Coordinación General de Puertos
y Marina Mercante
Dirección General de Puertos

American Association of Port Authorities

Alliance of the Ports of Canada, the Caribbean, Latin America and the United States

Productivity-Based Tariff Scheme for the Mexican Ports

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Certified Company
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In Integrity

FOA Consulting, S. C.

May, 2006

The Recent Past

The Mexican ports applied a tariff scheme in the past with the following characteristics:

- It is a static model that considers the value of the port infrastructure but does not consider the future development of the ports and their infrastructure (New investments involved)
- Likewise, it considers the costs and the current expenses, but it does not consider their evolution over time.
- Consequently, it does not include the port assets profitability.
- It considers the costs and investments incurred to render the services as well as the criterium to determine the maximum tariffs.
- It does not consider the competitiveness of the port tariffs, since it disregards the tariffs of competitive ports in the analyisis.

Towards a New Tariff Scheme

Due to the limitations that the previous scheme has, it was necessary to develop a new tariff model that will consider the following in order to determine the tariffs:

- Not only the current reality of investments in the ports, but also the perspective of a future development. This develelopment comes from investments as well as from operations and management described in the port planning.
- Port productivity criteria.
- The profitability of port assets.
- Equilibrium tariffs that do not allow that the ports have losses and that consider at the same time the market tariffs, this is competitiveness.

Objectives of the New Tariff Scheme

1. Strengthen the financial self-sufficiency of the Port Management.

2. Achieve the profitability of port assets in a medium and long term.

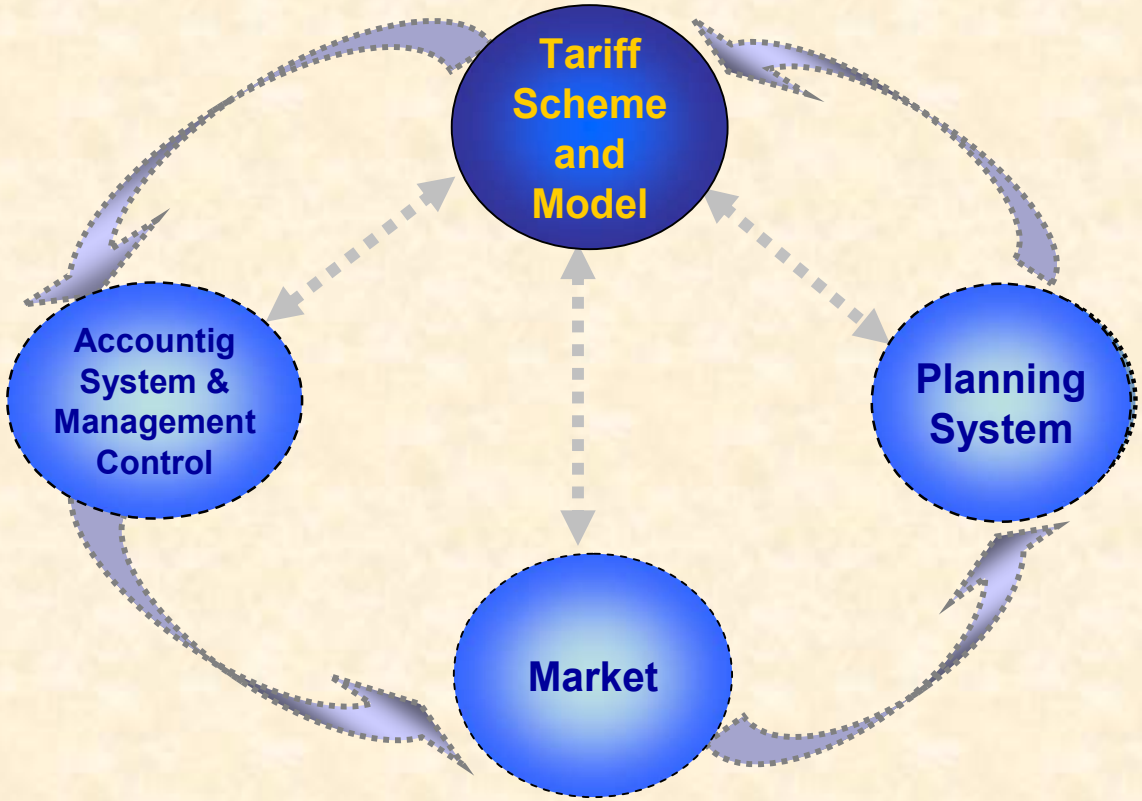
3. Encourage the competitiveness of the Mexican ports.

4. Consider the future development of ports

5. Have flexible mechanisms for updating tariffs

Systemic Concept of the Model

The tariff model considers the operative and financial reality of the ports, their development perspectives and the market.



Feedback to make decisions and design of development scenarios

It gives:

- **Productivity, efficiency and profitability parameters**
- **The scenarios of port development with decisions of quality investment.**

It Identifies and dimensions:

- **The potential demand**
- **The competitive advantages**
- **The benchmarking with other ports**

General Considerations

A The model is a tool that allows and facilitates the Port Management to elaborate its proposal regarding the infrastructure tariffs, in such a way that:

1. The tariffs are based on:
   - Financial self-sufficiency
   - Possibilities that the market offers
   - Productivity and competitiveness
2. A greater certainty is generated through structuring a realistic view point based on the current situation and on feasible scenarios of development.
3. The decision making is improved through the evaluation of decisions that are described in the port planning (Master Plans)

B The model recognizes that the port management involves other businesses.

In this sense, the financial feasibility of the ports is determined by that of each individual business and by that of all in general (global management).

C The model according to the costs, expenses and investments that will be made in a planning horizon determines:

- Equilibrium Tariffs, that constitute the minimum collections of reference in order to not incur losses.
- Maximum Tariffs, determined according to the collections of competitive ports, a reasonable profitability or the tariffs currently collected.

D The tariffs susceptible of collection by the ports must be in the range defined by the equilibrium tariff and the maximum tariff.

