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FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

Inland waterways classification as a tool for public policy and planning: core concepts and proposals for South America

Background

South America has not yet been able to take full advantage of its extensive system of naturally navigable waterways to meet its needs for cargo and human mobility. Infrastructure limitations have been recognized by the actors as one of the major obstacles to the development of inland navigation in the region and, to one extent or another, are addressed in most national and regional plans and projects. What is also needed is a greater recognition of other important priorities and areas of work, such as formulating sustainable mobility and logistics policies for inland water transport and setting corresponding regulations.

A classification of the inland waterways, which is currently does not exist in the region, could also be instrumental for achieving greater and better use of inland navigation. The experiences of other regions in the world demonstrate that inland waterways classification, far from being a formal step or a purely academic exercise, is an essential, powerful and dynamic tool for inland waterways policies and projects inasmuch as it allows the identification of the limitations and the economic potential of navigable waterways in the region and makes it possible to encourage and monitor the development of their capacity for the transport of goods and people.

Against this backdrop and in order to encourage reflection on a potential inland waterways classification for the South American region, this bulletin uses the example of the European system of classification to demonstrate the role of classification in inland navigation development. Specifically, it looks at

This *FAL Bulletin* looks at the classification of navigable inland waterways in South America. It describes an existing classification system (ECMT/UNECE), noting its role in the development of river transport, based on which it discusses lessons learned and presents a preliminary proposal for a classification for South America.

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the 1996 European Agreement on Main Inland Waterways of International Importance (AGN Agreement), in which 18 European countries currently participate. Signed in 1996, the AGN Agreement continues to be one of the main instruments for inland water transport development in Europe, as demonstrated by the growing number of countries in the region that have raitifed it.[1]

In line with that objective, this *FAL Bulletin* describes the main elements of a European classification system of navigable waterways (Section I) and existing mechanisms for the monitoring and use of the established network of inland waterways (Section II) and then analyses the role of the classification in the development of inland water transport in Europe (Section III). It goes on to discuss lessons learned and presents a preliminary proposal for the establishment of a regional classification for South America (Section IV). Lastly, the conclusions section addresses the institutional process and next steps needed to develop the classification.

I. European classification of navigable inland waterways: origins and principles

Inland waterway classification can be defined as the ordering and organisation of the components of river infrastructure according to given criteria. These criteria as well as the extent of divisions or categories of classification can vary depending on the main objective of the classification. In the classification under the aforementioned AGN Agreement, the main parameter of the classification has been the capacity of a navigable waterway (e.g. stretch of inland waterway or a port) to accommodate a certain volume of cargo ship traffic. There are other classifications of navigable waterways in Europe whose objective is to guarantee the safety of navigation. For example, in the technical prescriptions for inland vessels, waterways are divided into zones I, II, III and IV based on the size of their waves.[2] However, the classification of navigable waterways based on economic capacity —the ECMT/UNECE classification— is the most widely known and the one analysed in depth in this document.

The ECMT/UNECE classification was the product of a joint effort by several organisations active in the development of inland wate transport sector in Europe, including the European Conference of Ministers of Transport (ECMT), the World Association for Waterborne Transport Infrastructure (PIANC) and the United Nations Economic Commission for Europe (UNECE). The ECMT was the first to adopt, in 1954, the classification of inland waterways of international importance. The classification was subsequently revised with the support of the PIANC, and an updated version of the classification was adopted by resolution of the ECMT in 1992 (ECMT, 1992). Also in 1992, this classification was adopted by resolution of the UNECE Main Working Group on Inland Water Transport (UNECE, 2004), and in 1996 became part of the AGN Agreement.

The ECMT/UNECE classification divides inland waterways into 10 classes, based mainly on their capacity to accommodate vessels (motor vessels and barges) and pushed convoys of certain sizes. The criteria for determining class are: (a) the horizontal dimensions of the vessels or units (length and maximum length); and (b) vertical criteria, such as draft and maximum height under bridges.

