South America Inland Waterways Classification

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WG 201 – Development for Inland Waterway Classification for South America.

Rosario, Argentina, 30th April 2019

PIANC – ECLAC – 1st Report – Dec 2018

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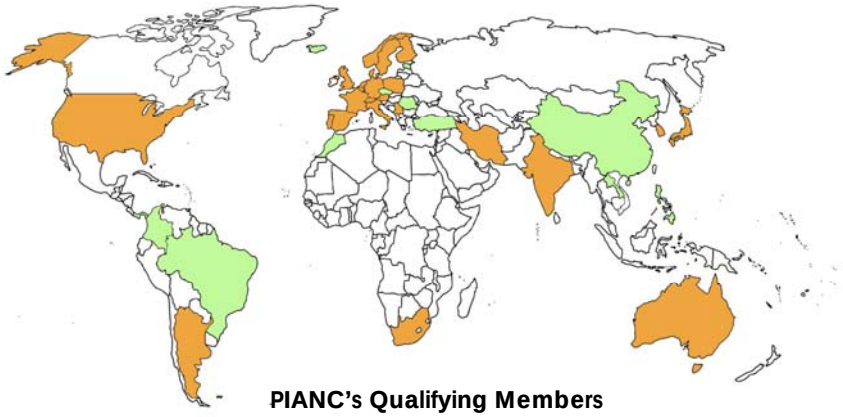
The World Association for Waterborne Transport Infrastructure



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- High-quality *Technical Reports*
- International *Commissions and Working Groups*

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- *Two-yearly Smart Rivers Conferences bringing experts together on inland waterway infrastructure.*

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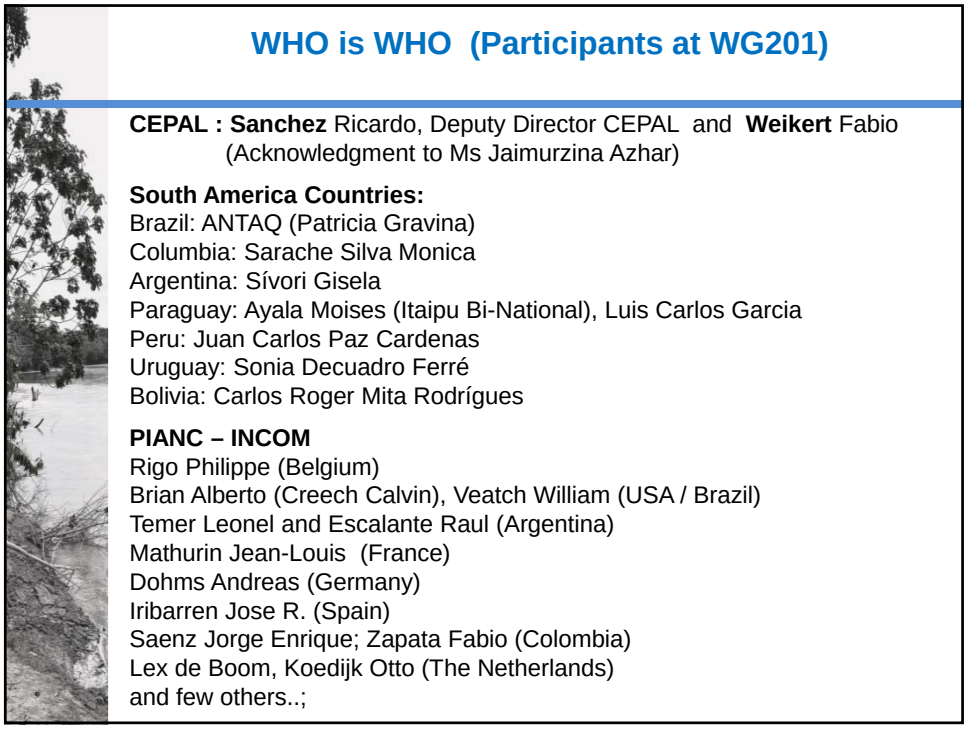
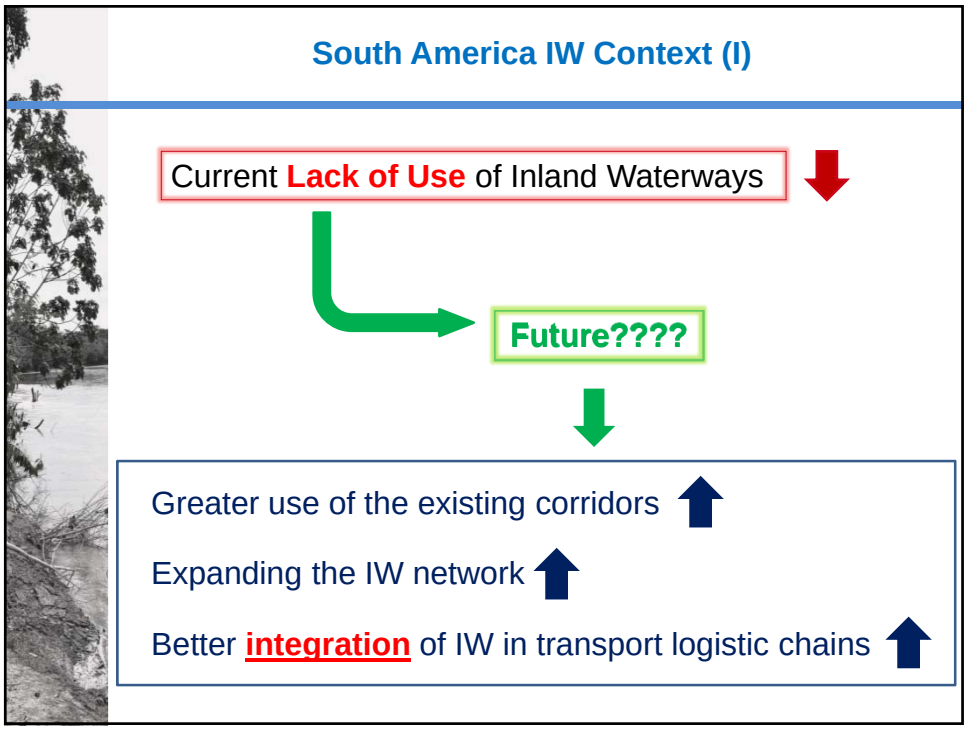


WHO is WHO (Participants at WG201)

CEPAL : Sanchez Ricardo, Deputy Director CEPAL and **Weikert** Fabio
(Acknowledgment to Ms Jaimurzina Azhar)

South America Countries:
Brazil: ANTAQ (Patricia Gravina)
Columbia: Sarache Silva Monica
Argentina: Sívori Gisela
Paraguay: Ayala Moises (Itaipu Bi-National), Luis Carlos Garcia
Peru: Juan Carlos Paz Cardenas
Uruguay: Sonia Decuadro Ferré
Bolivia: Carlos Roger Mita Rodrígues

PIANC – INCOM
Rigo Philippe (Belgium)
Brian Alberto (Creech Calvin), Veatch William (USA / Brazil)
Temer Leonel and Escalante Raul (Argentina)
Mathurin Jean-Louis (France)
Dohms Andreas (Germany)
Iribarren Jose R. (Spain)
Saenz Jorge Enrique; Zapata Fabio (Colombia)
Lex de Boom, Koedijk Otto (The Netherlands)
and few others..;



South America IW Context (I)

