

OFFICIAL BUDGET and COST ESTIMATING SYSTEM for **PORT DREDGING** in BRAZIL

DREDGING SUMMIT & EXPO | 2017



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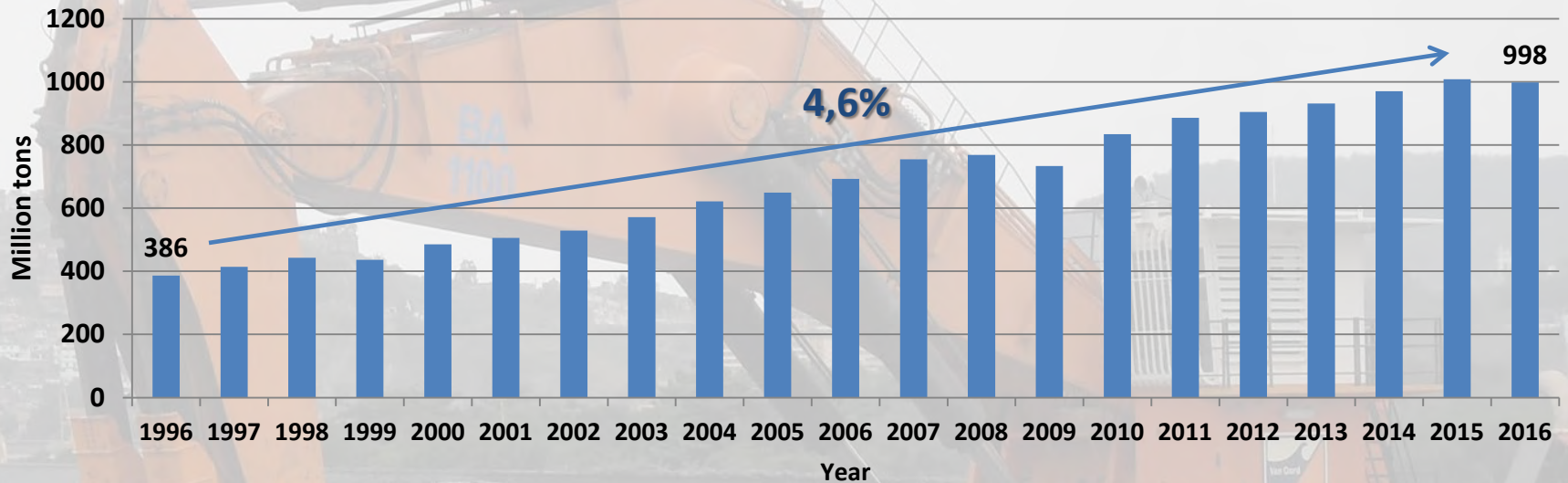


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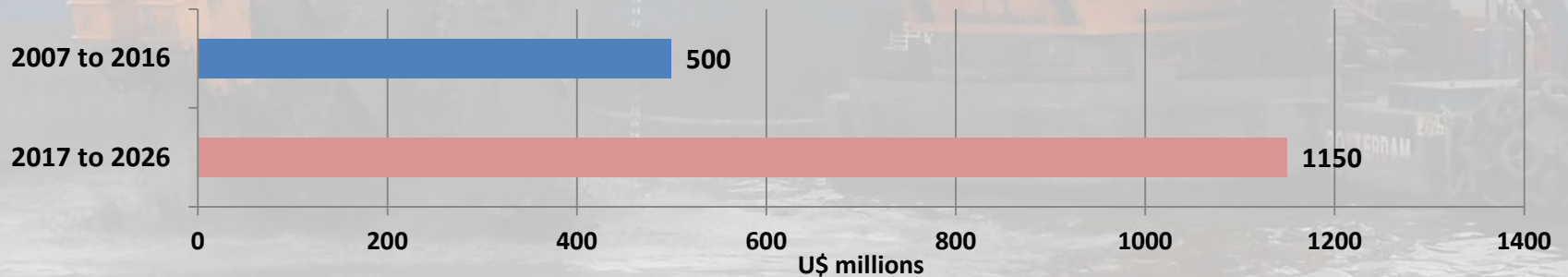


INTRODUCTION

Evaluation of Brazilian Port Handling



Investments in Dredging Works (Federal Government resources)



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FIRST STEP – NEW METHODOLOGY

Mixing concepts of 3 different cost calculation references

RICHARD NICK BRAY
“Dredging: a handbook
for engineers” Chapter 10

CIRIA
“A guide to cost standards
for dredging equipment
2009”.

SICRO
The official federal system
that provides a cost
standard for budgets of
infrastructure works.

