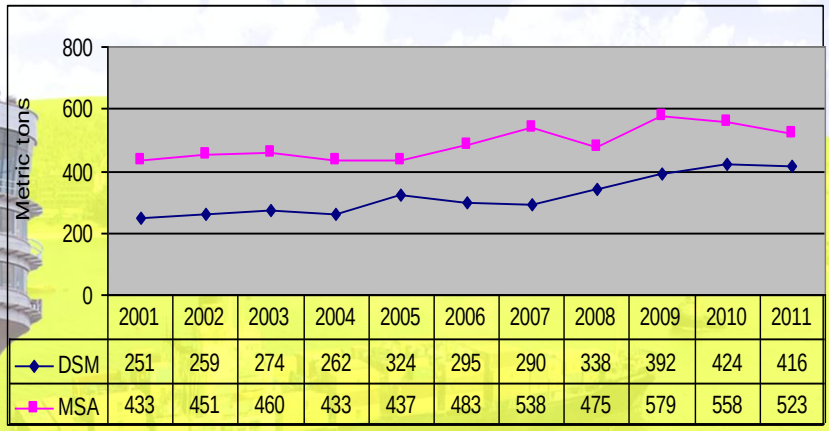
**Chart 6: Tons per ship-day worked; 2003-2011**




| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|
| Tons/ship-day | 1,472 | 1,285 | 1,949 | 1,997 | 1,680 | 1,750 | 2,175 | 2,366 | 2,486 |

## Gang Output

**Chart 7: Tons per gang - shift, DSM & MSA ports; 2001-2011**



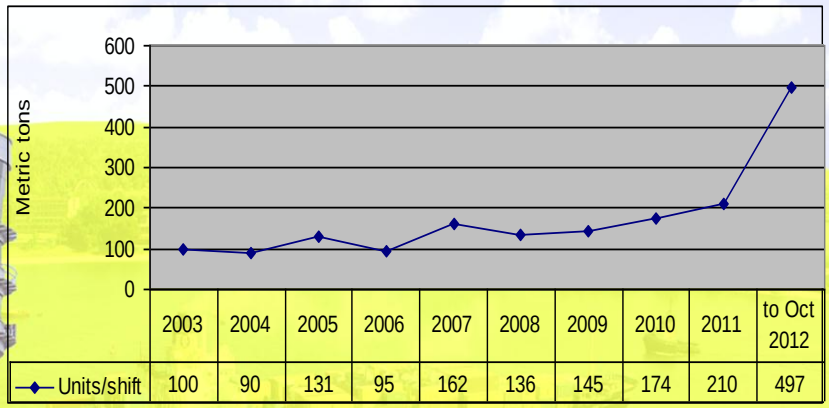

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DSM | 251 | 259 | 274 | 262 | 324 | 295 | 290 | 338 | 392 | 424 | 416 |
| MSA | 433 | 451 | 460 | 433 | 437 | 483 | 538 | 475 | 579 | 558 | 523 |

NB: Mombasa port is using conveyor handling facility

% Increase per annum:

- Dar es Salaam port (DSM) – 5.1%
- Mombasa port (MSA) – 1.9%

**Chart 8: Motor vehicles per shift; 2003 – Oct 2012**




Strategies to speed up discharge of vehicles:

- Direct discharge for vehicles that have no defaults and are tagged green.
- Use VDITT (vessel discharge inspection and transfer tally) for default vehicles (missing parts) and are tagged red.

## Utilization indicators

•Utilization indicators measure how intensively port facilities are used i.e. percentage of actual use of resources and maximum possible use of those resources over a period of time.

•The most common utilization indicators collected are:

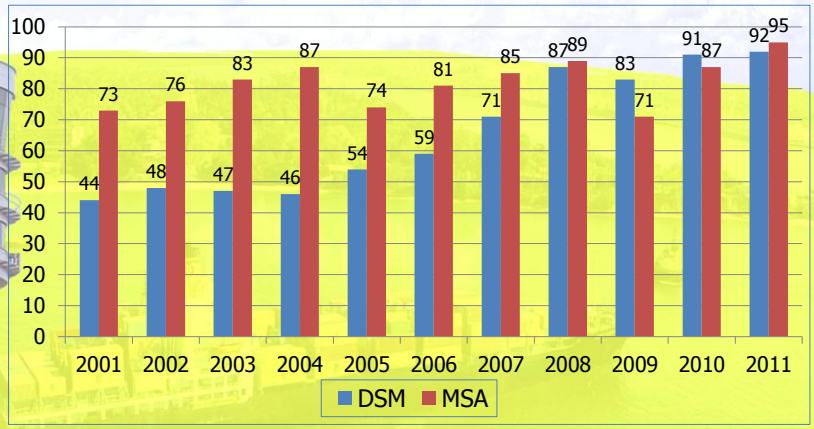
- *Berth occupancy*
- *Storage utilization.*

## Berth Occupancy

•Berth occupancy is the ratio of time the berth is occupied by a vessel to the total time available in that period.

•High berth occupancy is a sign of congestion (>70%) and hence decline of services, while low berth occupancy signifies underutilization of resources (<50%).