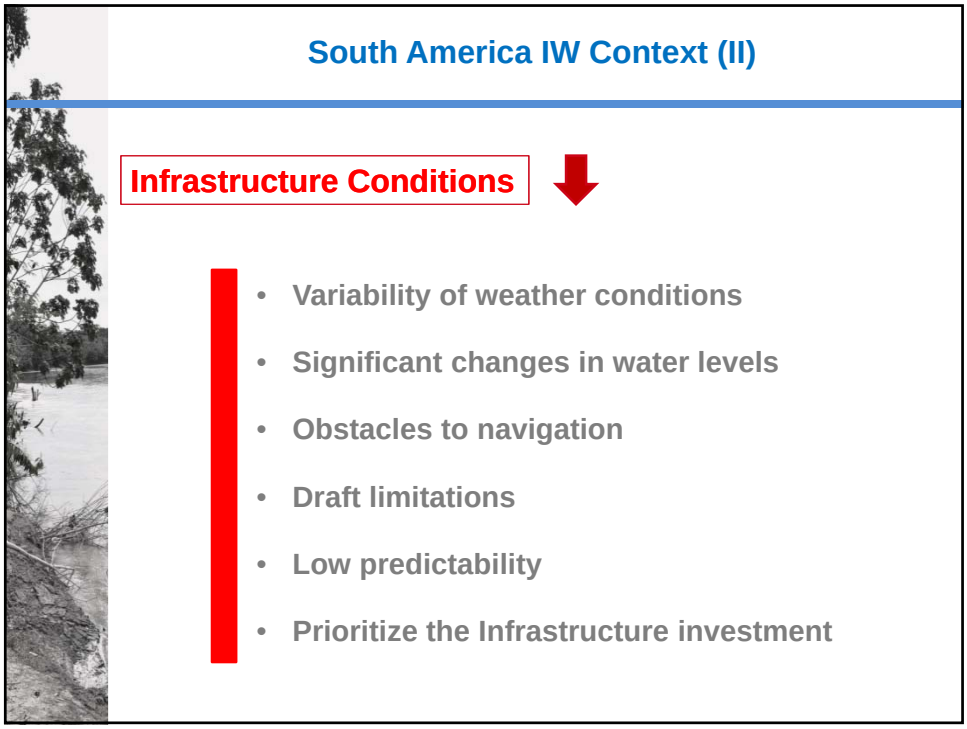
Current **Lack of Use** of Inland Waterways

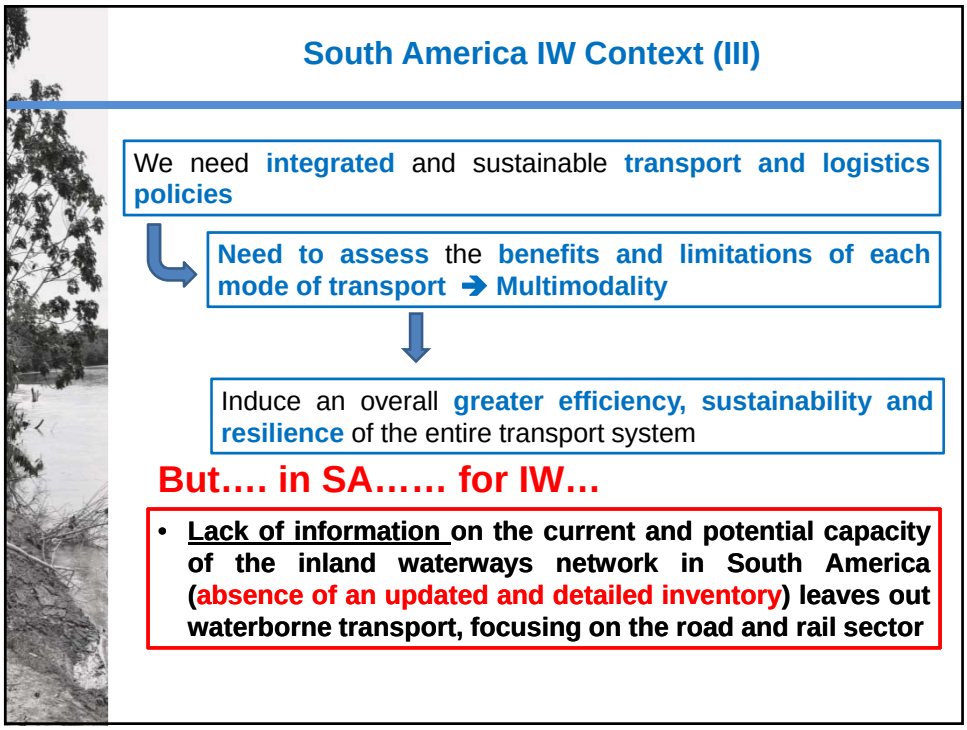
Future????

Greater use of the existing corridors

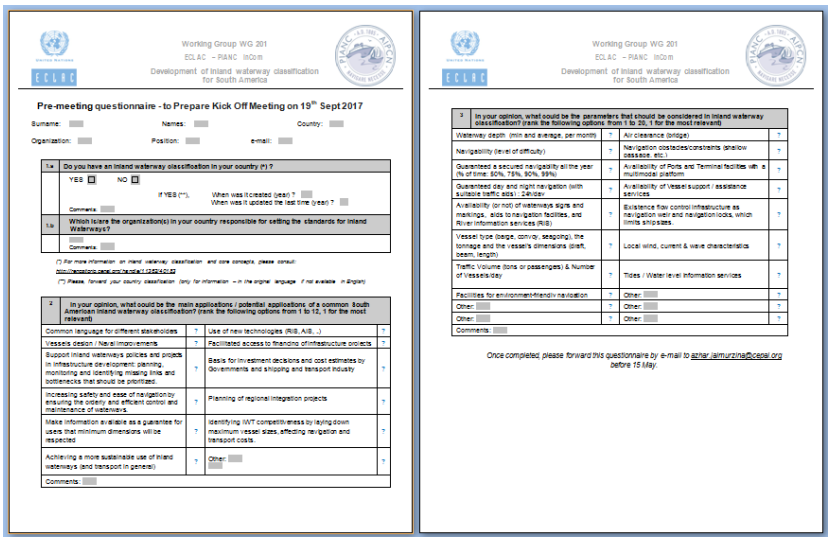
Expanding the IW network

Better **integration** of IW in transport logistic chains


South America IW Context (II)
Infrastructure Conditions
Variability of weather conditions
Significant changes in water levels
Obstacles to navigation
Draft limitations
Low predictability
Prioritize the Infrastructure investment


South America IW Context (III)
We need integrated and sustainable transport and logistics policies
Need to assess the benefits and limitations of each mode of transport ➔ Multimodality
Induce an overall greater efficiency, sustainability and resilience of the entire transport system
But…. in SA…… for IW…
Lack of information on the current and potential capacity of the inland waterways network in South America (absence of an updated and detailed inventory) leaves out waterborne transport, focusing on the road and rail sector

Preliminary Survey



Working Group WG 201
ECLAC – PIANC InCom
Development of inland waterway classification for South America

Pre-meeting questionnaire - to Prepare Kick Off Meeting on 19th Sept 2017

Surname: Names: Country:
Organization: Position: e-mail:

1.a	Do you have an inland waterway classification in your country (*) ?	
	YES ☐ NO ☐	If YES (**), When was it created (year) ? When was it updated the last time (year) ?
	Comments:	
1.b	Which is/are the organization(s) in your country responsible for setting the standards for Inland Waterways?	
	Comments:	

(*) For more information on inland waterway classification and core concepts, please consult: http://repositorio.cepal.org/handle/11362/42143

(**) Please, forward your country classification (only for information – in the original language if not available in English)

2	In your opinion, what could be the main applications / potential applications of a common South American inland waterway classification? (rank the following options from 1 to 12, 1 for the most relevant)			
Common language for different stakeholders		?	Use of new technologies (RIS, AIS, ...)	?
Vessels design / Naval improvements		?	Facilitated access to financing of infrastructure projects	?
Support inland waterways policies and projects in infrastructure development, planning, monitoring and identifying missing links and bottlenecks that should be prioritized.		?	Basis for investment decisions and cost estimates by Governments and shipping and transport industry	?
Increasing safety and ease of navigation by ensuring the orderly and efficient control and maintenance of waterways.		?	Planning of regional integration projects	?
Make information available as a guarantee for users that minimum dimensions will be respected		?	Identifying IWT competitiveness by laying down maximum vessel sizes, affecting navigation and transport costs.	?
Achieving a more sustainable use of inland waterways (and transport in general)		?	Other:	?
Comments:				