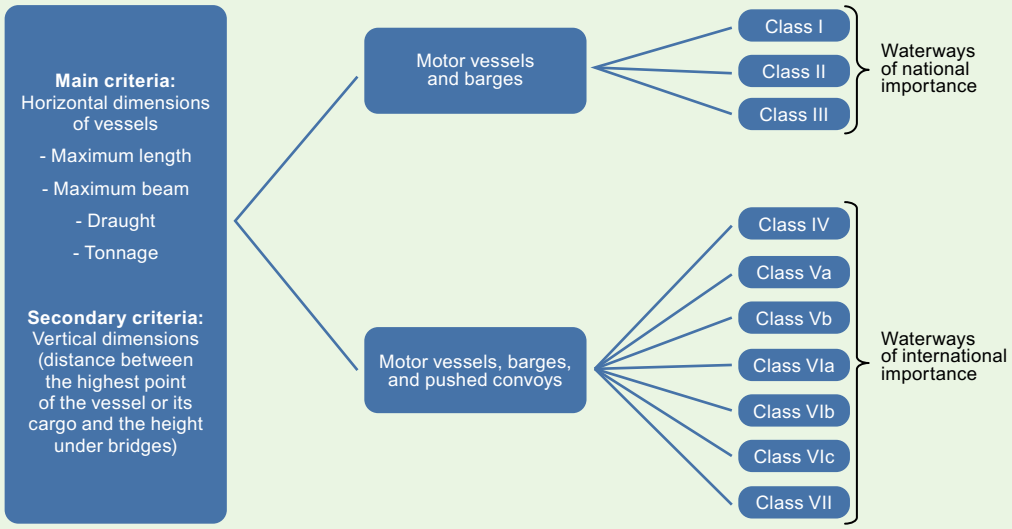
It is important to note that the classification criteria were based on an analysis of the existing fleet and were adjusted as the characteristics of the fleet evolved. The first ECMT classification of 1954 divided inland waterways into five classes, depending on the dimensions of the five types of vessels that were common in Western Europe at the time. Class I corresponded to the historic Freycinet standard, decreed in France in 1879. The classification sizes of waterways in higher classes focused on the transport of containers on pushed convoys. When the first pushed convoy navigated the length of the Rhine River, in 1957, followed by the introduction of pusher boats, the ECMT responded by adding Class VI to its classification. Some time later, however, this classification turned out to be inadequate, and in 1990, a PIANC working group was formed for the specific purpose of conducting a study on Class Vb navigable waterways. This produced the most recent version of the classification adopted by the ECMT and the UNECE, which took into account the rest of the inland waterways in Europe, including the rivers of eastern Europe, which generally accommodate a fleet with slightly smaller dimensions that the rivers of western Europe (PIANC, 1990).

In addition to the division by classes, the ECMT/UNECE classification divides inland waterways into two main categories: classes of national importance (Classes I-III) and classes of international importance (Class IV and higher), which meet the technical criteria most suited to regional trade. The class IV vessel, known as the Rhine-Herne Canal vessel, was the standard used for navigable waterways of European importance, and is often referred to as the "Europe boat." See diagram 1.

[1] The most recent ratifications have been by Austria (2010), Ukraine (2010) and Serbia (2014).

[2] In the UNECE and European Union technical specifications for river-going vessels, navigable waterways are classified as Zone 1 (wave height of up to 2 metres), Zone 2 (wave height of up to 1.2 metres) and Zone 3 (wave height of up to 0.6 metres). See: Resolution No. 61, ECE/TRANS/SC.3/172/Rev.1, EC Directive 2006/87/EC.

Diagram 1
EUROPE: ECMT/UNECE INLAND WATERWAY CLASSIFICATION SYSTEM



Source: ECLAC Infrastructure Services Unit, on the basis of UNECE Resolution 30, 2016.

As noted in UNECE Resolution 30 (1992), this system of classification fulfills various quality and operational criteria:

- It is illustrative, giving a clear and unequivocal description of existing inland waterways;
- It is forward-looking, specifying the parameters to be complied with when constructing new or modernizing existing inland waterways to achieve a certain classification;
- It contains a class hierarchy, ensuring that a vessel normally operating on waterways of one class could be used on waterways belonging to a higher category without restriction as to the parameters covered by the classification;
- It is based on the modular principle with regard to dimensions of vessels;
- It is set up on a long-term basis so as to accommodate future developments in inland water transport technology;
- It is universal in character so that it could be applied over the largest possible territorial range on the European continent;
- It provides for flexibility concerning the draught and bridge clearance values to be determined with due regard to local conditions.

This classification has provided a starting point for identifying the European system of navigable waterways and ports of international importance, while also laying a foundation for planning the future development of the system of pan-European inland navigation.

II. From inland waterways classification to identification of the existing and future network of inland navigation in Europe

The AGN Agreement was an initiative that was directly inspired by the concern among UNECE member countries about the state of inland waterway infrastructure in Europe. At the time of its signing, the use of inland waterways and navigation infrastructure was limited by the insufficient length of waterways of international importance, the highly fragmented nature of the European waterway network, the discrepancy between the routes of navigable waterways and cargo flow patterns and the limited reliability of traffic on some sections due to long breaks in navigation periods caused by low water levels, ice obstacles, lack of nighttime navigation, etc. (UNECE, 1996).

Given this context, the main purpose of the AGN Agreement was to promote inland water transport by developing a network of inland waterways with the following characteristics:

- Homogeneous, i.e. suitable for standard vessels, barges and convoys;
- Suitable for economical international transport including the operation of river-seagoing vessels;
- Integrated, allowing for the connection of different river basins by means of connecting canals and incorporating suitable coastal routes;

- Able to accommodate most important cargo flows, this condition being dependent on the sufficient density of the waterway network and on the development of the network in all European countries. (UNECE, ECE/TRANS/243, 2000).