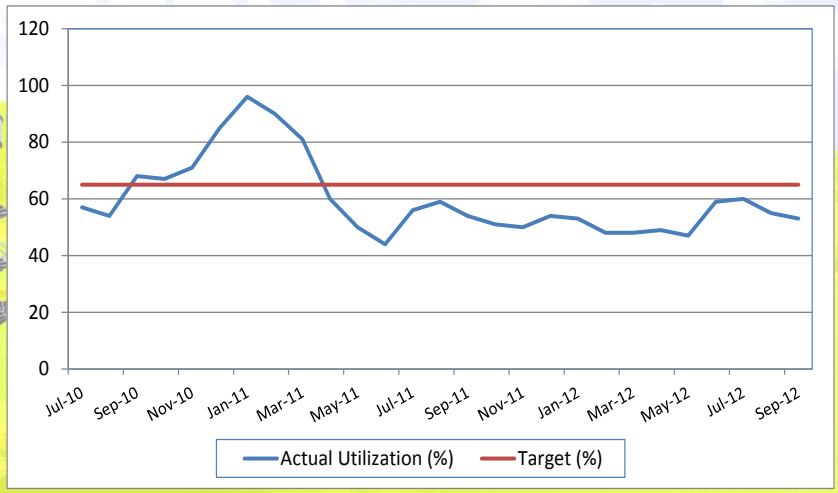
**Chart 9: Container terminal berth Occupancy (%)**
**DSM & MSA ports; 2001-2011**



## Storage (Yard) utilization

- Yard utilization is the ratio of number of storage slots (number of containers on hand) to the number of available slots (Terminal capacity).
- The maximum storage capacity for DSM port is set to 65% to avoid yard congestion.
- If yard capacity is over 65%, containers are transferred to ICDs

**Chart 10: Yard utilization (in %): July 2010 – Sept. 2012**



## Productivity indicators

•Productivity indicators are measures of the **efficiency** and **cost effectiveness** of the terminal operations, i.e. the ratio of output achieved to effort put in, and is expressed in terms of quantity of production achieved per unit of resource in unit time.

•These measures indicate how effectively **labour, equipment** and **land** are being used.

•If productivity is improved, in most cases cargo handling costs will decrease and profits will go up.

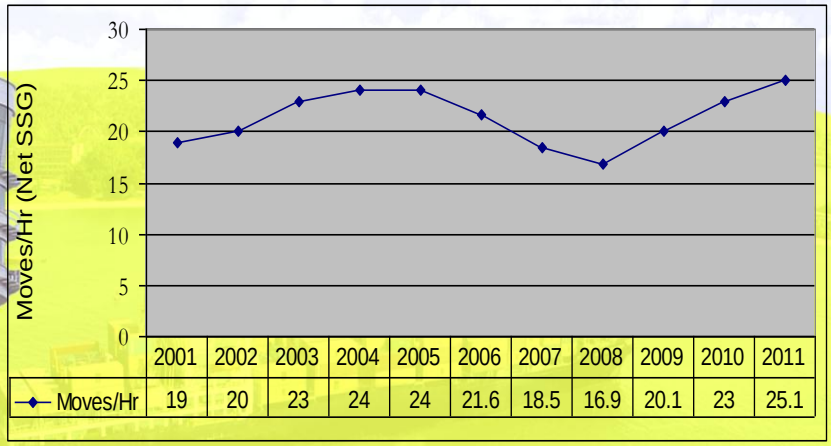
•Productivity indicators collected by the port includes:

- *Ship productivity – measure container handling rates for a ship's call (container moves/ship-hour in port or at berth or per working hour). The indicator does not* consider resources put into operation.
- *Crane productivity - measure handling rates of a crane (container moves/crane - hour)*

•High productivity is also a determinant of better ship turnround time.

•Low productivity especially in labour and equipment may result into increase in ship turnround time. This may result in increase in port costs and route costs.

**Chart 11: Crane productivity DSM port-Container Terminal; 2001-2011**




| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Moves/Hr | 19 | 20 | 23 | 24 | 24 | 21.6 | 18.5 | 16.9 | 20.1 | 23 | 25.1 |

- TPA is using this indicator to measure the performance of the privately run Container Terminal in order to promote and develop the terminal to achieve its maximum utilization and meet all appropriate international standards.
- The set performance target is 25 moves per hour. If the performance in any one year falls short of the applicable target for that year by 10% or less, then the loyalties owed for that year shall be increased by 5%. If falls short by more than 10%, then the loyalties owed for that year shall be increased by 10%.

## Financial performance indicators

•The financial performance indicators collected by Dar es Salaam port include the Operating Revenues, Operating expenditures, Surplus from operations, Non-operating revenues and Net profit ratio, Cost per ton, labour cost per ton.

•Using these measures, port can easily know whether is profit generator or cost centred port and thereafter take appropriate action.

## CONCLUSION

•Port performance indicators that should be collected on a global scale are those which are useful, comparable and easy to gather data/compute. These indicators include berth output, ship output, ship productivity, quay crane productivity, ship turnround time, storage utilization, equipment utilization, berth occupancy and cost per ton/teu.

- Proper and regular use of these indicators will largely help terminal or port operators to maintain and improve operational as well as financial performance and meet the service demands of customers.

- Performance indicators cannot be useful unless the data used are correct, reliable, comprehensive, and carefully and critically analysed.
- Measuring port performance will always lead in making adequate investment in ports.
- DSM port intend to use more performance indicators to compare itself with more ports. UNCTAD's initiatives could help us achieve this goal.
- We recommend transparency in relevant ports data and also to be easily accessible.