It is responsability of the port management and of the board of directors to determine the tariffs that are actually collected and that include the promotionals.

Tariff Scheme

- Tariffs of Competitive Ports
- Maximum reasonable profitability
- Integral Logistic Costs
- Commercial Reality of the Port

→ **Maximum Tariff** ← Based on Competitive Ports or Maximum Profitability

RANGE — Where the Tariffs are placed

- Financial Information
- Master Plan

→ **Allocation Criteria** →

Equilibrium Tariff ← Minimum Tariffs to recover expenses and investment

- Parametric and Management Indicators

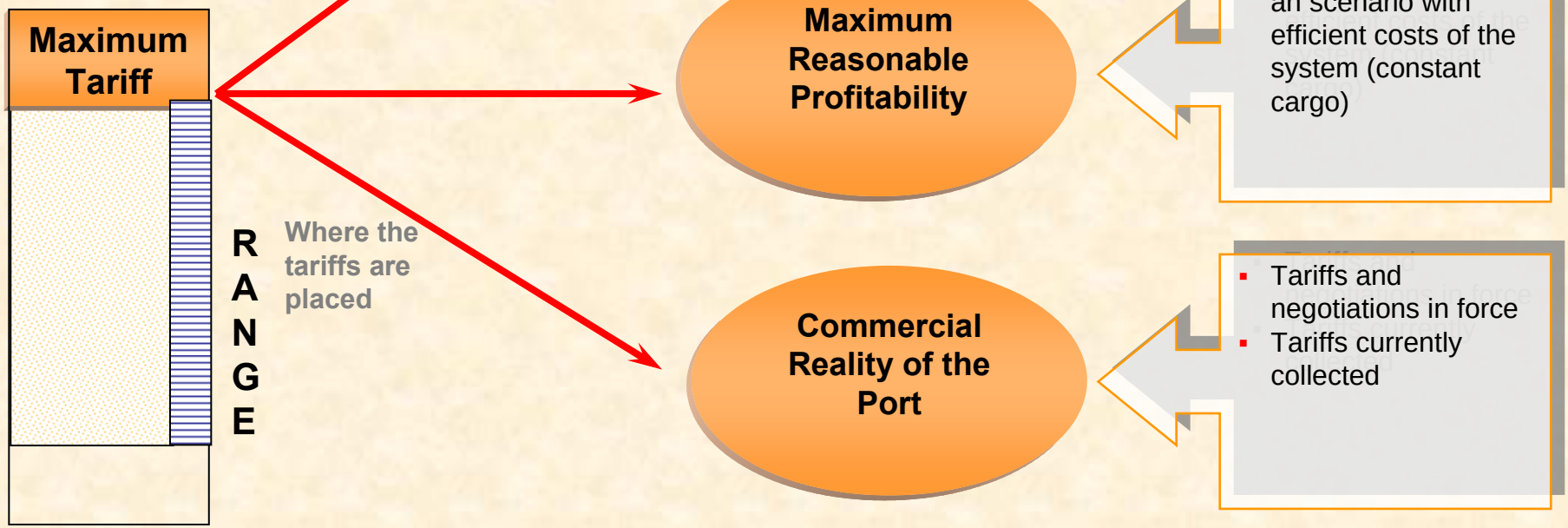
Equilibrium Tariff Formulation

$$TIP = \frac{\sum_{J=0}^{n} (Cost_J + Inv_J)/(1+r)^J}{\sum_{J=0}^{n} Operated\ Vol_J/(1+r)^J}$$

Tariff Scheme

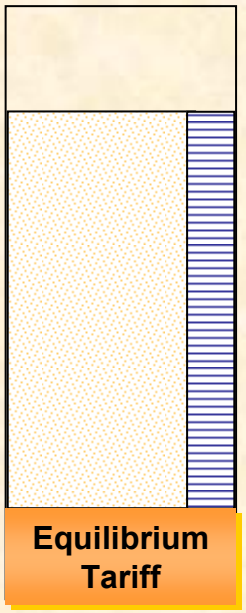
Maximum Referential Tariffs

Reference Based on Competitive Ports or Maximum Profitability



Equilibrium Tariffs

Referential Equilibrium Tariff (Financial Self-Sufficiency)



Where the tariffs are placed

Origin – Destination of the Loads

Tariff that recovers costs

Validated Programatic Scenario

- Efficient Costs of the Port System
- Management, Productivity and Efficiency Indicators of the System (Balance Score Card)
- Parametric Costs for Investments

Allocation Criteria

Concepts to be collected	Port		Dockage	Wharfage	Unloading
	Fixed Collection	Variable Collection			
Management expenses	% [3]				
Protection works	●				
Maritime signaling	●				
Dredging	●				
Dockage and Wharfage • Capital			●		
• Maintenance and Insurance				●	● [2]
Urbanization[1]				●	● [2]
Passenger Terminal [1]					● [2]

1/ Includes: Capital, maintenance and insurance.

2/ The loading / unloading that recovers maintenance and insurance expenses of the dockage and wharfage works related to the operation of cruises and capital costs, maintenance and insurance of the passenger terminal and the urbanization works related to the operation of cruises.

3/ The percentage of distribution is proportional to the tariffed income related to the total income of the port.

Costs and Investments that The Tariffs Recover

1 *Costs and Expenses*

All the Operative and Management Costs related to the operation of the port.

2 *Existing Investments*

It is assumed that the tariffs recover only the capital income and the maintenance cost of the infrastructure, considering that they are transfers of the Federal Goverment.