It is important to underscore the essentially comodal approach of the AGN Agreement, which belongs to the general framework of European agreements on infrastructure, including the European Agreement on Main International Traffic Arteries (AGR) of 1975, the European Agreement on Main International Railway Lines (AGC) of 1985 and the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) of 1991.[3]

The AGN Agreement established an international legal framework for coordinated planning of the development of the network of navigable waterways and ports of international importance, based on standard operational parameters. The agreement has three main components: first, the establishment of the network of navigable waterways of international importance (category E navigable waterways);[4] second, the commitment to guarantee that category E navigable waterways and ports meet the technical parameters and operational standards indicated in the Agreement;[5] and third, the commitment to ensure that national plans and bilateral or regional agreements allow the completion of missing links and the reduction of bottlenecks in the network.[6]

The identification of the network of inland waterways of international importance was based on the following criteria:

- A determination of the minimum technical and operational criteria for navigable waterways and ports in the category E network (based on the ECMT/UNECE classification);
- Identification of category E navigable waterways and missing links between them, and identification of ports in the category E network;
- The numbering system for category E navigable waterways and the associated numbering system for ports.

The annexes to the AGN Agreement defined the technical and operational characteristics for the navigable waterways of category E, setting minimum navigability conditions for the European inland navigation network. Some exceptions to the newly adopted parameters were made for existing waterways, but stricter criteria were set for sections to be developed in the future. In addition, minimum characteristics for established for waterways suitable for combined transport and river-sea navigation (see table 1).

With the adoption of the AGN Agreement, UNECE published the Blue Book (UNECE, 1998), which represented the main mechanism for monitoring implementation of the Agreement and the development of the E waterway network. It contained detailed information on the parameters of the waterways, locks and ports comprising the category E network and also identified waterways suitable for transporting containers. The information included not only the actual values but also the potential values that could be achieved with modernization works. Lastly, the Blue Book contained lists of the limitations on the network in terms of:

- Basic bottlenecks (sections that do not meet the requirements of class IV);
- Strategic bottlenecks (sections that meet the requirements of class IV but need additional work to improve the structure of the network or increase the economic capacity of the waterway); and
- Missing links (sections needed to complete the network).

The AGN Agreement,[7] together with the Blue Book,[8] has been amended several times to update the list of navigable waterways and ports as Europe's river infrastructure has evolved. In 2012, UNECE built an online database with the information contained in the Blue Book.

[3] For more information, see http://www.unece.org/trans/conventn/legalinst.html.
[4] Article 1, paragraph 1.
[5] Article 2, paragraph 1.
[6] Article 2, paragraph 2.
[7] For detailed information on the amendments to the AGN Agreement, see http://www.unece.org/trans/main/sc3/sc3depnot.html.
[8] The first edition of the Blue Book was published in 1998, the first revised version in 2006, and the most recent version in 2012.

Table 1
EUROPE: TECHNICAL AND OPERATIONAL PARAMETERS OF THE NETWORK OF CATEGORY E NAVIGABLE WATERWAYS

	Main technical parameters	Operational parameters
Category E waterways	- Only waterways meeting the basic requirements of class IV are part of the E network. - Uniform class, draught and height under bridges should be ensured for the whole waterway or at least for substantial sections thereof. Where possible, the parameters of adjacent waterways should be similar. - Restrictions of draught (less than 2.5 m) and of minimum height under bridges (less than 5.25 m) are accepted only for existing waterways as an exception. - Generally, the highest bridge clearance values should be ensured (5.25 m at a minimum, 7.00 m for waterways connecting seaports with the hinterland and used for container and river-sea traffic and 9.10 m for waterways connected with coastal routes). - Waterways expected to carry a significant volume of container and ro-ro traffic should meet, at a minimum, the requirements of class Vb. - The minimum draught should be ensured during at least 240 days of the year (or for 60% of the total navigation period). - To be suitable for container transport, the waterway must be able to accommodate vessels with a width of 11.4 m and a length of 110 m with two or three layers of stacked containers, or a pushed convoy of 185 m. - New waterways should meet the requirements of class Vb and ensure a minimum draught of 2.80 m. - Improvements to existing waterways should result in at least class Va services.	1. Navigability should be ensured throughout the navigation period with the exception of: breaks due to severe climatic conditions (for fixed periods that are kept to a minimum), maintenance of locks and waterways (for fixed periods that are kept to a minimum). 2. No breaks will be admissible during low water periods. The minimum draught of 1.20 m should be ensured for the entire navigation period, or for waterways affected by severe climatic conditions, for 60% of the period. 3. Operating hours of locks, movable bridges and other infrastructure should allow for round-the-clock navigation (24 hours/day) on working days and reasonable hours on public holidays and weekends.
Category E ports	- The port should be situated on a category E waterway. - It should be capable of accommodating vessels or pushed convoys used in conformity with its class of waterway. - It should be connected with main roads and railway lines (preferably belonging to the AGR, AGC or AGTC networks). - Its cargo handling capacity should be at least 0.5 million tons per year. - It should offer suitable conditions for the development of a port industrial zone. - It should provide for the handling of standardized containers (with the exception of ports specialized in bulk cargo handling). - All the facilities necessary for usual operations in international traffic should be available. - Reception facilities for the disposal of waste generated on board ships should be available.	

Source: ECLAC Infrastructure Services Unit, on the basis of the AGN Agreement.

