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Inland waterway classification in reference to the Danube's one-way navigation issue

16th Stakeholders' Forum Meeting (SFHM 16)

18.06.2025. Ljubiša Mihajlović/MGSI-Plovput

Preparing FAIRway2 works in the Rhine Danube Corridor (2019-EU-TM-0262-S and 2019-HR-TMC-0263-S)

What Is Inland Waterway Classification?

A structured way of organizing rivers, canals, and ports based on their navigational and infrastructural capacity.

Purpose:

- Support planning and investment
- Identify strengths and limitations
- Guide sustainable transport policies

Benefits:

- Enables regional integration and harmonization
- Supports infrastructure modernization
- Improves regulatory frameworks (e.g., safety, liability)
- Facilitates intermodal transport planning
- Helps identify bottlenecks and missing links

European Classification System (ECMT/UNECE)

United Nations Economic Commission for Europe

European Agreement on Main Inland Waterways of International Importance (AGN)

Accord Européen sur les grandes voies navigable d'importance internationale (AGN)

Европейское Соглашение о Важнейших Внутренних Водных Путях Международного Значения (СМВП)

Key Elements:

- Developed by ECMT, UNECE & PIANC
- Introduced in 1954, revised in 1992
- Basis for the AGN Agreement (1996)

Classes:

- I–III: National importance
- IV–VII: International importance

Croatia acceded to the AGN Agreement on April 27, 1999, while Serbia joined later, on January 10, 2014.

Classification Criteria

Main Technical Criteria:

- Vessel length and beam
- Draught (depth)
- Bridge clearance (vertical space)
  -> with reference to HNL

Example:

- Class IV (Europe Boat):
  85m long, 9.5m beam, 2.5m draught

→ Minimum for international waterways

- Class VIc (The class to which Croatia and Serbia's common Danube sector belongs)

	Pushed convoys Type of convoy: General characteristics				Minimum height under bridges [2]	Graphical symbols on maps
	Length L (m)	Beam B (m)	Draught [6] d (m)	Tonnage T (t)	H (m)	
8	9	10	11	12	13	14
IV	85	9.5 [5]	2.50-2.80	1,250-1,450	5.25 or 7.00 [4]	
Va	95-110 [1]	11.4	2.50-4.50	1,600-3,000	5.25 or 7.00 or 9.10 [4]	
Vb	172-185 [1]	11.4	2.50-4.50	3,200-6,000		
VIa	95-110 [1]	22.8	2.50-4.50	3,200-6,000	7.00 or 9.10 [4]	
VIb	185-195 [1]	22.8	2.50-4.50	6,400-12,000	7.00 or 9.10 [4]	
VIc	270-280 [1] 195-200 [1]	22.8 33.0-34.2 [1]	2.50-4.50 2.50-4.50	9,600-18,000 9,600-18,000	9.10 [4]	
VII [7]	275-285	33.0-34.2 [1]	2.50-4.50	14,500-27,000	9.10 [4]	

Focus on the Danube River

Danube Status:

- Part of AGN category E network
- Vital East–West corridor

Free-Flowing Sections (e.g., Budapest–Belgrade):

- Sensitive ecosystems
- No locks or dams → fluctuating water levels
- Seasonal draught → limits cargo capacity

AGN Agreement and Blue Book

- **AGN:** Legal basis for European inland navigation network
- **Blue Book:** Monitoring tool listing all navigable waterways

UNECE

Inventory of Main Standards and Parameters of the E Waterway Network

Blue Book
Fourth Revised Edition

Inventory of existing and envisaged standards and parameters of E waterways and ports in Europe and shows, on an internationally comparable basis, the current inland navigation infrastructure parameters in Europe as compared to the minimum standards and parameters
website: https://unece.org/publications/inland-water-transport

Serbia

Missing links: none.

Basic bottlenecks: Begej (E 80-01-02) from its mouth to the border of Serbia/Romania — upgrading from class III to at least class Va is required.

Strategic bottlenecks:

- Danube (E 80) from km 1,405.6 to km 1,227.9 — narrow fairway conditions.