Working Group WG 201
ECLAC – PIANC InCom
Development of inland waterway classification for South America

3	In your opinion, what could be the parameters that should be considered in inland waterway classification? (rank the following options from 1 to 20, 1 for the most relevant)			
Waterway depth (min and average, per month)		?	Air clearance (bridge)	?
Navigability (level of difficulty)		?	Navigation costacles/constraints (shallow passage, etc.)	?
Guaranteed & secured navigability all the year (% of time: 80%, 75%, 90%, 99%)		?	Availability of Ports and Terminal facilities with a multimodal platform	?
Guaranteed day and night navigation (with suitable traffic aids) : 24h/day		?	Availability of Vessel support / assistance services	?
Availability (or not) of waterways signs and markings, aids to navigation facilities, and River information services (RIS)		?	Existence flow control infrastructure as navigation weir and navigation locks, which limits ship sizes.	?
Vessel type (barge, convoy, seagoing), the tonnage and the vessel's dimensions (draft, beam, length)		?	Local wind, current & wave characteristics	?
Traffic Volume (tons or passengers) & Number of Vessels/day		?	Tides / Water level information services	?
Facilities for environment-friendly navigation		?	Other:	?
Other:		?	Other:	?
Other:		?	Other:	?
Comments:				

Once completed, please forward this questionnaire by e-mail to ignacio.lalmurzina@cepal.org before 15 May.

Preliminary Survey - The Questions

Questions were:

1) Do you have an **IW classification in your country**?

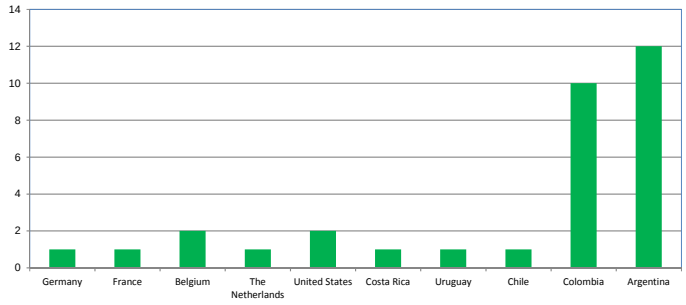
2) Which is the **organization in your country** responsible for setting the standards for Inland Waterways?

3) What are the **main applications / potential applications** of a common South American **IW classification**?

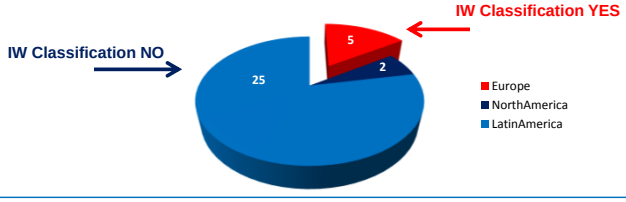
4) What are the **parameters that should be considered** in an IW classification?

Survey Results

Answers (32) - Countries (10)



Answers (32) - Regions (3)



Results *2) What are the main applications / potential applications of a common South American IW classification?)*

	Average	σ	σ / Aver
Support inland waterways policies and projects in Infrastructure development: planning, monitoring and identifying missing links and bottlenecks that should be prioritized	78	25	32%
Increasing safety and ease of navigation by ensuring the orderly and efficient control and maintenance of waterways	71	30	42%
Planning of regional integration projects	71	23	32%
Achieving a more sustainable use of inland waterways (and transport in general)	63	29	46%
Basis for investment decisions and cost estimates by Governments and shipping and transport industry	59	22	37%
Use of new technologies (RIS, AIS, ..)	56	32	56%
Vessels design / Naval improvements	54	28	53%
Make information available as a guarantee for users that minimum dimensions will be respected	52	29	55%
Identifying IWT competitiveness by laying down maximum vessel sizes, affecting navigation and transport costs.	45	26	57%
Common language for different stakeholders	41	33	81%
Facilitated access to financing of infrastructure projects	40	26	65%

100: max rate (first position in preferences)

10: min rate (last position in preferences)

Results *3) What are the parameters that should be considered in inland waterway classification?*

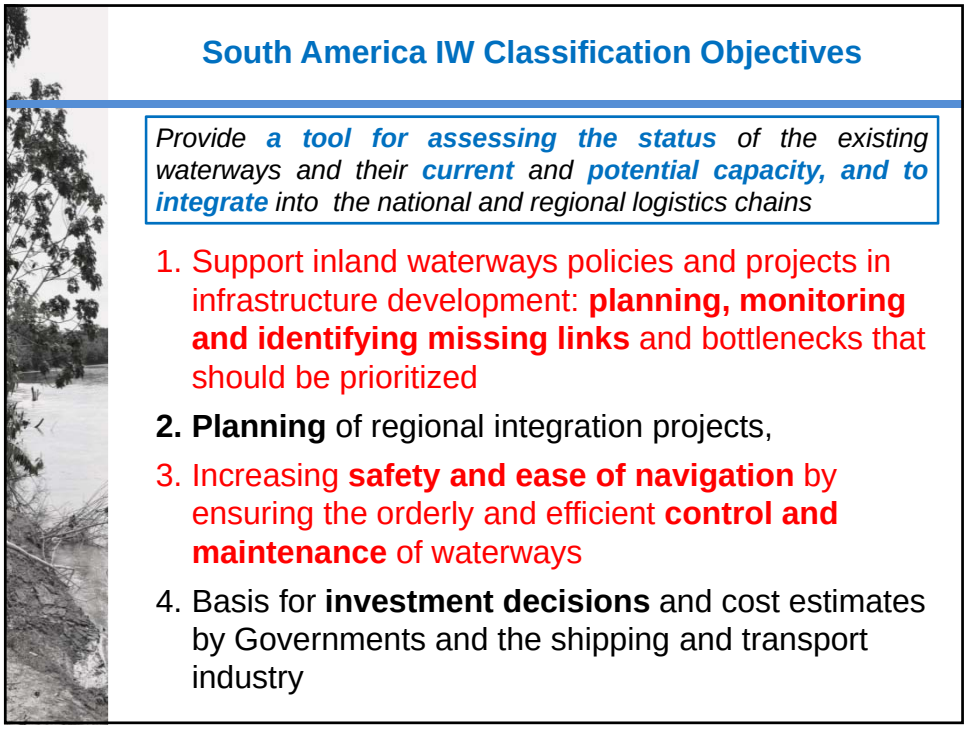
	Average	Σ	σ / Aver
Waterway depth (min and average, per month)	89	21	24%
Navigability (level of difficulty)	75	25	34%
Vessel type (barge, convoy, seagoing), the tonnage and the vessel's dimensions (draft, beam, length)	72	27	37%
Guaranteed a secured navigability all the year (% of time: 50%, 75%, 90%, 99%)	72	29	40%
Navigation obstacles/constraints (shallow passage, etc.)	66	25	37%
Guaranteed day and night navigation (with suitable traffic aids) : 24h/day	62	30	48%
Availability (or not) of waterways signs and markings, aids to navigation facilities, and River information services (RIS)	60	27	45%
Availability of Ports and Terminal facilities with a multimodal platform	56	25	44%
Tides / Water level information services	55	29	53%
Existence flow control infrastructure as navigation weir and navigation locks, which limits ship sizes.	54	27	50%
Air clearance (bridge)	53	26	50%
Traffic Volume (tons or passengers) & Number of Vessels/day	51	33	65%
Facilities for environment-friendly navigation	46	31	68%
Local wind, current & wave characteristics	45	28	63%
Availability of Vessel support / assistance services	41	28	70%

100: max rate (first position in preferences)

10: min rate (last position in preferences)