NEW METHODOLOGY

Reliable cost calculation
methodology

Subject to Brazilian
Federal Government
Rules

Accountable to the
Government Accountability
Office (GAO)



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NEW METHODOLOGY

Innovation

- Calculates and includes the silted volume in the work
- Mobilization and demobilization distance
- Includes costs regarding crew assistance and logistics support
- Useful tools to support the public agent



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NEW METHODOLOGY

Concept of Activity Based Costing

ACTIVITY	MOBILIZATION	OPERATION				DEMOBILIZATION
		EXTRACTION OF THE SEDIMENT	TRIP TO THE DISPOSAL AREA	DISCHARGE OF THE MATERIAL	TRIP FROM THE DISPOSAL AREA	
RESOURCE	dredging equipment	dredging equipment				dredging equipment
	manpower	manpower				manpower
	crew assistance	crew assistance				crew assistance
	logistics support	logistics support				logistics support



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SECOND STEP – SYSTEMATIZATION

System Objectives

GUARANTEE A STANDARD

Simulation of budgets

Standardization

GUARANTEE THE ACCURACY OF THE RESULTS

Reliable sources

Transparency

Technical basis

SERVE AS A DECISION MAKING SUPPORT TOOL

Analytical budget

Maximize efficiency

Sensitivity analysis



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SYSTEMATIZATION OBJECTIVES

Analytical Budget

RESOURCES	MOBILIZATION	OPERATION				DEMOBILIZATION	UNPRODUCTIVE HOURS	TOTAL	%
		EXTRACTION OF THE SEDIMENT	TRIP TO THE DISPOSAL AREA	DISCHARGE OF THE SEDIMENT	TRIP FROM THE DISPOSAL AREA			R\$ 99.946.547	
EQUIPMENTS	R\$ 1.265.964	R\$ 15.336.715	R\$ 21.314.121	R\$ 2.043.414	R\$ 21.314.121	R\$ 1.265.964	R\$ 8.779.624	R\$ 71.319.925	91,0%
OPERATION	525.016	R\$ 7.987.594	R\$ 10.170.758	R\$ 573.590	R\$ 10.170.758	R\$ 525.016	R\$ 1.003.206	R\$ 30.955.938	39,5%
MAINTENANCE	R\$ 326.633	R\$ 4.173.110	R\$ 6.327.624	R\$ 834.622	R\$ 6.327.624	R\$ 326.633	R\$ 4.415.745	R\$ 22.731.991	29,0%
DEPRECIATION	R\$ 122.942	R\$ 942.437	R\$ 1.429.003	R\$ 188.487	R\$ 1.429.003	R\$ 122.942	R\$ 997.232	R\$ 5.232.046	6,7%
RETURN ON CAPITAL	R\$ 199.166	R\$ 1.526.748	R\$ 2.314.984	R\$ 305.350	R\$ 2.314.984	R\$ 199.166	R\$ 1.615.516	R\$ 8.475.915	10,8%
INSURANCE	R\$ 92.207	R\$ 706.828	R\$ 1.071.752	R\$ 141.366	R\$ 1.071.752	R\$ 92.207	R\$ 747.924	R\$ 3.924.035	5,0%
MANPOWER	R\$ 113.345	R\$ 911.348	R\$ 1.381.864	R\$ 182.270	R\$ 1.381.864	R\$ 113.345	R\$ 964.337	R\$ 5.048.373	6,4%
CREW ASSISTANCE	R\$ 35.850	R\$ 274.815	R\$ 416.698	R\$ 54.963	R\$ 416.698	R\$ 35.850	R\$ 290.793	R\$ 1.525.666	1,9%
LOGISTICS SUPPORT	R\$ 15.988	R\$ 90.072	R\$ 136.575	R\$ 18.014	R\$ 136.575	R\$ 15.988	R\$ 95.309	R\$ 508.520	0,6%
TOTAL	R\$ 1.431.148	R\$ 16.612.950	R\$ 23.249.257	R\$ 2.298.661	R\$ 23.249.257	R\$ 1.431.148	R\$ 10.130.063	R\$ 78.402.485	
%	1,8%	21,2%	29,7%	2,9%	29,7%	1,8%	12,9%	R\$ 21.544.062	