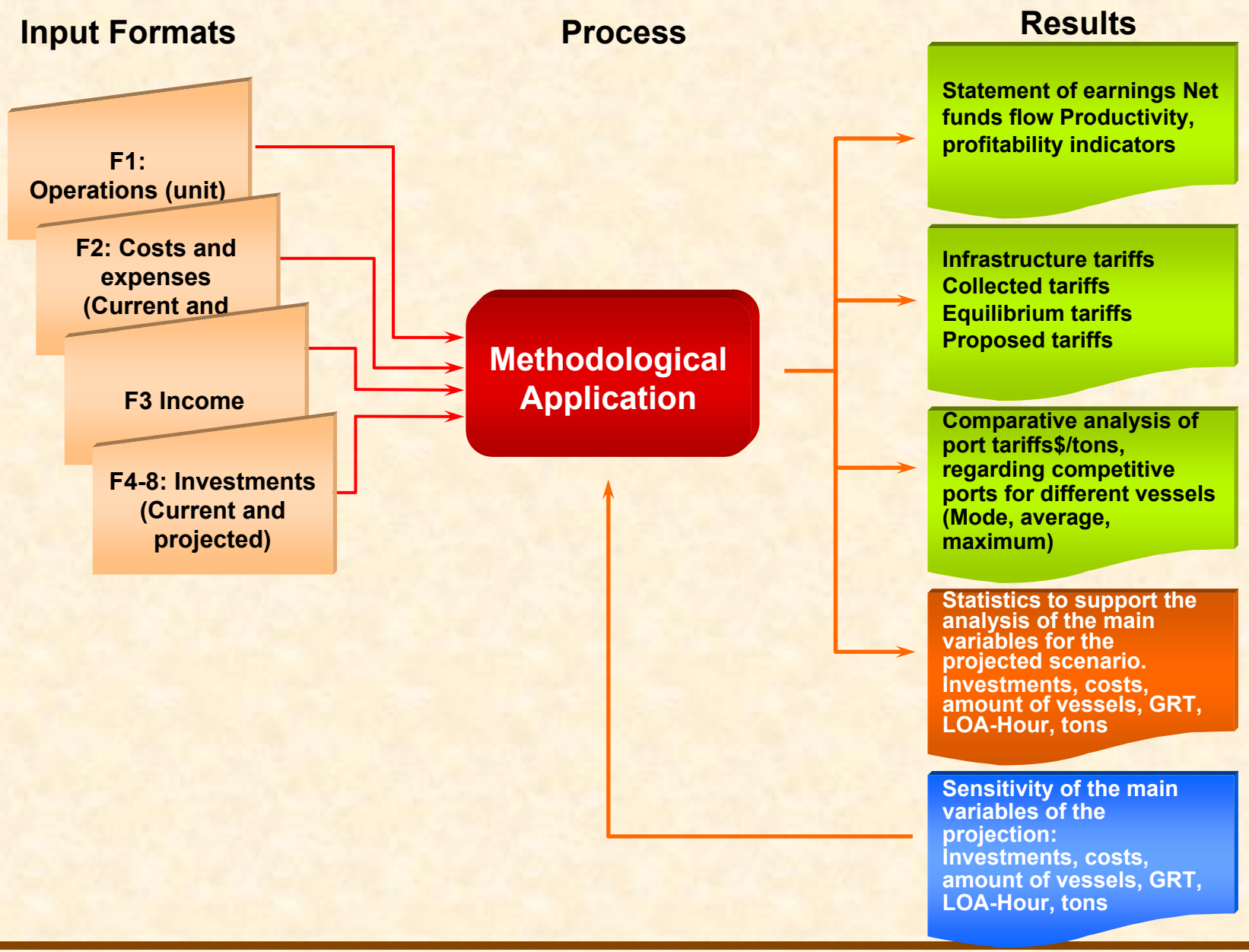
3 *Future Investments*

It is assumed the capital recovery and its income that corresponds to the assessment period of these investments.

4 *Allocation of Expenses and Investments*

It is considered that the costs and investments that each tariff recovers are payed by the beneficiaries, the vessel or the cargo.