SECTION OF E WATERWAY	LENGTH (km)	MAXIMUM DIMENSIONS OF VESSELS AND PUSHED CONVOYS WHICH MAY BE ACCOMMODATED			MINIMUM HEIGHT UNDER BRIDGES**** (m)	CLASS	SUITABILITY FOR COMBINED TRANSPORT**	COMMENTS
		LENGTH*** (m)	WIDTH*** (m)	DRAUGHT (m)				
2	3	4	5	6	7	8	9	10
DANUBE	67.0	110.0/280.0	11.40/34.20	2.50	9.10	VIc	A	Free-flowing
Km 1 433.0–km 1 366.0[88]		No restrictions	No restrictions	2.50	8.80	VIc	A	
DANUBE	70.5	110.0/280.0	11.40/34.20	2.50	9.10	VIc	A	Free-flowing
Km 1 366.0–km 1 295.5[89]		No restrictions	No restrictions	2.50	9.10	VIc	A	

AGN Agreement and Blue Book

Croatia

Missing links: Danube–Sava Canal (E 80-10) from Vukovar to Samac.

Basic bottlenecks:

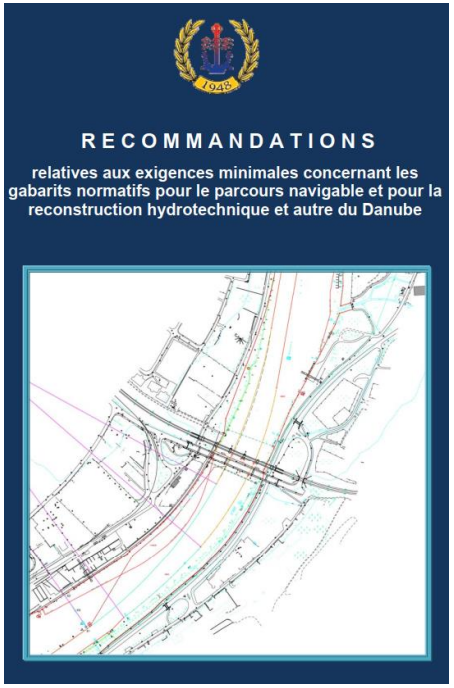
- Sava (E 80-12), two sections from Slavonski Šamac to Oprisavci[iii] and from Slavonski Brod to Sisak — upgrading from class III to class IV.

Strategic bottlenecks:

- Danube (E 80) from km 1,433.1 to km 1,295.5 — 17 critical sections with inadequate fairway parameters:
  - Km 1,429.0–km 1,425.0, reduced fairway width
  - Km 1,424.2–km 1,414.4, reduced fairway width
  - Km 1,408.2–km 1,400.0, reduced depth and fairway width
  - FKm 1,397.2–km 1,389.0, reduced depth and fairway width
  - Km 1,384.0–km 1,381.6, reduced fairway width
  - Km 1,381.4–km 1,378.2, reduced fairway width
  - Km 1,376.8–km 1,373.4, reduced depth and fairway width
  - Km 1,371.4–km 1,366.4, reduced fairway width
  - Km 1,366.2–km 1,361.4, reduced fairway width
  - Km 1,357.0–km 1,351.0, reduced fairway width
  - Km 1,348.6–km 1,343.6, reduced depth and fairway width
  - Km 1,340.6–km 1,338.0, reduced fairway width
  - Km 1,332.0–km 1,325.0, reduced fairway width
  - Km 1,324.0–km 1,320.0, reduced depth and fairway width
  - Km 1,315.4–km 1,314.6, reduced fairway width
  - Km 1,311.4–km 1,307.6, reduced depth and fairway width
  - Km 1,302.0–km 1,300.0, reduced fairway width.

Recommendations of the Danube Commission on Fairway Dimensions

- Serve as a technical and operational basis for maintaining navigability.
- Define the minimum dimensions (or "fairway parameters") that should be ensured in various river sections under under representative hydrological conditions.
- These recommendations do not represent legal obligations, but they are technically authoritative and serve as a reference for national waterway authorities, infrastructure planning, and international cooperation.
- They are primarily based on: Hydrological data, observed vessel traffic and types of vessels navigating the Danube, goeographical and morphological conditions of specific river sections, and technical and economic feasibility of waterway maintenance.



Which set of DC recommendations to use?

In this project, original Danube Commission recommendations (prior to 2014) for fairway dimensions are applied. This decision is based on the following technical-methodological and practical considerations:

Continuity and proven practice:

- The first set of recommendations was established in the late 1950s, and has since been updated multiple times to harmonize with other classification systems (ECMT/UNECE, AGN).
- However, the core technical parameters (depth, width, curve radius) have remained largely unchanged, confirming their long-term technical validity.