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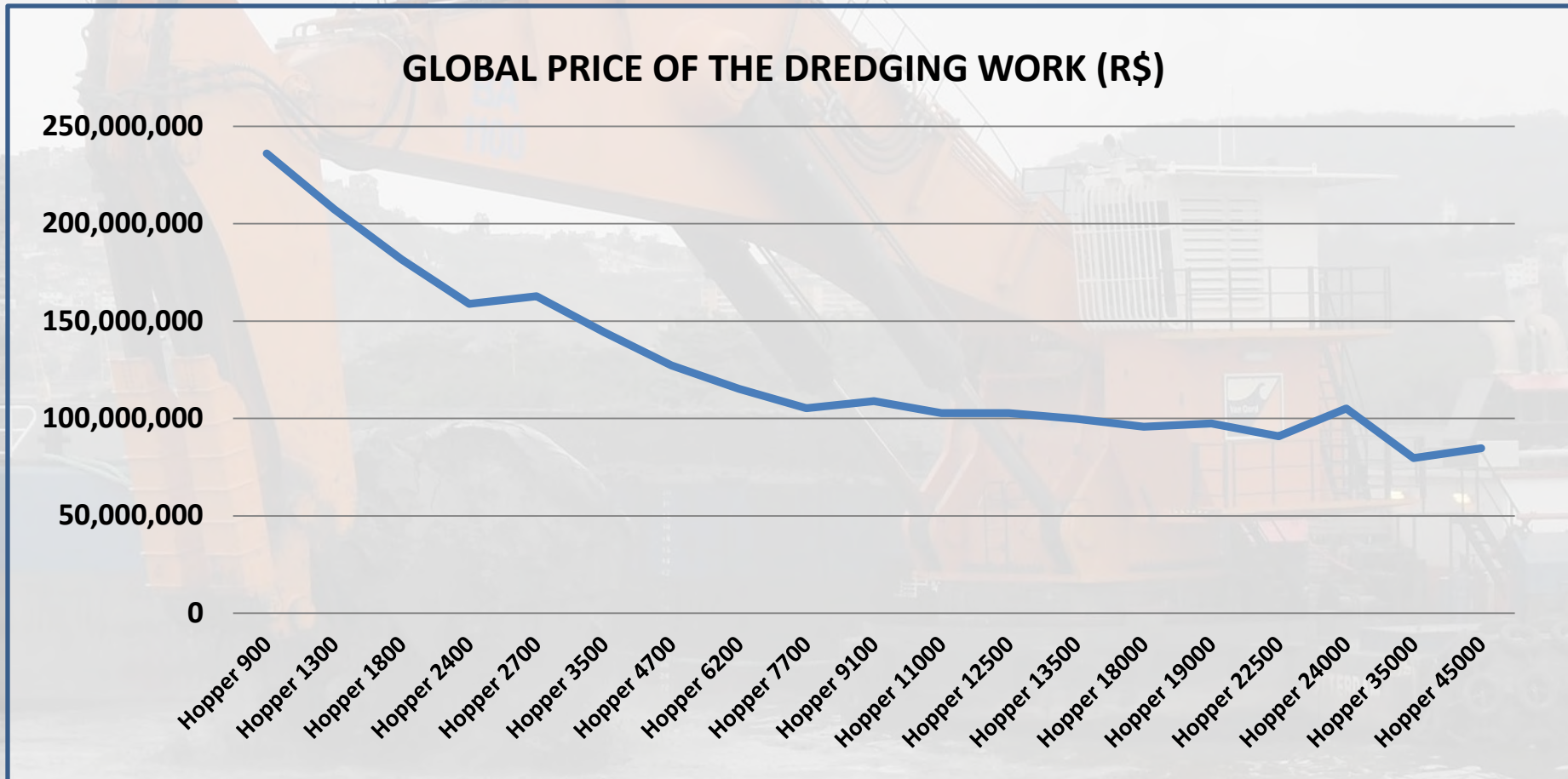


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SYSTEMATIZATION OBJECTIVES

Maximum Efficiency (Hopper dredges)



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SYSTEMATIZATION OBJECTIVES

Maximum Efficiency (Backhoe dredges)

BACKHOE's DATABASE
Backhoe A
Backhoe B
Backhoe C
Backhoe D
Backhoe E
Backhoe F
Backhoe G
Backhoe H
Backhoe I



BARGES DATABASE
Barge 1
Barge 2
Barge 3
Barge 4
Barge 5
Barge 6
Barge 7
Barge 8
Barge 9

Best combinations – fit inputs and minimize downtime



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SYSTEMATIZATION OBJECTIVES

Sensitivity Analysis

INPUT	UNIT	ORIGINAL VALUE	NEW VALUE	RESULTS
Speed to the disposal area	Knots	10.0	10.0	ORIGINAL GLOBAL PRICE U\$ 49,500,200
Speed from the disposal area	Knots	12.0	12.0	
Loading factor of the bucket	%	90%	90%	
Loading factor of the barge	%	85%	85%	
Loading factor of the Hopper	%	80%	80%	
Bulking factor	%	15%	15%	NEW GLOBAL PRICE
Distance to the disposal area	Nautical miles	8.5	9.5	U\$ 52,018,061
Euro exchange	R\$	3.58	3.58	
Dollar Exchange	R\$	3.32	3.32	
Fuel price	R\$ / liter	2.45	2.45	VARIATION
Maintenance factor	%	0.0345%	0.0345%	5.09%
Unproductive hours	%	20%	20%	
Engine capacity factor	%	63%	63%	