IW Classification Parameters

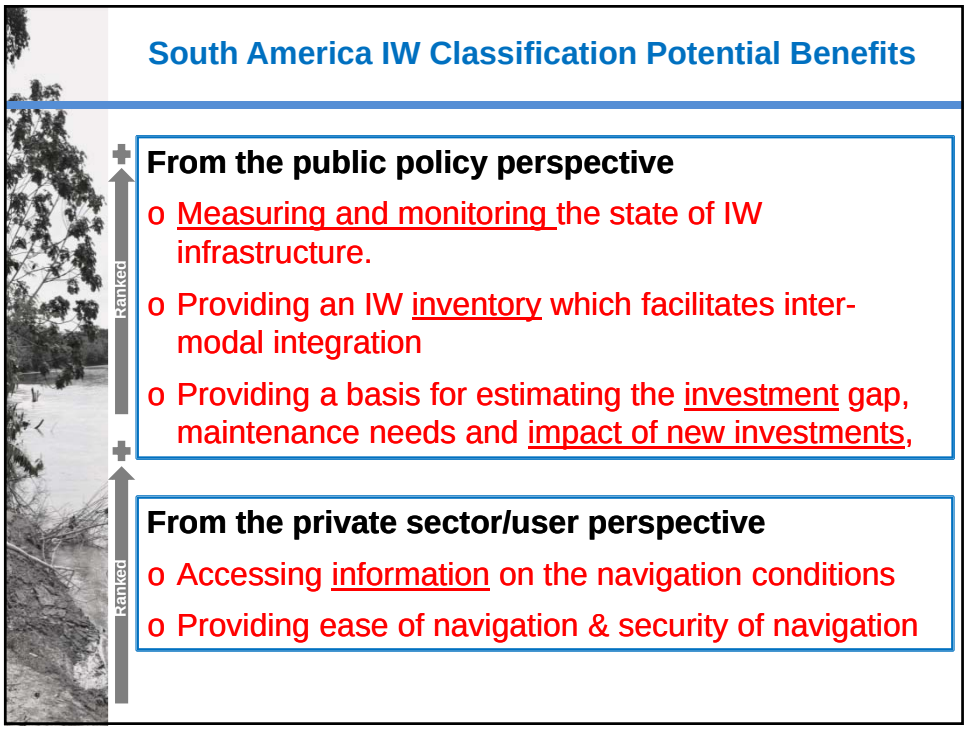
1. Waterway depth (min and average, per month)
2. Navigability (level of difficulty)
3. Guaranteed a secured navigability all the year (% of time: 50%, 75%, 90%, 99%)
4. Vessel type (barge, convoy, seagoing), the tonnage and the vessel's dimensions (draft, beam, length)
5. Navigation obstacles/constraints (shallow passage, etc.)
6. Availability (or not) of waterways signs and markings, aids to navigation facilities, and River information services (RIS)
7. Guaranteed day and night navigation (with suitable traffic aids) : 24h/day
8. Tides / Water level information services
9. Air clearance (bridge)
10. Availability of Ports and Terminal facilities with a multimodal platform
11. Existence of flow control infrastructure as navigation weir and navigation locks, which limits ship sizes.
12. Local wind, current & wave characteristics
13. Facilities for environment-friendly navigation
14. Traffic Volume (tons or passengers) & Number of Vessels/day
15. Availability of Vessel support / assistance services



South America IW Classification Objectives

*Provide **a tool for assessing the status** of the existing waterways and their **current** and **potential capacity, and to integrate** into the national and regional logistics chains*

1. Support inland waterways policies and projects in infrastructure development: **planning, monitoring and identifying missing links** and bottlenecks that should be prioritized
2. **Planning** of regional integration projects,
3. Increasing **safety and ease of navigation** by ensuring the orderly and efficient **control and maintenance** of waterways
4. Basis for **investment decisions** and cost estimates by Governments and the shipping and transport industry



South America IW Classification Potential Benefits

Ranked

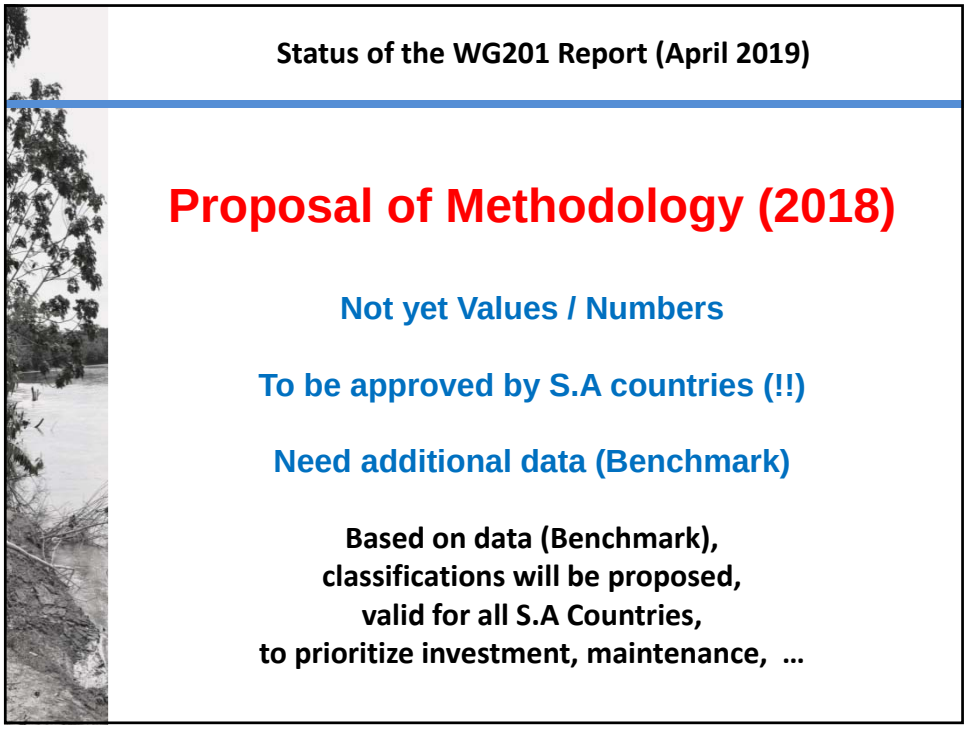
From the public policy perspective

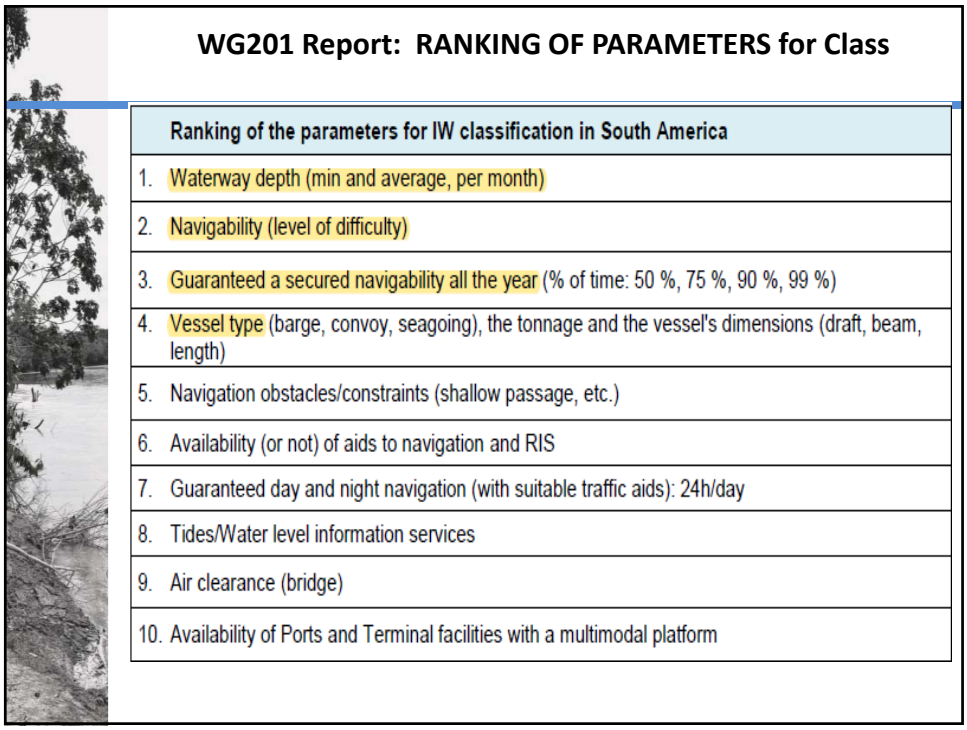
- Measuring and monitoring the state of IW infrastructure.
- Providing an IW inventory which facilitates inter-modal integration
- Providing a basis for estimating the investment gap, maintenance needs and impact of new investments,