Structure of the Model

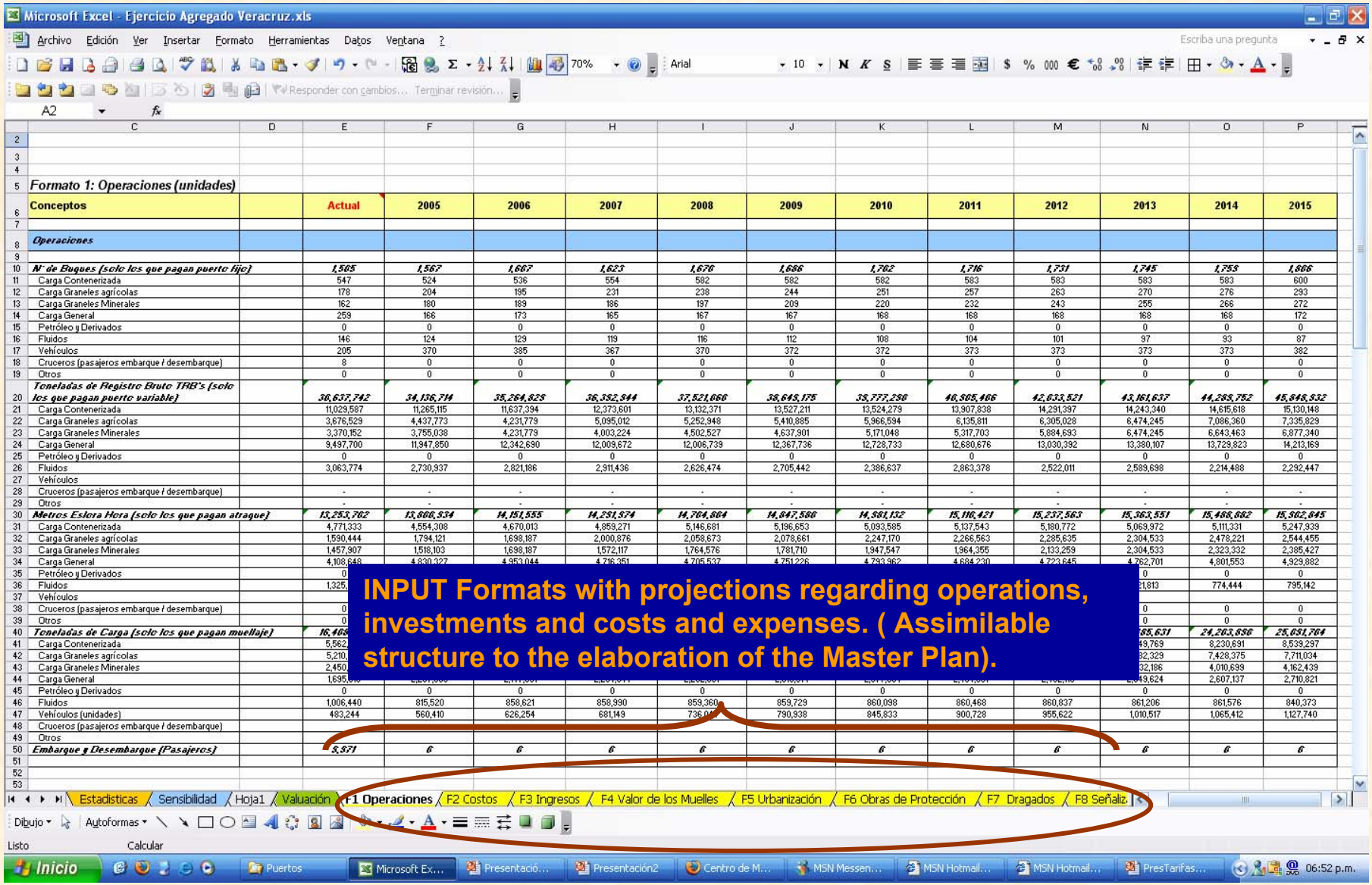


Tariffs determined by the Model

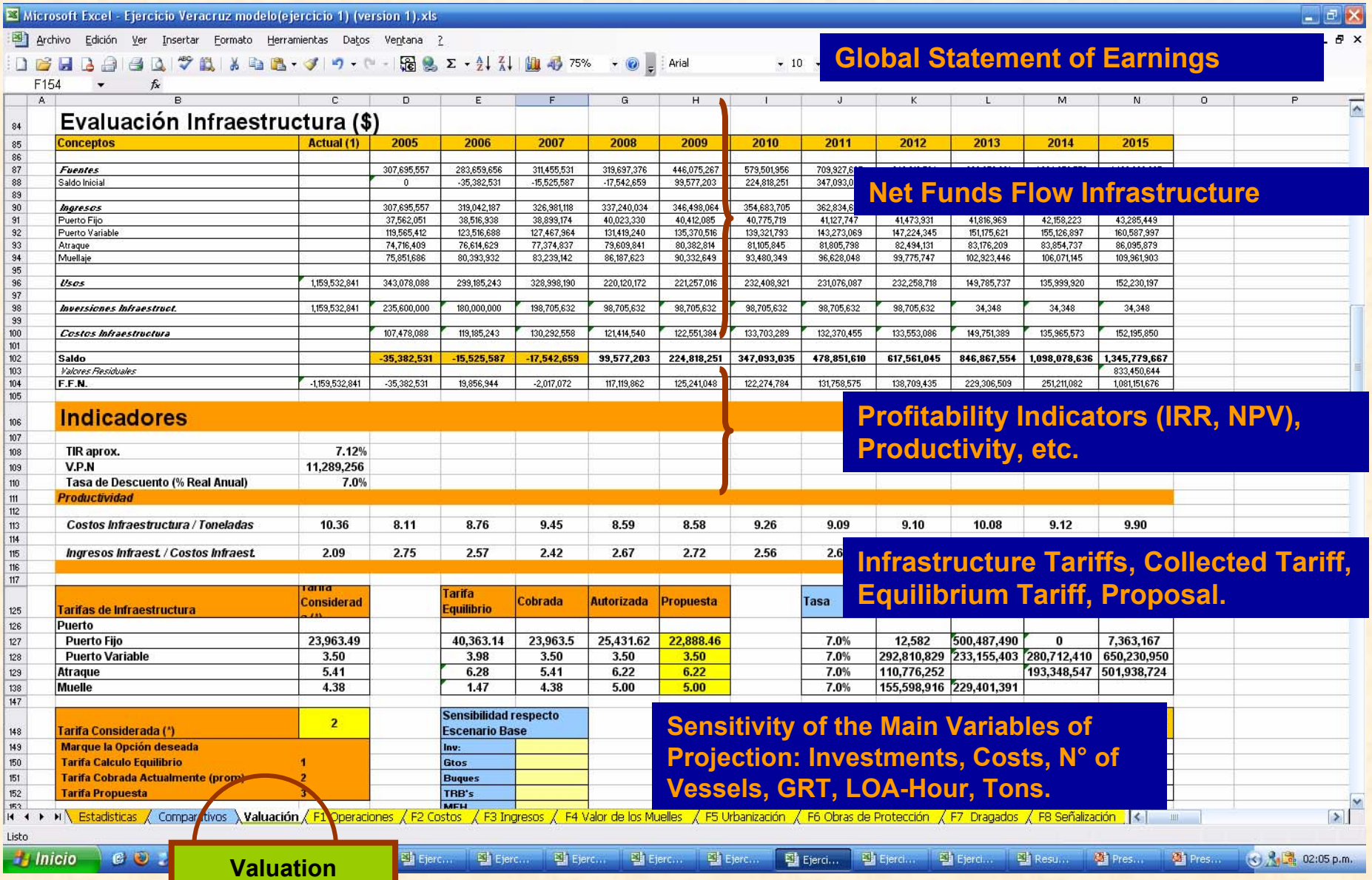
Port
Fixed Collection and Variable Collection
• Container Cargo
• General Cargo
• Agricultural bulk cargo
• Mineral bulk cargo
• Vehicles
• Fluids
• Oil and by-products
• Cruises
• Others

Dockage
• Specialized
• Non specialized
• Cruises
• Others
Wharfage
• Container Cargo
• Agricultural Bulk Cargo
• Mineral Bulk Cargo
• General Cargo
• Oil and by-products
• Fluids
• Vehicles
• Others
• Cruises Loading / Unloading

Structure of the Model …



Structure of the Model …



Global Statement of Earnings

Net Funds Flow Infrastructure

Profitability Indicators (IRR, NPV), Productivity, etc.