SYSTEMATIZATION OBJECTIVES

Sensitivity Analysis – average impact of 15 dredging works

INPUT	VARIATION	VARIATION IN THE GLOBAL COST
speed	1 knot	7.0%
Distance to the disposal area	1 nautical mile	5.0%
Maintenance factor	1 percentage point in annual factor	1.9%
Engine capacity factor	1 percentage point in each factor	1.2%
Loading factor	1 percentage point in the index	1.1%
Indirect costs, taxes and profit	1 percentage point in the final value	0.8%
Bulking factor	1 percentage point in the index	0.8%
Unproductive hours	1 percentage point in the index	0.7%
Euro exchange	1% in the unit cost	0.5%
Fuel price	1% in the unit cost	0.4%



SYSTEMATIZATION OBJECTIVES

Sensitivity Analysis – highly complex inputs

INPUT	VARIATION	VARIATION IN THE GLOBAL PRICE	SOURCE
speed	1 knot	7.0%	public agent
Distance to the disposal area	1 nautical mile	5.0%	project
maintenance	1 percentage point in annual factor	1.9%	methodology
Engine capacity factor	1 percentage point in each factor	1.2%	methodology
Loading factor	1 percentage point in the index	1.1%	public agent
Indirect costs, taxes and profit	1 percentage point in the final value	0.8%	Government
Bulking factor	1 percentage point in the index	0.8%	public agent
Unproductive hours	1 percentage point in the index	0.7%	methodology
Euro exchange	1% in the unit cost	0.5%	Brazilian Central Bank
Fuel price	1% in the unit cost	0.4%	Petrobras



HIGHLY COMPLEX INPUTS

Loading Factor - Bucket



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HIGHLY COMPLEX INPUTS

Loading Factor - Barge



Average impact in the global price – 1.1%



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THIRD STEP – DATABASE

New Challenge – improve accuracy of the inputs

IMPROVE THE ACCURACY

Speed

Loading factor

Bulking factor

Unproductive hours



DEVELOP A DATABASE AND FEED IT WITH DATA FROM DREDGING WORKS

Travel time to the disposal area

Travel time from the disposal area

Number of cycles per area

Number of unproductive hours per work



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THIRD STEP – DATABASE

Development of a data base to feed dredging works data

24/05/17

PRÉ-CADASTRO **CICLOS**

Nº Ciclo	Tempo	Volume	Paralizações	Excluir
1	11:55	1.0	1.0	<input type="checkbox"/>
2	11:55	2.0	2.0	<input type="checkbox"/>
3	11:55	3.0	3.0	<input type="checkbox"/>
4	11:55	4.0	4.0	<input type="checkbox"/>
5	11:55	5.0	5.0	<input type="checkbox"/>
6	11:55	6.0	6.0	<input type="checkbox"/>

PrototipoDragagem

Informe a area de despejo

NAVEGAÇÃO VAZIA

LATITUDE: Informe a latitude

LONGITUDE: Informe a longitude

hora início hora fim

DRAGAGEM

LATITUDE: Informe a latitude

LONGITUDE: Informe a longitude

hora início hora fim

BOCA: 1 2

MANOBRA: Informe a manobra

NAVEGAÇÃO COMPLETA

LATITUDE: Informe a latitude

LONGITUDE: Informe a longitude

hora início hora fim

DESPEJO

LATITUDE: Informe a latitude

LONGITUDE: Informe a longitude

hora início hora fim

DMT(mn): Informe DMT(mn)

LATITUDE: Informe a latitude

LONGITUDE: Informe a longitude

hora início hora fim

DMT(mn): Informe DMT(mn)

MATERIAL: Informe o material

TDS*: Informe o tds

VOLUME(m³)

MISTURA*: Informe a mistura

IN SITU*: Informe in situ

SALVAR



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CONCLUSIONS

- Importance of dredging works to Brazilian economy
- New system provides more reliability in establishing fair prices
- Support tools provide useful and relevant information
- A reliable methodology is not enough to ensure the accuracy (database for highly complex inputs)
- Complexity of the system demands constant feeding and updating (legislation, methodology, technology, database)





THANK YOU !

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