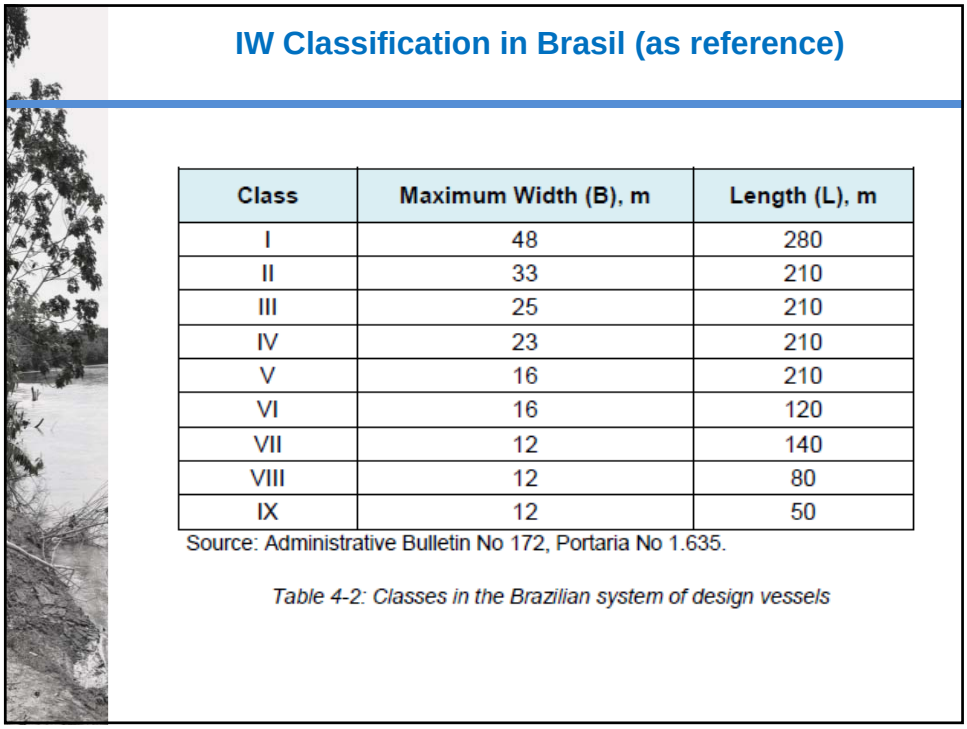
Ranked

From the private sector/user perspective

- Accessing information on the navigation conditions
- Providing ease of navigation & security of navigation


Status of the WG201 Report (April 2019)
Proposal of Methodology (2018)
Not yet Values / Numbers
To be approved by S.A countries (!!)
Need additional data (Benchmark)
Based on data (Benchmark),
classifications will be proposed,
valid for all S.A Countries,
to prioritize investment, maintenance, …


WG201 Report: RANKING OF PARAMETERS for Class
Ranking of the parameters for IW classification in South America
1. Waterway depth (min and average, per month)
2. Navigability (level of difficulty)
3. Guaranteed a secured navigability all the year (% of time: 50 %, 75 %, 90 %, 99 %)
4. Vessel type (barge, convoy, seagoing), the tonnage and the vessel's dimensions (draft, beam, length)
5. Navigation obstacles/constraints (shallow passage, etc.)
6. Availability (or not) of aids to navigation and RIS
7. Guaranteed day and night navigation (with suitable traffic aids): 24h/day
8. Tides/Water level information services
9. Air clearance (bridge)
10. Availability of Ports and Terminal facilities with a multimodal platform

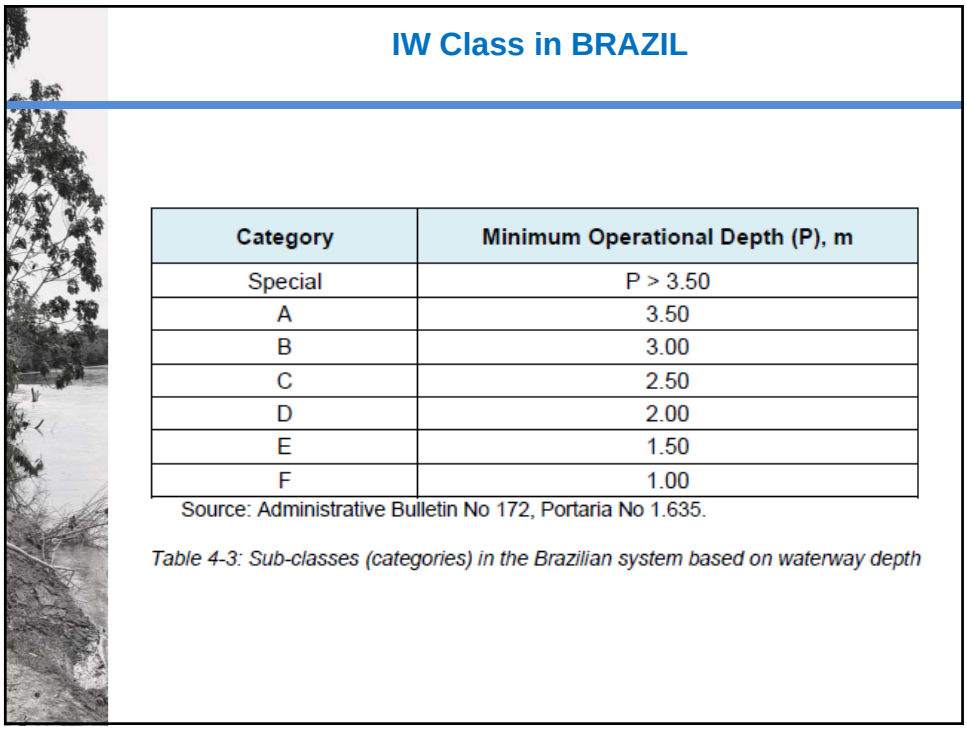


IW Classification in Brasil (as reference)

Class	Maximum Width (B), m	Length (L), m
I	48	280
II	33	210
III	25	210
IV	23	210
V	16	210
VI	16	120
VII	12	140
VIII	12	80
IX	12	50

Source: Administrative Bulletin No 172, Portaria No 1.635.