Infrastructure Tariffs, Collected Tariff, Equilibrium Tariff, Proposal.

Sensitivity of the Main Variables of Projection: Investments, Costs, N° of Vessels, GRT, LOA-Hour, Tons.

Valuation

Structure of the Model …

Comparative Analysis of Port Tariffs, Costs per Tons, regarding the Competitive Ports for Different Vessels (Mode, Average, Maximum)

Microsoft Excel - Ejercicio Agregado Veracruz modelo(ejercicio 1).xls

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Arial 10

A5

Buque Tipo (moda)

Tipo de Carga	Contenedores	Tarifas Infraestructura
Buque	TMM Colima	TARIFAS
Fijo		23,963.49
Arqueo Bruto	40,146.00	3.5
Eslora (mts)	244.00	
Horas estadía en muelle	14.53	5.41
Toneladas carga/descarga	9,586.93	4.38

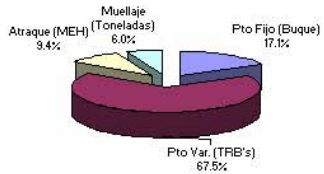
Costos Comparativos

Conceptos	Veracruz Tarifa Equilibrio	Veracruz Tarifa Pública da	Veracruz Tarifa Cobrada	Brownsville	Houston	Galveston
Pto Fijo (Buque)	40,363.1	22,431.6	23,963.5	861.68	5,066.65	
Pto Var. (TRB's)	159,604.4	140,511.0	140,613.2	46,123.74		
Atraque (MEH)	22,246.6	22,046.3	19,189.0		92,257.13	341.48
Muellaje (Toneladas)	14,134.1	47,934.7	42,013.8	150,897.61	307,302.43	275,360.60
Costo Buque	236,348.3	232,923.6	225,779.5	197,883.02	404,626.20	275,702.07
Costo Tonelada	**24.7**	**24.3**	**23.6**	**20.6**	**42.2**	**28.8**

Nota: Tarifa Calculada debería ser menor que la tarifa que permite el mercado o suceptible de cobrar en condición competitiva

Participac

Infraestructura



Buque Promedio

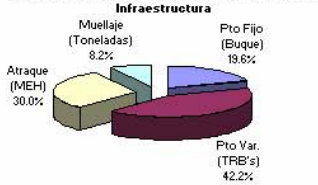
Tipo de Carga	Contenedores	Tarifas Infraestructura
Buque	Prom.	TARIFAS
Fijo		23,963.49
Arqueo Bruto	21,803.25	3.50
Eslora (mts)	164.91	
Horas estadía en muelle	59.56	5.41
Toneladas carga/descarga	11,361.70	4.38

Costos Comparativos (Buque Promedio)

Conceptos	Veracruz Tarifa Equilibrio	Veracruz Tarifa Pública da	Veracruz Tarifa Cobrada	Brownsville	Houston	Galveston
Pto Fijo (Buque)	40,363.1	22,431.6	23,963.5	861.68	5,066.65	
Pto Var. (TRB's)	86,681.0	76,311.4	76,366.9	62,162.74		
Atraque (MEH)	61,645.0	61,090.1	53,172.6		29,347.85	341.48
Muellaje (Toneladas)	16,750.7	56,808.5	49,791.5	178,832.32	364,191.37	326,336.35
Costo Buque	205,439.9	216,641.6	203,294.5	241,856.74	398,605.87	326,677.83
Costo Tonelada	**18.1**	**19.1**	**17.9**	**21.3**	**35.1**	**28.8**

Nota: Tarifa Calculada debería ser menor que la tarifa que permite el mercado o suceptible de cobrar en condición competitiva

Participación Porcentual Cobros en Tarifas de Infraestructura



Buque Tipo (Max. Carga Contenerizada)

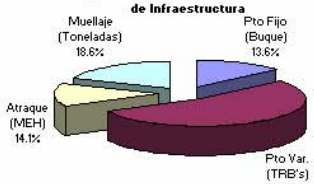
Tipo de Carga	Contenedores	Tarifas Infraestructura
Buque	TMM Yucatan	TARIFAS
Fijo		23,963.49
Arqueo Bruto	40,146.00	3.5
Eslora (mts)	244.00	
Horas estadía en muelle	27.42	5.41
Toneladas carga/descarga	37,431.00	4.38

Costos Comparativos

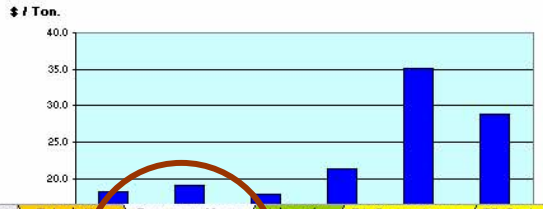
Conceptos	Veracruz Tarifa Equilibrio	Veracruz Tarifa Pública da	Veracruz Tarifa Cobrada	Brownsville	Houston	Galveston
Pto Fijo (Buque)	40,363.1	22,431.6	23,963.5	861.68	5,066.65	
Pto Var. (TRB's)	159,604.4	140,511.0	140,613.2	52,692.59		
Atraque (MEH)	41,989.8	41,611.8	36,218.8		92,257.13	341.48
Muellaje (Toneladas)	55,185.0	187,155.0	164,037.6	589,161.32	1,199,824.88	1,075,111.90
Costo Buque	297,142.4	391,709.4	364,833.1	642,715.59	1,297,148.66	1,075,453.38
Costo Tonelada	**7.9**	**10.5**	**9.7**	**17.2**	**34.7**	**28.7**

Nota: Tarifa Calculada debería ser menor que la tarifa que permite el mercado o suceptible de cobrar en condición competitiva