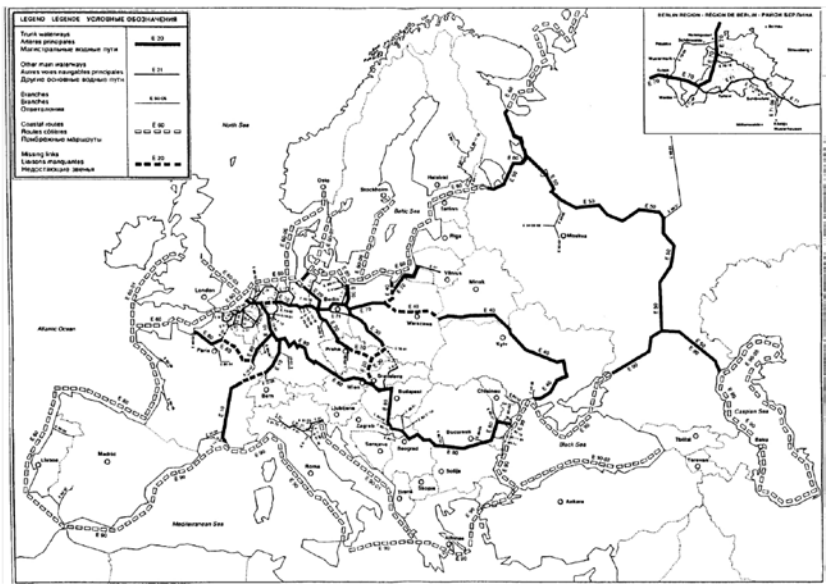
III. Use of the classification in the development of the inland waterway network and pan-European navigation system

The adoption of technical and operational parameters and the classification of inland waterways in Europe, achieved in the AGN Agreement, have brought greater visibility to the existing and potential network for inland navigation in the region. As will be shown in the following paragraps, the AGN Agreement and the Blue Book have helped to determine the dimensions of the network, to identify missing links and to gauge the potential for developing waterways suitable for economic use. The Agreement has also been useful in determining the degree to which inland waterways have been or could be integrated with sea, road and rail corridors. Lastly, the Agreement has been used to determine the scope of application of certain technical and legal provisions for the transport of merchandise.

In the first place, with the signature of the AGN Agreement and the publication of the first Blue Book, it became possible to identify the full dimensions and main characteristics of the pan-European network of inland waterway navigation adapted for cargo transport purposes. It was determined that in 1997 the full length of the network was 27,711 km, of which some 5,775 km (approximately 21%) had missing links or corresponded to a class inferior to class IV. A schematic map was prepared of the category E network, identifying the main waterways in the region, their connections with coastal routes, and missing links (see map 1).

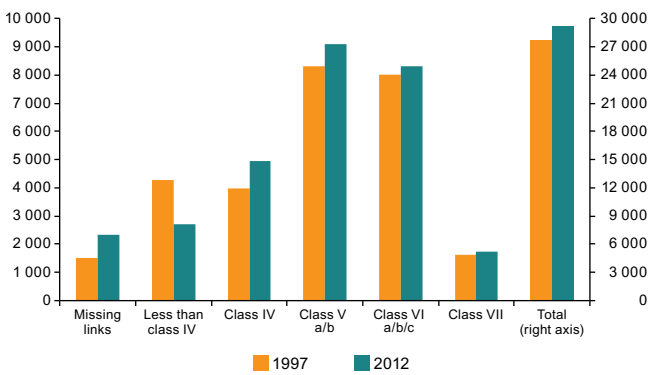
The update of the AGN Agreement and the Blue Book has made it possible to monitor the development of the category E network over the years, identifying changes in both the overall size and composition of the network. That information reveals that there was a slight increase in the total length of the network in the period 1997-2012 (increase of 5%), a slight increase in waterways in class V (9%), class VI (3.5%) and class VII (8%) and a net decrease in the substandard portion of the network (decrease of 36%). At the same time, missing links have been added, increasing by 50%, and in 2012 this group represented 8% of the total network. The number of category E ports in the network continued to grow between 1997 and 2012, from 391 to 439 ports (see figure 1).

Map 1
EUROPEAN NETWORK OF CATEGORY E WATERWAYS, ACCORDING TO THE AGN AGREEMENT, 1997



Source: (UNECE, ECE/TRANS/243, 2000).
Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

Figure 1
EVOLUTION OF EUROPEAN NETWORK OF CATEGORY E INLAND WATERWAYS, 1997-2012



Source: ECLAC Infrastructure Services Unit, on the basis of data from the 1997 and 2012 editions of the Blue Book.

Thus, implementation of the classification of navigable waterways in Europe has allowed for close monitoring of the evolution of the network, which has revealed a slight improvement in its condition and persistent challenges in terms of missing links. The generally positive evolution of the regional network of navigable waterways is the product of national and regional efforts to promote river transport and cannot be attributed solely to the AGN Agreement. However, it is true that the monitoring system has made it possible to bring considerably more visibility to the potential for inland waterway transport in the region while also pointing up major weaknesses and thereby facilitating the identification of strategic projects for national and regional infrastructure development plans. For example, the missing links in the network, identified in the Blue Book, have been addressed in several regional planning tools, such as the strategic documents prepared by the PLATINA platform in charge of implementing the first part of the European Union's NAIADES program (PLATINA, 2010).