Table 4-2: Classes in the Brazilian system of design vessels

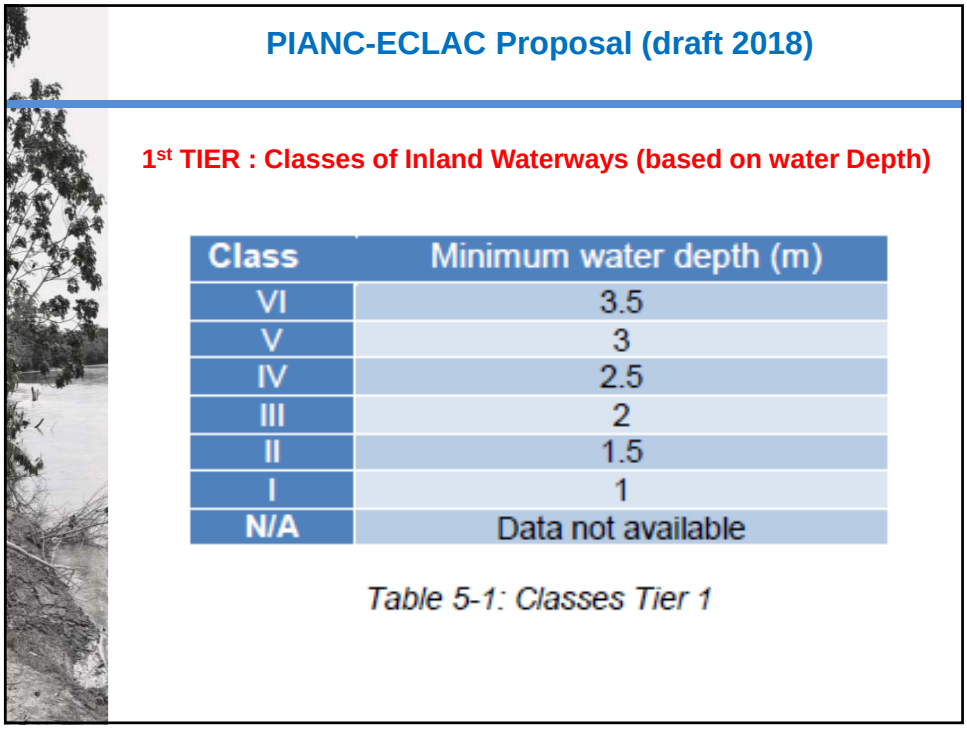


IW Class in BRAZIL

Category	Minimum Operational Depth (P), m
Special	P > 3.50
A	3.50
B	3.00
C	2.50
D	2.00
E	1.50
F	1.00

Source: Administrative Bulletin No 172, Portaria No 1.635.

Table 4-3: Sub-classes (categories) in the Brazilian system based on waterway depth

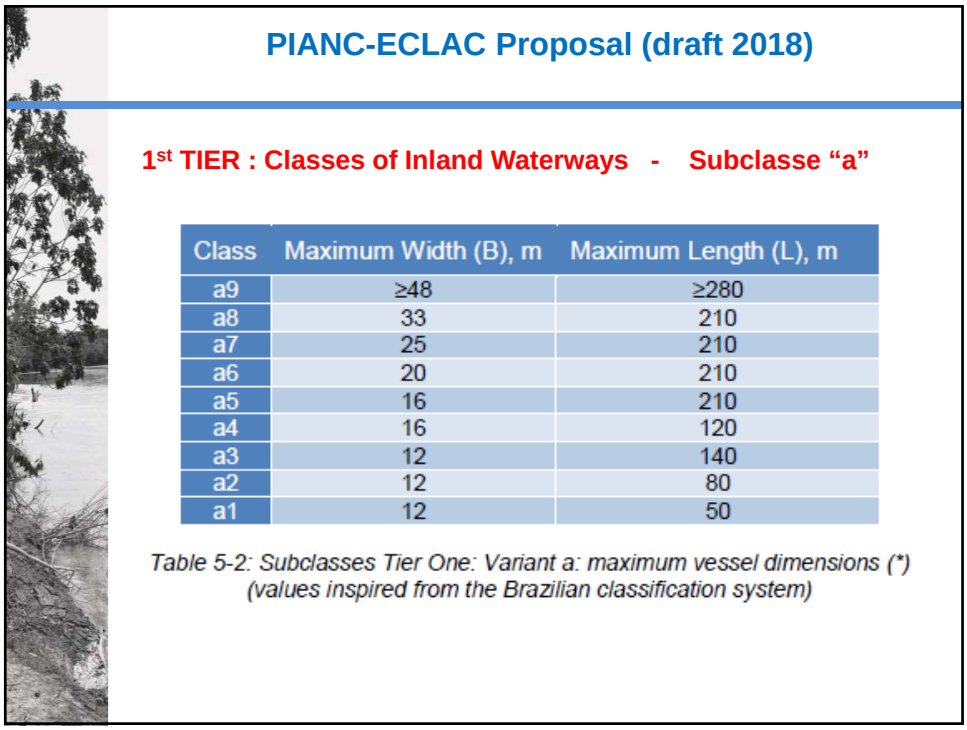


PIANC-ECLAC Proposal (draft 2018)

1st TIER : Classes of Inland Waterways (based on water Depth)

Class	Minimum water depth (m)
VI	3.5
V	3
IV	2.5
III	2
II	1.5
I	1
N/A	Data not available

Table 5-1: Classes Tier 1



PIANC-ECLAC Proposal (draft 2018)

1st TIER : Classes of Inland Waterways - Subclasse "a"

Class	Maximum Width (B), m	Maximum Length (L), m
a9	≥48	≥280
a8	33	210
a7	25	210
a6	20	210
a5	16	210
a4	16	120
a3	12	140
a2	12	80
a1	12	50

Table 5-2: Subclasses Tier One: Variant a: maximum vessel dimensions (*) (values inspired from the Brazilian classification system)

PIANC-ECLAC Proposal (draft 2018)

1st TIER : Classes of Inland Waterways - Subclasse "b"

Sub-class	Minimum width of the navigation Channel	Minimum width in case of locks	Air clearance (height under the bridge)
b6	100 m	40m	15m
b5	80	35	12
b4	60	25	9
b3	50	16	7
b2	40	12	5
b1	30	6	3

Table 5-3: Subclasses Tier One: Variant b: minimum waterway dimensions

If further information is available, the exact number of days with impacted services can be indicated as follows:

*** - Less than 10 days of impacted service
** - Less than 20 days of impacted service
* - Less than 30 days of impacted service

PIANC-ECLAC Proposal (draft 2018)

2nd TIER : CATEGORIES of Inland Waterways (Services)

	Advanced		Intermediate			Basic			
Category	Navigation 365/365	Navigation 24/7	Basic RIS operational services (*)	AIS	Intermodal connections/ terminal transshipments	Surveillance and security facilities	Physical aids to navigation	Navigational charts	hydrometric surveys and network
A	If both		x	x	x	x	x	x	x
B	If one of them		x	x	x	x	x	x	x
C			If all three			x	x	x	x
D			If two of them			x	x	x	x
E			If one of them			x	x	x	x
F						If less than the 4 four basic services			
X	N/A	N/A	N/A	N/A	N/A	N/A			

N/A: information not available
(*) Static and dynamic infrastructural information and prediction of water levels

PIANC-ECLAC Proposal (draft 2018)

3rd TIER : Regulatory and Management Regime

Regulatory and management regime	Regional integration	Environmental aspects	Social dimension	Economic and financial dimension	Institutional dimension
	Use of regional or international standards as part of the regulatory regime or river basin-approach	Existence of rules and practices to deal with the environmental implications of the waterway development.	Existence of rules and practices to deal with the social implications of the waterway development.	Existence of investment plans and financing schemes for the development of the waterway	Existence of dedicated institutions in charge of the waterway's development and effective division of responsibilities and coordination mechanisms.
A	If all five				
B	If four out of five				
C	If three out of five				
D	If two out of five				
E	If one out of five				
X	Information not available				

Table 5-5: Regulatory and management regime

Tapajós River Watershed

26

- **492,000 km² (190,000 miles²)**
  - 59% Mato Grosso
  - 38% Pará
  - 3% in Amazonas and Rondônia
- **Primary Rivers**
  - Tapajós River (806 km)
  - Teles Pires River (830 km)
  - Juruena River (634 km)
  - Arinos River (297 km)
  - Confluence at the Amazon River near Santarém, Pará

DNIT Departamento Nacional de Infraestrutura de Transportes

US Army Corps of Engineers®

Barge and waterway design data

27

Design Barge Convoy in Tapajós EVTEA (Tapajós River)

3.0m Draft

Waterway Dimensions (using Brazil Design)

- Waterway Depth = 3.4 m (Dredged / Sand); 4.1 m (Rock)
- One-Way Waterway Width = 70.4 m (Straight)
- Two-Way Waterway Width = 140.8 m (Straight)
- Minimum Radius = 820 m
- Maximum Width in Bend = 166.4 m (2-way, bend of 820 m)