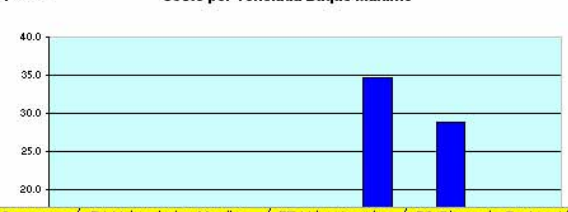
Participación Porcentual Cobros en Tarifas de Infraestructura



Costo por Tonelada Buque Promedio



Costo por Tonelada Buque Máximo



Estadísticas | Comparativos | Valuación | F1 Operaciones | F2 Costos | F3 Ingresos | F4 Valor de los Muelles | F5 Urbanización | F6 Obras de Protección | F7 Dragados | F8 Señalización

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Comparatives

Structure of the Model …

Microsoft Excel - Ejercicio Veracruz modelo(ejercicio 1) (version 1).xls

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D28 =+'F1 Operaciones'!E40

INFORMACIÓN ESTADISTICA RESUMIDA DE LAS PROYECCIONES (Esta hoja se calcula automáticamente)

Inversiones

Millones de Pesos

Conceptos	Actual	Total Proyectado	2005	2006	2007	2008	2009	2010	2011	201
Totales	1,653	1,108	236	180	199	99	99	99	99	99
Muelles	956	339	59	180	100	0	0	0	0	0
Urbanización	507	592	0	0	99	99	99	99	99	99
Obras de Protección	0	0	0	0	0	0	0	0	0	0
Dragados	176	176	176	0	0	0	0	0	0	0
Señalización	14	0	0	0	0	0	0	0	0	0
Otras Inversiones										
VP (Inversiones ($)/ Toneladas (N°))	81,234.77	107,243.04								
MEH / MEH Max	28.2%	27.6%	27.9%	27.3%	26.1%	26.8%	27.1%	27.3%	27.6%	27.8

Operaciones

Unidades

Conceptos	Actual	Total Proyectado	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Buques (N°)	1,505	18,614	1,567	1,607	1,623	1,670	1,686	1,702	1,716	1,731	1,745	1,759	1,806
TRB's	30,637,742	437,981,260	34,136,714	35,264,829	36,392,944	37,521,060	38,649,175	39,777,290	40,905,406	42,033,521	43,161,637	44,289,752	45,848,932
MEH	13,253,702	163,881,241	13,800,934	14,151,555	14,291,974	14,704,804	14,847,580	14,981,132	15,110,421	15,237,563	15,363,551	15,488,882	15,902,845
Toneladas	16,408,595	233,854,847	17,308,249	18,344,724	18,993,959	19,666,759	20,612,594	21,330,853	22,049,112	22,767,371	23,485,631	24,203,890	25,091,704
Crecimientos Anuales													
Crecimiento N° Buques		1.7%	4.1%	2.5%	1.0%	2.9%	1.0%	0.9%	0.9%	0.8%	0.8%	0.8%	2.7%
Crecimiento TRB's		3.8%	11.4%	3.3%	3.2%	3.1%	3.0%	2.9%	2.8%	2.8%	2.7%	2.6%	3.5%
Crecimiento MEH		1.7%	4.1%	2.5%	1.0%	2.9%	1.0%	0.9%	0.9%	0.8%	0.8%	0.8%	2.7%
Crecimiento Toneladas		3.9%	5.5%	6.0%	3.5%	3.5%	4.8%	3.5%	3.4%	3.3%	3.2%	3.1%	3.7%
TRB's / Buques	20,353	23,530	21,778	21,940	22,420	22,465	22,918	23,377	23,834	24,287	24,734	25,175	25,383
Toneladas / MEH	1.24	1.43	1.25	1.30	1.33	1.34	1.39	1.42	1.46	1.49	1.53	1.56	1.58

Costos y Gastos por Infraestructura

Millones de Pesos

Conceptos	Actual	Total Proyectado	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Totales	222.0	2,089.0	174.7	190.8	202.8	194.9	196.9	209.0	208.6	210.7	227.9	215.1	232.3
Administración	164.0	1,416	125.6	133.8	135.5	137.2	138.9	140.6	142.4	144.2	146.0	147.8	149.6
Mantenimiento de Obras de Atraque y Muelle	6.4	83	7.0	7.0	7.0	7.0	7.0	7.0	9.5	9.5	9.5	9.5	9.5
Mantenimiento Señalamiento Marítimo	4.0	25	1.2	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0
Mantenimiento Área de Urbanización	15.0	280	23.0	26.0	26.0	26.0	26.0	26.0	30.0	30.0	30.0	30.0	30.0
Mantenimiento Obras de Protección	2.7	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dragado de Mantenimiento	9.7	50	0.0	0.0	10.0	0.0	0.0	10.0	0.0	0.0	15.0	0.0	15.0
Prima de seguros señalización marítima	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prima de seguros de obras de protección	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prima de seguros de áreas urbanizadas	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prima de seguros de obras de atraque	20.3	235	18.0	22.0	22.3	22.7	23.0	23.3	23.7	24.1	24.4	24.8	25.2
% Crecimiento Anual			-91.6%	-90.9%	16.1%	2.1%	-2.9%	7.3%	5.9%	0.8%	9.3%	2.1%	1.9%
Costos Infraestructura / Toneladas	13.5	8.9	10.1	10.4	10.7	9.9	9.6	9.8	9.5	9.3	9.7	8.9	9.3
Gastos Adm. / Toneldas	10.0	6.1	7.3	7.3	7.1	7.0	6.7	6.6	6.5	6.3	6.2	6.1	6.0
Gastos Mantenimiento / Toneladas	1.7	1.7	1.8	1.9	1.8	1.8	1.7	1.6	1.9	1.9	1.8	1.8	1.7
Primas de Seguros / Toneldas	1.2	1.0	1.0	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0

Estadisticas | Comparativos | Valuación | F1 Operaciones | F2 Costos | F3 Ingresos | F4 Valor de los Muelles | F5 Urbanización | F6 Obras de Protección | F7 Dragados | F8 Señalización

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Statistics that Support the Analysis of the Main Variables of the Projected Scenario: Investments, Costs, N° of Vessels, GRT, LOA-Hour, Tons.