Another positive outcome of the classification of navigable waterways in Europe was the identification of opportunities for integrating inland water transport with other modes of transport: from sea transport in coastal areas to road or railway transport. From the start, the AGN Agreement and the classification have facilitated links between inland and coastal navigation routes, since both coastal routes and seaports were part of the category E network identified in the AGN Agreement. In addition, the requirement that category E ports should have access to the main road and railway lines (preferably belonging to the AGR, AGC or AGTC networks) also promoted better integration of river corridors with the main overland road and rail transport corridors. Lastly, one year after the AGN Agreement was signed, an additional protocol to the European Agreement on Important International Combined Transport Lines and Related Installations was signed, on combined transport on inland waterways. The protocol identifies the parts of the category E network defined in the AGN Agreement that are suitable for regular combined transport services,

defined as transport of goods in one and the same transport unit using more than one mode of transport (UNECE, ECE/TRANS/243, 2000).

It should also be noted that the delimitation of category E waterways has been useful in delimiting the scope of application of some security and legal requirements concerning inland water transport operations. The example that best illustrates this is the European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways of 2000. This agreement, which contains security regulations governing the transport of dangerous goods, is open only to UNECE member countries with inland waterways (excluding coastal routes) that are part of the category E network. However, more importantly, although the agreement allows for the possibility that a contracting party may exempt certain national waterways from the agreement, it does not authorize such exemption in the case of waterways in the category E network. Consequently, a minimum level of security is guaranteed in the transport of dangerous goods along the main inland waterways of Europe (UNECE, ECE/TRANS/243, 2000). Another more recent example is the Strasbourg Convention on the Limitation of Liability in Inland Navigation of 2012, which is the equivalent for inland navigation of the Convention on Limitation of Liability for Maritime Claims (LLMC). The Strasbourg Convention allows the owners of vessels to limit their liability by making predetermined contributions to a special fund set up according to criteria established in the Convention for the purpose of paying damages for harm caused by navigation accidents, with the condition that the owner of the vessel is not personally culpable for the harm in question. As in the case of the ADN Agreement, the Strasbourg Convention does not allow exemptions for waterways that are included in the category E network of the AGN Agreement (CCNR, 2012).

In addition to identifying the existing and potential network of navigable waterways in Europe, the AGN Agreement has, therefore, also facilitated the establishment of a set of technical and legal regulations governing the transport of goods along all navigable waterways of international importance in Europe, contributing to a level of regional integration that goes beyond the member countries of the European Union.

IV. Towards a classification of inland waterways for South America: preliminary proposals

Navigable rivers form a natural network for communication and trade in South America. The South American system comprises a wide range of navigable rivers, from one of the largest watersheds in the world, the Amazon (Solimões) and the Paraguay-Paraná Rivers, to the smaller, less navigable rivers, which tend to be even more important for local communities and economies as they offer the only means of communication and accessibility in several regions of the continent (Bara Neto, Sánchez and Wilmsmeier, 2006).

In terms of volume, inland navigation is the third most important mode of inland transport for intraregional exports and imports, and the fourth in terms of value. The types of goods that are shipped by river are relatively bulky and low in value. In recent years, there has been an intriguing increase in the participation of inland water transport in international trade flows, by a factor of two in value terms between 2006 and 2012 (Wilmsmeier, 2013). However, in many cases, local and national flows largely exceed international flows (Bara Neto, Sánchez and Wilmsmeier, 2006).

ECLAC studies (Bara Neto, Sánchez and Wilmsmeier, 2006; Wilmsmeier, 2013) have documented the failure to tap the natural potential of river navigation in South America, in both economic and social terms, especially in regions where: (a) geography hinders the development of terrestrial infrastructure; and (b) river transport is the natural mode of transport for mass production. In these regions, governments should recognize that navigable rivers, as main arteries of transport, complement and in certain cases replace roads and should thus receive treatment and attention on par with other modes of transport.

The European classification shows the practical impact and various uses of inland waterways classification not only for infrastructure development but for defining the basis of the regulatory framework (security provisions and delimitation of liability) for inland navigation in the region. In this sense, it is a powerful and dynamic tool for advancing public policies for the development of inland water transport. This type of tool could support and strengthen the various national and regional initiatives to promote river transport in South America. It could also support the establishment and application of standardized criteria in terms of the technical and operational characteristics of navigable waterways in the region.

At the same time, it must be acknowledged that there are limitations involved in transferring the European system of classification of navigable waterways to other regions in the world. Essentially, the technical criteria used in the ECMT/UNECE classification do not transfer, as such, to the case of South America. Using the horizontal dimensions of vessels as the main criteria came about because the European network primarily consists of channelized rivers and canals that do not typically experience major

fluctuations in water level. Meanwhile, South America mostly has natural rivers with water levels that are in constant flux, so vertical parameters, especially draught, should have a more prominent role in any classification. Analysing this issue in 1990, the PIANC experts have concluded that given the differences in the characteristics of navigable waterways and in the composition of river fleets in Europe, Asia, Africa and South America, it would be hard to establish a worldwide classification of navigable waterways, and the best hope would be to decide on some elements in common to enable comparisons and assessments across regions (PIANC, 1990).