Demonstrated use in already regulated river sections:

- All regulated sectors along the common section of the Danube have historically used these parameters, including specific stretches such as: Apatin, Čivutski Ruvac, Drava confluence, Aljmaš, and Staklar.
- The latest infrastructure project covering six critical sectors on the Danube in Serbia from Bačka Palanka to Belgrade also relied on the original recommendations as practical evidence in project implementation.

Which set of DC recommendations to use?

Consistency with the most recent version:

- Although the most recent version introduces additional flexibility and encourages adaptation to local conditions, it does not invalidate the technical basis of previous recommendations.
- On the contrary, it acknowledges that a “one-size-fits-all” approach is not always feasible or ecologically justified, thus allowing for the continued use of validated existing standards.

Practical Suitability in the Local Context:

- The existing infrastructure, navigation regimes, and hydromorphological conditions are still aligned with the previously recommended fairway dimensions.
- Despite the absence of substantial new investments in the recent period, the current navigability parameters are better than in previous years.
- This further confirms the adequacy and durability of the earlier recommendations under real-world operational conditions.

Fairway Parameters used for modelling

Minimal depth in the fairway H:

- Sections with free flow H ≥ 2.5 m
- Sections under the influence of the backwater H ≥ 3.5 m

Minimal width of the fairway B:

Sections with free flow:

- Sections with easily scouring bottom B ≥ 180 m
- Sections with easily scouring bottom in meander B ≥ 200 m
- Sections with rock bottom B ≥ 100 m
- Shoals with easily scouring bottom B ≥ 150 m

Sections under the influence of the backwater: B ≥ 200 m

- **Minimal radius of curvature (along the fairway axis) R:**
- R ≥ 1000 m
- Sections with unfavorable geomorphologic conditions R ≥ 750 m

Fairway Parameters used for modelling

Fairway width B, with regard to the radius of curvature R:

- B = 180.0 m for R > 4000 m (straight section)
- B = 200.0 m for R < 4000 m (curvature - meander)

Favorable/Unfavorable stretches:

- All stretches of the river course, for which the condition B > 180.0 (200.0) m have been met can be considered favorable with a view to navigation.
- Stretches that do not fulfill conditions (B < 180.0 m) are deemed unfavorable with regard to the safe navigation.
- Stretches that currently fulfill such conditions, B > 180.0 (200.0) m, but their width in the past used to be less than required, which points out to the deformability of the channel, are also considered unfavorable.
- All stretches where R < 1000, are deemed unfavorable with regard to the safe navigation and river training works are proposed as a measure for solution to this problem.

Inland waterway classification and One-way navigation

Classification systems (ECMT/UNECE, AGN, DC, requirements for the GNS) are designed to:

- Ensure year-round, two-way navigation with minimum class IV standards
- Promote efficient and predictable transport on international waterways
- Serve as a planning tool for infrastructure investments and regulation

One-way navigation, while sometimes operationally necessary, is:

- A temporary measure, not aligned with long-term classification objectives
- A sign of infrastructure bottlenecks or environmental limitations
- Discouraged by the Danube Commission except in exceptional cases

Why One-Way Traffic Doesn't Work on the Danube

Technical and Operational Justification

The One-Way Illusion

- One-way navigation refers to a regulated traffic regime on a navigable waterway in which vessels are allowed to proceed in only one direction at a time within a designated river sector.
- Traffic in the opposite direction is temporarily halted.
- Although one-way navigation may seem like a good way to reduce physical interventions in sensitive river sectors, particularly from an ecological perspective, it is not:
  - practical,
  - economical, or
  - strategic solution

  for international waterways on TEN-T network like the Danube.