Projection Statistics

Sensitivity

The tariff model includes the sensitivity analysis to the planning scenario, assuming variations in its basic variables, reflecting the impacts in the profitability, equilibrium tariffs, tariffs in force and tariff proposal.

Sensitivity variables to determine the Equilibrium Tariff:

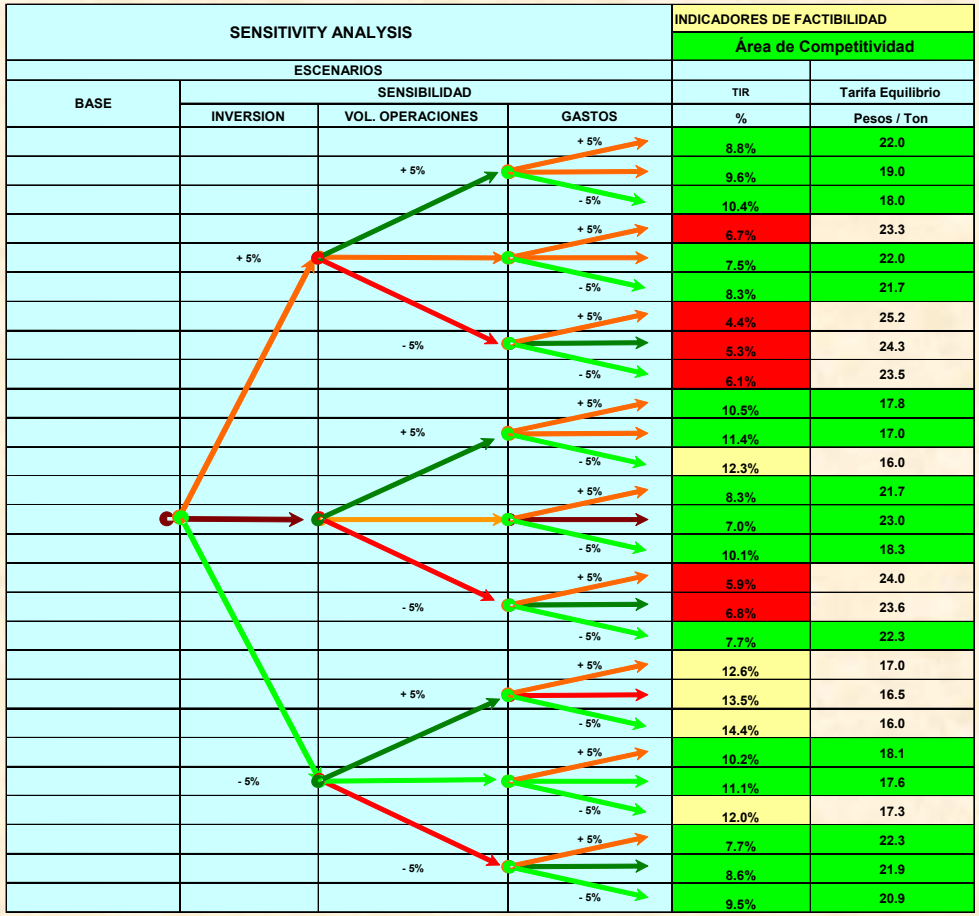
- **Volume of Port Operations**
- **Investments**
- **Operative and Management Costs**

Factors that determine the Competitiveness of the Port Tariffs (1):

- **Market Tariff susceptible of collection Equilibrium Tariff**

Competitiviness Condition of the Tariffs

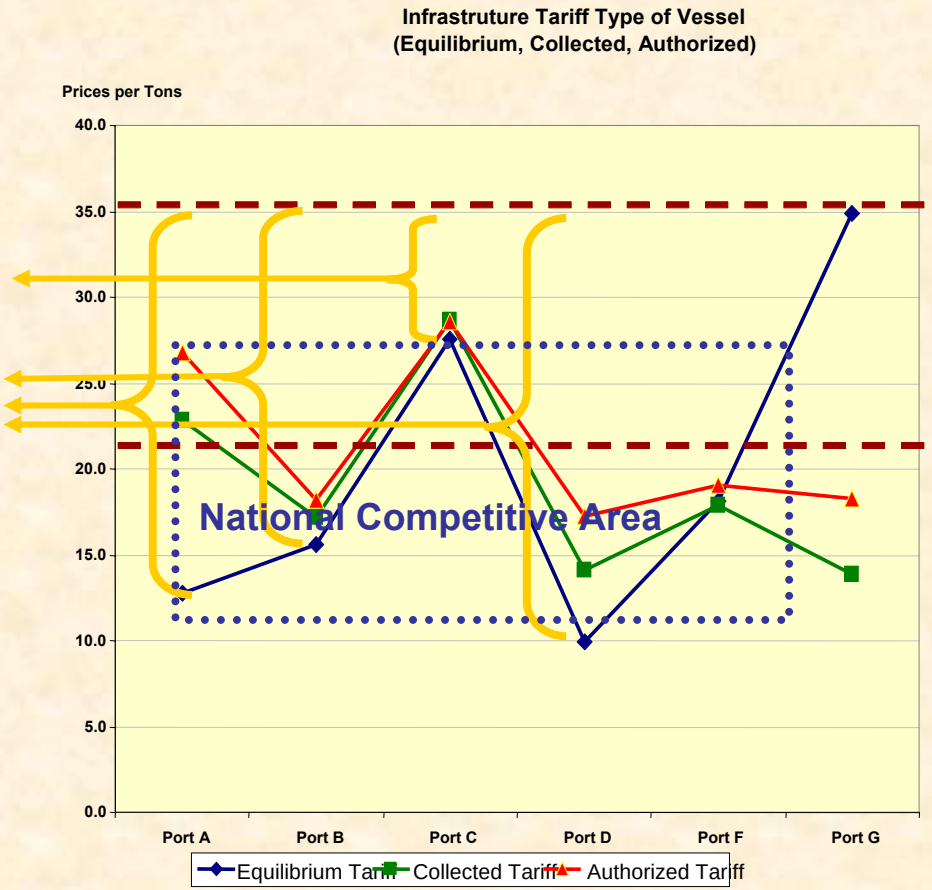
Market Tariff susceptible of collection **>** **Equilibrium Tariff**



Sensitivity and Competitiveness Analysis

The competitiveness of the port tariffs, besides other factors, is given by the capacity to compete with regard to the prices of the competitive ports. This capacity could be measured considering the relationship between the equilibrium tariff of the ports and the levels of competitive prices in the referential market or the hinterland.