Despite the limitations on any direct transfer of the European example to the South American continent, the experience of the former is an important point of reference for deciding on the basic elements of a regional classification of navigable waterways. Therefore, as a preliminary proposal for a South American classification, this bulletin proposes the following three basic elements:

(i) The objectives and requirements in terms of quality for the classification,

(ii) The technical criteria for the classification, and

(iii) The operational criteria for the classification, and monitoring mechanisms.

The issue of the institutional process and framework for adoption of the classification will be addressed in the section on conclusions in this *FAL Bulletin*.

(a) Objectives and quality criteria for the classification of inland waterways in South America

A South American classification of navigable inland waterways should achieve a double objective: to determine the actual capacity of the regional network of navigable waterways and to note/monitor its potential development.

First, the classification should make it possible to clearly identify the capacity of existing navigable waterways by:

- Introducing a hierarchy of classes that guarantees that a vessel or convoy normally operating on waterways of one class could be used on waterways belonging to a higher category without restriction as to the parameters covered by the classification;
- Identifying waterways capable of accommodating the largest cargo and passenger flows (major waterways), contributing to the regional integration of the countries of South America;
- Identifying substandard sections and missing links.

Second, it should be forward-looking in its design, specifying the parameters to be complied with when constructing new or modernizing existing inland waterways with the objective of contributing to the sustainable development of the entire region, that is, to establishing a network that has the following characteristics:

- As homogeneous as possible but with the flexibility to take into account local conditions;
- Integrated, ensuring the integration of different watersheds via connecting canals, as well as via adequate coastal routes;
- Comodal, that is, suitable for international transport, which includes the operation of sea-going vessels and the integration with other modes of inland transport.

In terms of its general quality, the classification should be:

- Based on the specific conditions of navigable waterways in South America and the existing and future fleet of the region's countries;
- Able to be applied to the widest possible area of South America;
- Able to adapt to future developments in the technology of inland navigation;
- Able to incorporate waterways of diverse characteristics, given the important social and economic function of some sections at the local level;
- Sufficiently dynamic and flexible to accommodate the diversity of navigation conditions related to hydrography and climate.

As a final outcome of the classification, two basic components, similar to those of the UNECE/CEMT classification, are proposed: division into categories, based on economic importance (national or regional), and division into classes, based on more detailed navigability conditions. However, given the importance of river navigation for local development in many countries of the region, it would be useful to have three and not two main categories, adding a special category for waterways of local importance. Accordingly, the following basic structure for the classification is proposed:

- Division into three main categories:
  (i) *Navigable rivers of local importance*: waterways where the transport of goods or people is significant for local development;
  (ii) *Major waterways of national importance*: waterways where the transport of goods or people is significant for national development;
  (iii) *Major waterways of international importance*: waterways that meet minimum technical and operational criteria for international traffic, the equivalent of network of category E inland waterways created in Europe.
- Subdivision into classes based on technical parameters harmonized at the regional level.

The introduction of the category of navigable rivers of local importance recognizes a very important component of South American navigation —the river transport of people and the transit of traditional and artisanal traffic and small craft. This was not part of the original ECMT/UNECE classification. However, in 2004, UNECE Resolution 31 was amended to incorporate three additional classes (RA, RB, RC and RD) based on the general dimensions of vessels for recreational navigation (UNECE, 2004).

Confirming the objectives, the quality requirements and the expected results of the classification should be a first step in developing a South American classification of navigable waterways, prior to which the technical and operational criteria cannot be properly selected.

(b) Technical criteria for the classification

Although the technical criteria from the pan-European classification cannot be directly transferred to South America, the ECMT/UNECE example suggests an inventory of possible classification criteria, as well as the influence of some economic factors, such as the characteristics of the existing and potential fleet in the region and its technological evolution. Consequently, the selection of criteria for a South American classification should emerge from an analysis of various specific elements, including the current state of navigable waterways and hydrographic conditions (especially draught), existing river vessels and vessels being built, technologies in use (ro-ro systems, etc.), the interconnections with maritime and coastal routes and with seaports, transport policies and demand and the social function of some navigable waterways in terms of accessibility.

Although determining the exact criteria will be a medium-term process involving technical discussions between the South American experts, it is possible to anticipate a certain direction in the selection of technical criteria, based on the recommendations of international experts and the national classification experiences of some countries in the region, such as Brazil.

Essentially, unlike the European classification, the depth or draught criterion should carry significant importance in the final classification inasmuch as it is one of the most important limitations for navigation at present. An important variable to confirm in this regard, beyond the values for each specific class, will be the duration of the minimum time for which the indicated depth is guaranteed (90% of the time, as in the case of the Brazilian classification, 240 days or 60% of the navigation period as in the AGN Agreement or other options).

Box 1
CLASSIFICATION OF NAVIGABLE WATERWAYS IN BRAZIL

The existing classification in Brazil divides the country's main rivers into four classes based on minimum depth. There is also a classification of major waterways divided into five groups based on gabarits (dimensions of river-going vessels), proposed in the 1989 National Plan for Navigable Inland Waterways. A new classification is presently being considered that combines the two elements.