Key Reasons One-Way Navigation Is Not Feasible on the Danube

1. **Significant Reduction in Transport Efficiency**
   The efficiency of inland waterway transport — a primary justification for its promotion under EU Green Deal and TEN-T policies — is severely compromised
2. **Increased Operational Costs**
   Longer travel times result in:
   - *Higher fuel consumption*
   - *Extended crew working hours*
   - *Increased insurance costs*
   - *Lower vessel turnover*
3. **Complex Traffic Management Requirements**
   Requires real-time traffic regulation and coordination
4. **Increased Risk of Incidents**
   Emergency responses slower and risky

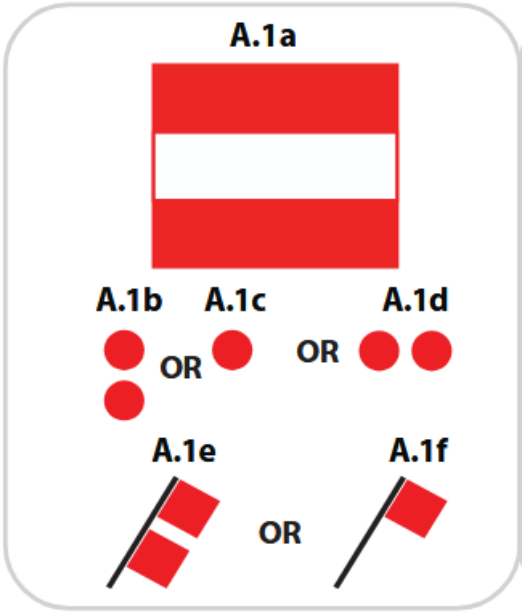
"With this revised TEN-T policy we should seek to build a reliable, seamless and high quality trans-European transport network which ensures sustainable connectivity throughout the European Union without physical gaps, bottlenecks or missing links by 2050. This network will contribute to the good functioning of the internal market, to the economic, social and territorial cohesion of the EU territory and to the European Green Deal objectives.

It should be gradually developed in steps, with intermediate deadlines in 2030 and 2040".

Proposal for a regulation of the European parliament and of the Council on Union guidelines for the development of the trans-European transport network...
https://data.consilium.europa.eu/doc/document/ST-15109-2021-INIT/en/pdf

Key Reasons One-Way Navigation Is Not Feasible on the Danube

5. **Negative Impact on Strategic Transport Corridors**
   Impact on the entire logistics chain, from ports and terminals to multimodal links
6. **Lack of Resilience in Crisis Situations**
   Entire stretches may be blocked, with no immediate redirection possibilities
7. **Limited Applicability to Commercial Shipping**
   One-way traffic systems might be manageable for short, isolated stretches or for recreational navigation. However, commercial shipping requires predictability, schedule reliability, and minimum waiting time. One-way regimes are fundamentally incompatible with such requirements, especially for time-sensitive cargo.



Legal and Institutional Requirements for Two-Way Navigation

The obligation to ensure two-way navigation on international waterways is grounded in binding technical regulations and international agreements:

- Under the European Agreement on Main Inland Waterways of International Importance (**AGN**), Annex III defines the minimum technical characteristics for waterway classes. For Class VIb and above, the agreement requires that waterways **must support two-way navigation for convoys of large vessels** (typically pushed barge convoys up to 195–270 m in length and 22.8–34.2 m in width).

- The **Danube Commission**, in its "Recommendations for the Development of the Danube Waterway Infrastructure" (2018), explicitly emphasizes that all Danube sections forming part of the international waterway network must **enable safe and reliable two-way navigation under representative hydrological conditions.**

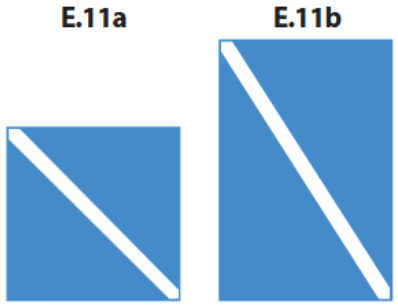
- **Belgrade Convention** (1948) governing navigation on the Danube states in Article 3 and Article 9 that navigation shall be free and equal, which implies the infrastructure **must allow unhindered passage in both directions** for all users.

Any permanent or systemic introduction of one-way navigation would contradict these standards and could undermine the Danube's legal status as an international transport corridor, affecting both funding eligibility and regional coordination.

Conclusion

- While environmental concerns are authentic and addressed seriously, one-way navigation cannot replace well-planned, low-impact infrastructural improvements where safe and economically feasible two-way traffic is required.

- We remain fully dedicated to ongoing conversation and transparency, but we emphasise that uninterrupted two-way navigation is a necessary condition for the Danube's role in European inland waterway transport.



Sustainable, two-way navigation is a key expectation of classified international waterways. One-way traffic contradicts the principles of integrated river transport and should be limited to emergency conditions only.

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Thank you for your kind attention

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