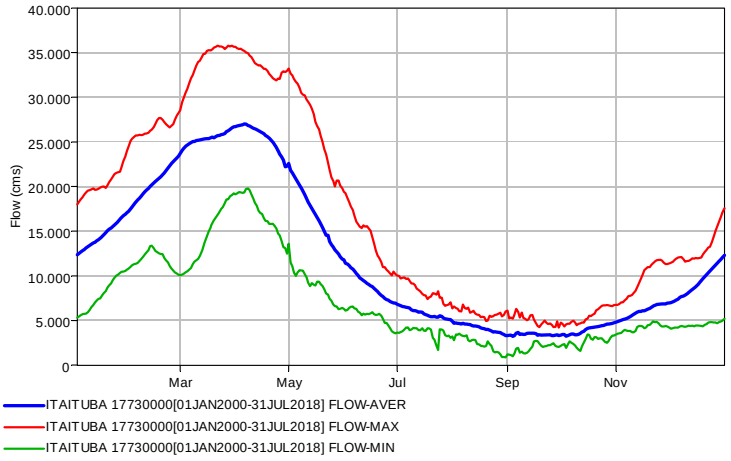
Hydrology – flow (Itaituba station)

28

Q_{high} = 33,704 m^3/s

Q_{mean} = 12,121 m^3/s

Q_{low} = 2,164 m^3/s



Average Annual Flow of Mississippi River ≈ 16,792 m^3/s (600,000 ft^3/s)

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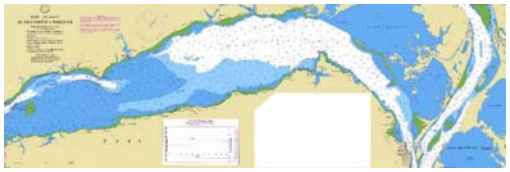
Bathymetry data



Navigation Charts

- From Santarém to São Luiz do Tapajós
- Data collected in 1982, and again in Dec 2013 – January 2014
- Depths below a low water datum (90% low monthly mean)
  - White: Deeper than 10 meters
  - Light Blue: 5-10 meters
  - Dark Blue: Less than 5 meters

EXAMPLE 1 of WG201 CLASSIFICATION of the Rio Tapajos (Brazil) – by A Dohms

	Parameters Needed for Classification (based on WG 201 proposal - 2018)	Parameters provided for Rio Tapajos (between Miritituba and Santarem)	Class
Tier One: Physical dimensions of the waterways			
Class I - VI	Minimum water depth (m); if needed to calculate as …% exceedance value of monthly or annually average	3 m	Class V
(Sub) Class a1 - a9 or	Maximum vessel width and length (m)	32 x 205 m	(Sub)class a7-a8
(Sub) Class a1 - a9	Minimum channel width, Minimum width of locks, Minimum air clearance (m)	N/A	--
Tier Two: Categories of Inland Waterways			
Category A - F (X)	navigational period; navigational aids (services)	43 signal bouys / 11 mooring bouys	Category F

Proposed Classification : class/category : V-a7 / F

WHAT IS MISSING ? ➔ data !!

➔**Need to gain experience on practical S.A. cases**

➔**Need benchmarking (Case studies with data available)**

A final Classification (with values) can be proposed.

A river is composed of Stretches (sections)

A long river could have different characteristics (Class) along its course.

For each river stretch, we need to define its **length and geographical limits**

WG 201 BENCHMARK

We propose a benchmark (a series of case studies):

1) Select some S.A. rivers to assess the feasibility to implement the WG201 classification (1st tier);

2) Collect data concerning these case studies (data are mandatory to know the reality!):

- **The statistic about the water depth (draft) to assess the reliability of the river. It is important to have the statistic of low water depth (Number of days having a given low depth per month).**
- **Dimensions of the typical "Barge configurations", which are composed of several units (fleet);**

WHAT is the "MINIMUM SET of DATA" ?

MANDATORY DATA:

Set 1: Data about water depth.

OPTIONAL DATA (optional but strongly expected):

Set 2: Data about the waterway dimensions;

Set 3: Data about the vessels (barge configurations)

and eventually

Set 4: Data about the traffic (transported tonnage / passengers)

!! We need past and current data (statistics), but also the trends (forecast) !!!

Not to class a river, but latter to use it for Planning

WHAT is the "MINIMUM SET of DATA" ?

MANDATORY DATA:

Set 1: Data about water depth.

Different types of water depth data may be acceptable :

Min water depth with XX% of reliability based on at least 3 years measurements.

Daily average water depth during at least 3 years

or

Monthly minimum water depth, during at least 3 years

or

Number of days (per month) when the water depth is smaller to a given threshold, during at least 3 years

or

Number of days (per month) when the navigation is not possible, during at least 3 years.

To be discussed: 3 years versus 5 years or …. (as minimal duration of the statistics)

WHAT is the "MINIMUM SET of DATA" ?

OPTIONAL DATA (optional but strongly expected):

Set 2: Data about the waterway dimensions; which can be:

- **the length (or number) of shallow water areas (if any);**
- **the navigability feasibility during high flow;**
- **the min. river width (B) which is always available;**
- **the min lock width (B) which is always available;**
- **the min air clearance, which is always available.**

- **Morphological** type of the river : single bed, braided bed or meandering bed; in the latter case : sinuosity and radius of the more severe bend (can be easily measured with Google Earth)
- Main natural **barriers** and physical **impediments**

WHAT is the "MINIMUM SET of DATA" ?

OPTIONAL DATA (optional but strongly expected):

Set 3: Data about the vessels (barge configurations):

- **On the maximum convoy dimensions (Lpp, Beam), about the "barge configurations" which are currently navigating,**

  and maybe on future trend (tomorrow)

Set 4: Data about the traffic (transported tonnage / passengers) for the current situation and, if possible, for the future:

- **Tonnage transported (monthly if possible or yearly during at least last 3 years)**
  and maybe on future trend (tomorrow)
- **The names of the main ports on the concerned river stretch**

BENCHMARK

Potential Case Studies:

- Brasil - Tapajós River in Brazil (Calvin and Brian)
- Colombia - Magdalena River (Jorge Saenz)
- Colombia - Atrato, Meta, Putumayo and Guaviare Rivers (F Zapata)
- Argentina - Parana superior (L Temer, Sebastian Garcia and R. Escalante)
- Paraguay-Parana (Moises Ayala)
- Others ?

EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

From the Saenz documents on the MAGDALENA RIVER (COLOMBIA) :

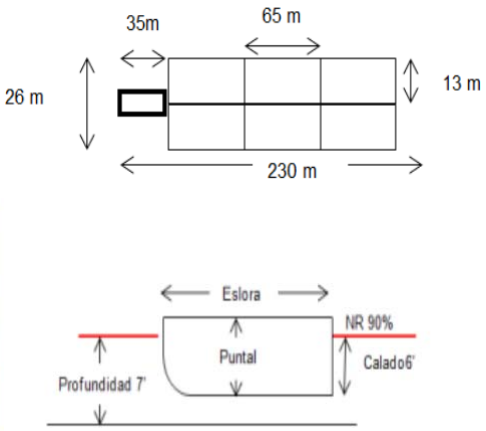
- **FLEET & BARGE CONFIGURATION**
  - ➔ **Statistics on the Dimensions of the typical "Barge configurations", which are composed by several units (fleet);**
- **TRAFFIC DATA AND DEMAND FORECAST**
  - ➔ **Statistics on the Tonnage transported per year;**
- **WATER LEVEL STATISTICS**
  - ➔ **Statistics on the water levels to assess the reliability of the river using several gauge stations**

EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

DIFFERENT CONVOY CONFIGURATIONS

EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

Magdalena River project area



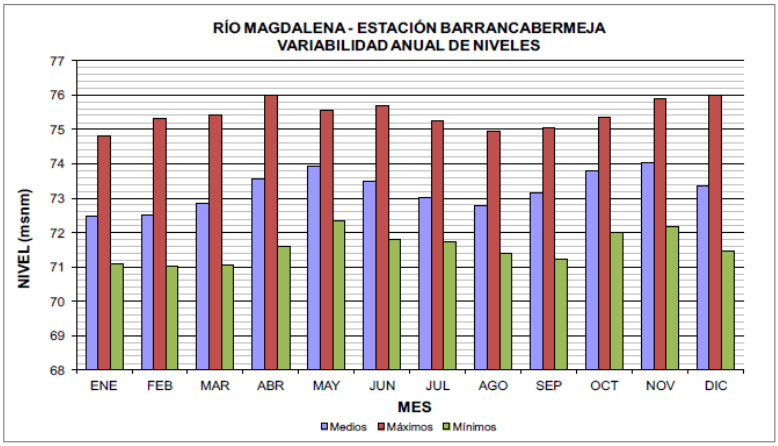
EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

TYPICAL CONVOY CONFIGURATIONS

Configuration	Name	Convoy geometry	Capacity (tons)
Push tow + 6 barges in 2x3 formation. Usually navigating up river.	R-2B-2B-2B		7.200
Push tow + 6 barges in 3x2 formation. Usually navigating down river.	R – 3B – 3B		7.200
Push tow + 8 barges in 2x4 formation. Usually navigating up river. Could become a 9 or 10 barges convoy with additional row.	R-2B-2B-2B-2B		9.600
Push tow + 9 barges in 3x3 formation. Usually navigating down river. Could become a 12 barges convoy with additional row.	R–3B–3B-3B		10.800

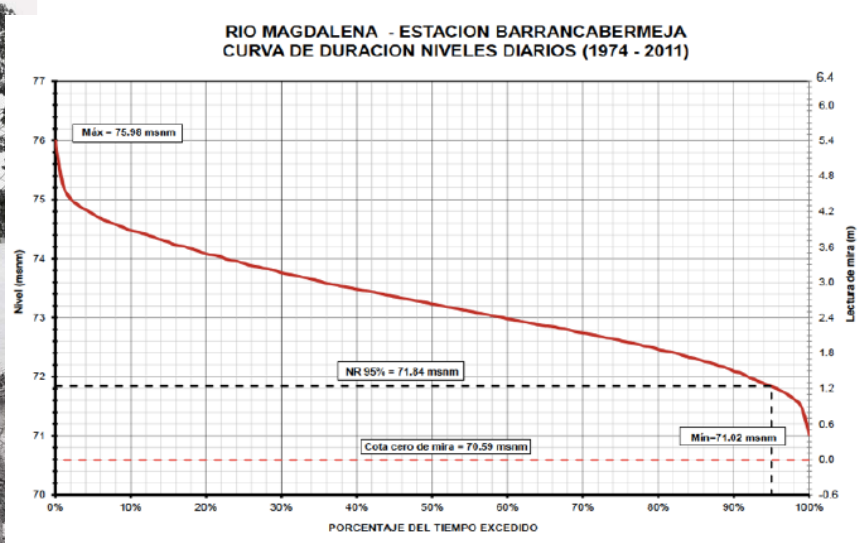
EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

TYPICAL HYDROLOGY IN MAGDALENA RIVER



This is the typical variation of water levels and discharges in the Magdalena river basin, with two hydrographs in a common year.

EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)



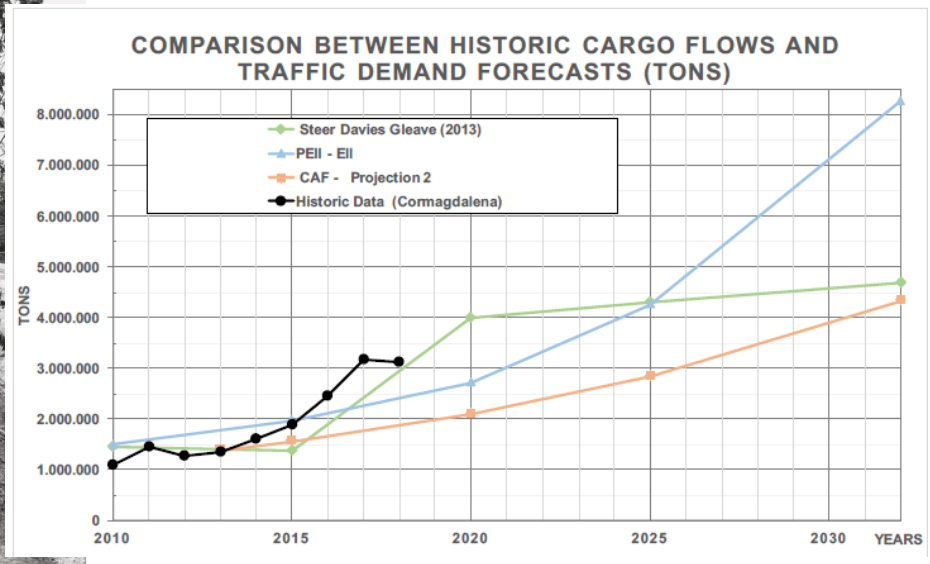
EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

FLEET INVENTORY

SHIPPING COMPANIES AND TRANSPORT CAPACITY (Nov/2014)

ID	COMPANY	NUMBER OF PUSH TOWS	NUMBER OF BARGES					
			LIQUID BULK	Ton.	General Cargo	Ton.	Total Barges	Total Ton.
1	IMPALA	16	54	103,518	41	102,500	95	206,018
2	NAVIERA FLUVIAL COLOMBIANA	16	91	90,361	0	0	91	90,361
3	NAVIERA RIO GRANDE - FLOTA FLUVIAL CARBONERA	7	6	5,302	14	16,089	20	21,391
4	NAVIERA CENTRAL S.A.	3	4	6,000	7	9,450	11	15,450
5	TRANSFLUCOL LTDA.	5	19	13,829	0	0	19	13,829
6	FLOTA NAVIERA BIG RIVER	1	2	8,800	0	0	2	8,800
7	TRANSNAVAL S.A.S.	5	7	4,673	5	3,650	12	8,323
8	TRANSPORTE BERNARDO MONSALVE LTDA.	1	8	6,206	0	0	8	6,206
10	TRANSFLUCAR LTDA.	2	6	5,139	0	0	6	5,139
11	CASTROMAR NAVEGACIONES S.A.	3	10	4,938	0	0	10	4,938
12	PARTICULARES	5	1	550	7	2,596	8	3,146
13	TRANSPORTES FLUVIALES ARIARI LTDA.	2	2	1,200	3	707	5	1,907
	TOTALES	**66**	**210**	**250,516**	**77**	**134,992**	**287**	**385,508**

EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)



EXAMPLE 2 of CLASSIFICATION (Columbia) of the Magdalena river (by Jorge Enrique Saenz)

- **NATURAL RIVER**: Braided to meandering; up to 1,5 km wide including islands
- **FUTURE NAVIGATION CHANNEL WIDTH**
  - SALGAR - BERRIO REACH = 300 m
  - BERRÍO – BARRANCABERMEJA REACH = 500 m
- **NAVIGABLE CHANNEL WIDTH** (two way) = 150 m
- **MINIMUM RADIUS OF CURVATURE** = 900 m
- **REFERENCE LEVEL EXCEDED** (% of time):
  - SALGAR - BERRIO REACH = 90%
  - BERRÍO – BARRANCABERMEJA REACH = 95%
- **SUMMER CHANNEL DEPTH** = 7 feet (2.10 m)
- **VESSEL DESIGN DRAFT** = 6 feet (1.80 m)

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UNITED NATIONS
ECLAC

Actions & Next Steps

- **Benchmark, collect data, …**
- **Final proposal (2020)**
- **Lobby to S.A Countries (politics, deciders, …)**
- **IMPLEMENTATION in S.A.**

WG 201 – Development for Inland Waterway Classification for South America.

Rosario, Argentina, 30th April 2019

https://smartrivers2019.com

SMART RIVERS
30 Sept – 3 Oct 2019,
Lyon France

WG 201 – Development for Inland Waterway Classification for South America.

Rosario, Argentina, 30th April 2019

Thanks

WG 201 – Development for Inland Waterway Classification for South America.

Rosario, Argentina, 30th April 2019