(a) Classification based on minimum depth

Class	Minimum depth	Guaranteed
A	More than 2.10 m	90% of the time
B	Between 1.30 m and 2.10 m	90% of the time
C	Between 0.80 m and 1.30 m	90% of the time
D	Less than 0.80 m	Only during high-water periods

(b) Classification based on gabarits (National Plan for Navigable Inland Waterways, 1989)

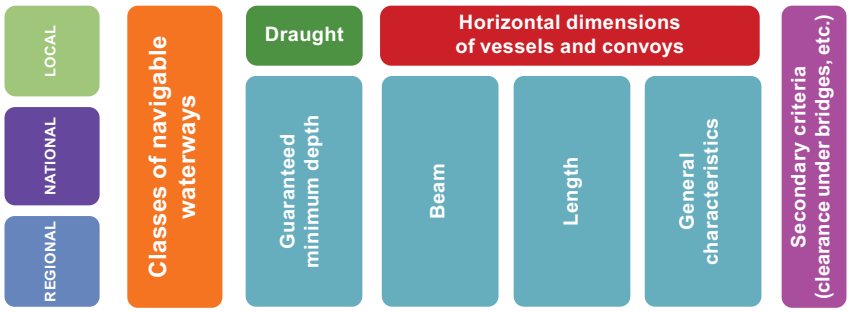
Gabarit	Length (m)	Beam (m)	Draught (m)	Mast (m)	Comments
I					Maritime and coastal navigation
II	210	32	2.5	15	
III	160	16	2	10	
IV	110	11	1.5	7	
V					Waterways, restricted or of local importance

Source: DNIT, 2016.

This criterion should be supplemented by the criteria related to the horizontal dimensions of the fleet in order to determine the final class of the waterway. The selection of these criteria will require an analysis and a typology of the fleets of river-going vessels in the countries of South America, in order to determine the dimensions of vessels and convoys actually deployed in the region.

Thus, the proposal is to combine the draught criteria, based on the minimum depths guaranteed for a certain amount of the navigation period, with the criteria related to the horizontal dimensions (length and beam) of typical vessels in the South American fleet. The approach is summarized in diagram 2.

Diagram 2
TECHNICAL CRITERIA FOR THE SOUTH AMERICAN CLASSIFICATION OF NAVIGABLE WATERWAYS

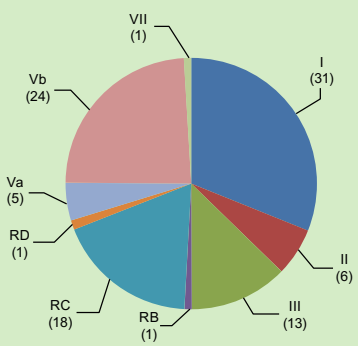


Source: ECLAC Infrastructure Services Unit, 2016.

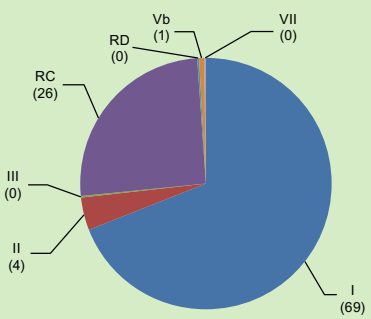
For the subsequent selection of the horizontal and vertical dimensions of the fleet, it might be possible to use some elements of the European classification to achieve a certain degree of correspondence between the two classification systems. However, use of that classification is likely to be very limited given that the available data on the river-going fleets in the region's countries suggest a heavy concentration of the current fleet in classes RA, I, II, III and IV (see box 2). Thus, in developing a classification, the best option would be to prepare a typology based on all the river-going fleets of South America combined and determining the most representative categories.

Box 2
APPLICATION OF THE UNECE CLASSIFICATION TO FLEETS IN SOUTH AMERICA, 2016

River-going fleet in Brazil
(percentage of the total fleet)



River-going fleet in Ecuador
(percentage of the total fleet)



Class	Length *(m)*	Beam *(m)*	Draught *(m)*	Capacity *(T)*
RA	5.5	2	0.50	
RB	9.5	3	1.00	
RC	15	4	1.50	
RD	15	4	2.10	
I	35	5	1.40	400
II	50	7.5	2.00	650
III	80	9	2.50	1 000
IV	85	9.5	2.50	1 500
Va	110	11.5	2.80	3 000
Vb	185	11.4	4.50	6 000
VIa	110	11.4	4.50	6 000
VIc	280	34.2	4.50	18 000
VII	285	34.2	10.00	27 000
VIb	140	15	3.90	12 000

Source: ECLAC Infrastructure Services Unit, on the basis of data from SIGMAP (Ecuador) and ANTAQ (Brazil), 2016.

(c) Operational criteria for the classification and monitoring mechanisms

Although a discussion of the technical criteria for the classes requires a specific analysis of the situation in South America, in the case of the operational criteria for navigable waterways, an initial proposal can be prepared already. Table 2 presents a preliminary list of the operational criteria that should be guaranteed for waterways in the region. Unlike the AGN Agreement, the plan in this case is to specify minimum criteria for all waterways in the region with the strictest operational requirements on the sections of national and regional importance.