Competitiveness



International Competitive Área

Instrumentation of the Model

1 Personnel Training of API

- **Financial Basic Principles of the Model**
- **Analysis of the source information and congruence with the port planning**
- **Structure of the model**
- **Incorporation of the information**
- **Calibration of the model and the final results**

2 Port Planning

- Master Program of Development
- Annual Operative Program

3 Determination of Basic Figures for the Model

- Arrivals (GRT, ton.)
- Investments
- Costs and Expenses
- Value of the Infrastructure

Master Appraisals

4 Incorporation of Information to the Model

5 Port Behavior

- Equilibrium Tariff
- Current Tariff Collected
- Tariff with Market Profitability
- Compared to Competitive Ports
- Analysis Vessel per Vessel

6 Determination of the Tariff Proposal by Port Administartion

7 Analysis of the Tariff Proposal
(Port Administration and Central Authority)

8 Authorization of the Tariff Proposal by the Board of Directors

9 Auth/Registry of the Tariff Proposal by Central Authority

10 Determination of tariffs that will be collected approved by the Board of Directors

- The Model allows to calibrate the tariffs according to the commercial conditions and allows to achieve the required profitability.

- Some ports, as a consequence of the past investments and the perspectives of future movements of cargos, present little profitability and shall be treated as exceptions.

- The abovementioned is achieved with the design and the fundament of a feasible panorama, which considers the value of the port infrastructure that can be recovered by the tariffs determined by the model.

- The tariff model, besides allowing the estimation of a tariff range, constitutes an element that establishes in a formal and structured way an indissoluble relationship among the Port Planning, the Management of Businesses in the Port and the Tariff.

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FELIPE OCHOA Y ASOCIADOS, S.C., has rendered administrative, technical and financial consulting services since 1973. For 32 years, the company has carried out more than 1,000 studies for a selected group of continuous clients of the Federal Government, Institutions and Private Companies, we have focused on different areas of planning at a local, regional and sector level.

FOA constitutes a group of professional Mexican advisors that renders consulting services to private and public entities with the aim of assessing and improving their operations, likewise, it plans and implements its new developments or expansion projects. Multidisciplinary teams of FOA advisors have continuous meetings to develop each project, by doing so, the relevant factors of the studies are included in the analysis, as well as the recommended solutions.

The Company's experience in Port Development includes its participation in the design of structuring schemes for Integral Port Management of Mexican Ports and the elaboration of the corresponding documents, these documents included the Master Programs of Development and Business Plans for different ports (Salina Cruz, Coatzacoalcos, Lázaro Cárdenas, Puerto Madero, Dos Bocas, Frontera, Puertos de Campeche); as well as the participation in the bidding for specialized terminals (Lázaro Cárdenas, Veracruz, Altamira and Manzanillo). Development of the studies for the Corridor Med-Mex to strenghten the relationship between Mexican ports and the Valencia Port in Spain.
Recently, the study for a New Productivity-Based Tariff Scheme was carried out, as well as the Training and Implementation of the Model in the 15 Federal APIs of the Mexican Government.

Mr. Reyes Juárez Del Angel

Mr. Juarez studied Engineering in the Autonomous University of T*amaulipas*, his Master's degree in Investigation on Operations in the National Autonomus University of Mexico, and his PhD in Investigation on Operations in the same University, he graduated with honors. Mr. Juárez has participated in the planning of the Mexican Transport Sector, he has 25 years of experience in the consulting area. As a partner and General Director of FELIPE OCHOA Y ASOCIADOS, and before as Technical Director, he has directed more than 500 studies and projects regarding strategic planning of transport, transport modelling, demand studies, economic, financial and enviroment impact evaluation. He has participated in the privatization processes of the most important Mexican communication and transport sectors, such *as Teléfonos de México* (1991), *APIs* and Port Terminals (1994-1996), Railroads (1997-1998), Airports (1998-1999) and in more than 50 urban road and toll highways processes and their technical, economic, financial and financing structural evaluation (1991-2003). He coordinated the Work Team of *FOA Consultores* for the structuring of the suburban train concession process of the Metropolitan Area of Mexico City (1998-2000) and in the option assessment to select the new Mexico City International Airport (2000). He has wide experience in evaluating projects, processes to attract capital and methodologies to assess external factors in the transport area paying special attention to the user.

Mr. Rafael Gómez Lara

Mr. Gómez is an Industrial Engineer, he studied his degree in the *Tecnológico de Veracruz* and his Master's degree in Engineering in the National Autonomus University of Mexico. Mr. Gómez has 25 years of professional experience, mainly focused on project development regarding transport areas, logistic of Intermodal Terminals, organizational reengineering projects and studies in the maritime-port activities. Recently, he participated in the Determination of a New Productivity-based Tariff Scheme, as well as the Training and Implementation of said model in the APIs of Lázaro Cárdenas, Manzanillo, Mazatlán, Topolobampo, Guaymas, Progreso, Dos Bocas, Coatzacoalcos, Veracruz, Tuxpan, Tampico, Altamira, Ensenada, Salina Cruz and Puerto Chiapas. The model allows to determine profitable port tariffs according to the commercial conditions.