Table 2
PROPOSED OPERATIONAL CRITERIA FOR NAVIGABLE WATERWAYS IN SOUTH AMERICA

Operational requirements	Local	National	Regional
1. Navigability ensured throughout the navigation period with the exception of: - Breaks due to severe climatic conditions (for fixed periods that are kept to a minimum). - Maintenance of locks and waterways (for fixed periods that are kept to a minimum).	Recommended	Required	Required
2. No breaks will be admissible during low water periods. Minimum draught ensured for the entire navigation period, or for waterways affected by severe climatic conditions, for 60% of the period.	Recommended	Required	Required
3. Navigation 24 hours/day on working days and reasonable hours on public holidays and weekends.	Recommended	Required	Required
4. Intermodal connections: with seaports and railway, airport and road corridors.	Recommended	Required	Required
5. Regular navigation services.	Recommended	Recommended	Required
6. Harmonized signage and signals.	Recommended	Required	Required
7. Navigation maps and river information system.	Recommended	Recommended	Required

Source: ECLAC Infrastructure Services Unit, 2016.

Based on the pan-European experience, the proposal is also to supplement the classification as such with a factual repository of information on the current state of waterways in the region, that is, the Blue Book equivalent for South America. This repository will contain the technical and operational parameters for waterways of national and regional importance along with a list of missing links and bottlenecks. Table 3 below presents a preliminary example of the information that the inventory could contain.

Table 3
NAVIGATION CONDITIONS FOR THE EL COCA - PERUVIAN BORDER SECTION OF THE NAPO RIVER

ID	Section	Classification	Technical parameters					Operational parameters		Observations	Special periods
			Length *(km)*	Draught *(m)*	Height *(bridges)*	Beam *(m)*	Length *(m)*	Operating hours	Type of vessel		High water
SA-XX-01	El Coca - Puerto Providencia	TBD	60	1	No restrictions	10	40	between 06:00 and 18:30, 365 days/year	Vessels or pushed convoys		
SA-XX-02	Puerto Providencia - Peruvian border	IV (convoy) throughout the year except indicated places	150	1.2[a]	No restrictions	12	Pusher boat plus barge (50 m)	between 06:00 and 18:30, 365 days/ year	Vessels or pushed convoys (convoy: pusher boat plus barge)	Critical points with requirements for continuous verification of draught due to branching of navigation channel	Navigation possible up to 2.2 m of draught under certain climate circumstances. Not guaranteed, and dependent on approval of departure and/ or arrival by authorities.

Source: ECLAC Infrastructure Services Unit.
[a] Minimum depth ensured for at least 240 days per year (or 60% of the total navigation period).

V. Conclusions: institutional framework and next steps

This *FAL Bulletin* proposes the initial elements needed to initiate a discussion on a South American classification of navigable inland waterways. However, developing, adopting and maintaining a classification of inland waterways is a long and continuous process that must be built in to national and regional policymaking for inland navigation and requires an adequate institutional framework from the start.

This institutional framework must allow for technical work to be carried out in close collaboration with decision makers in order to define the overall objectives of the classification and ensure that it is properly applied, maintained and used in investment decisions (on infrastructure and navigable waterways), in order to strengthen the efforts currently being made by the various countries in the region to formulate specific policies on inland navigation (Ecuador), master plans (Colombia), bilateral agreements (Brazil and Ecuador) and regulatory frameworks (Paraguay).

Beyond national efforts, the classification process must be incorporated into the framework of integration initiatives. An analysis of the European experience begs the question as to whether it is really necessary to formalize the classification system in a legal instrument, such as the AGN Agreement, given the political and legal costs involved in signing and maintaining an international agreement. One possible alternative is to fit the classification into an existing regional integration framework that could adopt it and take responsibility for update and monitoring mechanisms. As part of activities to monitor the development of the network, in addition to looking at purely technical parameters, it would be a good idea to review patterns of investment in waterways infrastructure as part of a more comprehensive analysis of the situation.

ECLAC, as the regional commission of the United Nations working on sustainable development and regional integration, with a long track record of analytical and field work in maritime and land transport and economic infrastructure issues, could lead and facilitate the regional effort to develop, adopt and maintain a South American classification of navigable inland waterways. However, this initiative will not succeed without:

- The active participation of the region's countries in preparing the methodology and applying the classification, as well as developing the various monitoring instruments, such as the inventory of waterways proposed above;
- Close collaboration with regional and global industry, in particular with the specialized PIANC groups, given their experience with harmonizing parameters for river infrastructure and fleets;
- Regional integration mechanisms: Given its nature and active portfolio of inland waterways infrastructure projects, the most appropriate forum might be the UNASUR/COSIPLAN/IIRSA initiative, which seeks to improve interconnection and transit between the countries of South America.

Therefore, the proposal is to launch the classification preparation process by having ECLAC and other multilateral organisations active in the development of river transport facilitate the initial technical meetings between South American experts, with the participation as well of international experts in these types of classification. In the medium term, this effort should be pursued in the framework of the relevant UNASUR/COSIPLAN/IIRSA initiatives, in order to ensure the eventual adoption of a regional classification that is tailored for South America.

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