Discussion Paper for regional workshops on Good Navigation Status

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Content

1. Introduction

1.1 Disclaimer

This discussion paper is prepared on the account of the consortium carrying out the study. The paper shall be seen as an indication of the current views of the consortium on Good Navigation Status (GNS) based on the research carried out so far. It provides an informal basis for discussion. The study is work in progress and the views / approaches do not necessarily represent the position of the European Commission and/ or its Member States.

1.2 Background and purpose of the study

One of the objectives of the Trans-European Transport Network (TEN-T) is to ensure that European waterways are well integrated in the European transport system, promoting in as much as possible inland navigation as a sustainable transport mode.

The TEN-T Guidelines stipulate that, by 2030, waterways of European significance have to achieve "good navigation status". In broad terms, that means that the waterways in question have to be fit for the purpose of deploying the full potential of inland navigation in Europe. However, the TEN-T Guidelines do not go into the detail of defining precisely the GNS concept.

The GNS study has been launched by the European Commission for that purpose. It is conducted by a consortium of inland navigation experts and requires a cooperative effort of stakeholders, including Inland Waterways' infrastructure managers, international river commissions and other interested parties.

The study will be carried out in 2016-2017. The results – definition of GNS core parameters and recommendations for achievement thereon – will be of key importance for all the above parties. In terms of TEN-T completion, GNS requirements will be taken into account for measuring fulfilment of the TEN-T Guidelines and for EU funding priorities. The study on GNS will provide a solid technical basis to be taken up by the European Commission in their further work.

The consortium has the responsibility to deliver an independent study to the European Commission, based on best professional internal and external expertise and robust scientific approach regarding expected IWT sector technology developments 2030 and taking account of the diversity of European waterways in TEN-T corridors. A broad stakeholder consultation and intensive involvement of technical experts is therefore key for effective study results and their acceptance.

A presentation and public debate of the results of the study is planned end 2017.

1.3 Purpose of the discussion paper at hand

The draft concept of “Good Navigation Status” is being discussed at several European and regional workshops. The content of the present discussion paper is based on desk research by the consortium and fed by the discussion that took place at the pan-European expert meeting on GNS in Rotterdam at 20^{th} of June as well as by the responses received on the first version of the discussion paper concerning the scope and elements of Good Navigation Status. This paper serves as input for the regional workshops on Good Navigation Status (GNS) planned on:

- 7^{th} of September, Klaipeda
- 14^{th} of September, Budapest
- 16^{th} of September, Strasbourg
- 17^{th} of October, Berlin

At the regional workshops it is the aim to further elaborate the concept by means of a more detailed presentation and discussions on the GNS concept and approach. This includes the list of “hard components” as well as “soft components”. The hard components focus on the actual waterway parameter values and ensuring a seamless and reliable transport. The soft components are a mix from the viewpoint of a wider scope of navigation or processes, either infrastructure-related or traffic-related which are needed to reach good scores on parameters for ”hard” components and to satisfy user requirements.

While “hard” components can be monitored by quantitative parameters in a systematic and consistent way across Europe, the wider scope and indirect process related components are regarded as “soft” components. The monitoring for soft components shall also be based on a structure providing minimum requirements for reporting (e.g. a checklist) but might be more qualitative and more tailored to the region. The latter shall also be found out through the planned regional workshops.

The planned discussions will also address the required guidance, stock taking of good practices brought forward in the regional workshops and a first discussion on exemption criteria. In addition, this paper serves as a basis for further bilateral contacts with experts. There will also be a meeting with experts representing waterway users organised by Inland Navigation Europe and the European Shipper`s Council on 13th of October where the topic is addressed. Furthermore, experts not able to attend the regional workshops are invited to respond by e-mail.

The general questions to be discussed at the regional workshops and/or via other means are:

- What is your view on the GNS concept and approach as presented in chapter 2? Do you agree? Do you have comments and/or suggestions for modification?
- What is your view on the GNS "hard" components and parameters?[1]
- What are the main topics in your view which need to be addressed in a guideline document on developing GNS?[1]
- What are in your view the possible criteria for the exemptions to be granted by the European Commission to Member States for not reaching the minimum requirements on draught (less than 2,50 m) and on minimum height under bridges (less than 5,25 m)? Can you give examples of situations where exemptions could be justifiable and for what reason?
- Into what extent is the sketched process for development of GNS already 'common practice' ? Is the process applicable in practise?
- Are external factors such as innovation and climate change sufficiently integrated in the concept?

2. GNS Concept and approach

2.1 Proposed definition of "Good Navigation Status"

Based on consultations of experts and the desk research carried out so far, the following definition of GNS is proposed:

"Good Navigation Status (GNS) means the state of the inland navigation transport network, which enables efficient, reliable and safe navigation for users by ensuring minimum waterway parameter values and levels of service."

Moreover, GNS is to be achieved considering the wider socioeconomic sustainability of waterway management.

2.2 Implications of the proposed definition

The definition determines GNS as reference for efficiency, reliability and safety of inland navigation, taking into account the sustainability from a wide socioeconomic viewpoint. According to the definition GNS should implement this by ensuring **minimum waterway parameter values** and **level of service**.

[1] More specific questions about the „hard" and "soft" componentsand the possible contents of the guideline document are presented in chapter 3 resp. 4 of this discussion paper

- The waterway parameter values refer to the physical dimensions of the waterways, which are key determinant for economies of scale and efficient inland navigation. This includes also the link to energy consumption and related air pollutant and climate change emissions.
- The level of service addresses a wide scope of navigation conditions relevant for efficiency, reliability and safety of inland navigation. As regards reliability, the level of service is determined by the availability of physical dimensions and capacity to ensure efficient navigation without time restrictions and to avoid delays related to lack of capacity. Various factors focusing on information and traffic management determine the safety of navigation.

The GNS concept needs to take up all these aspects and also consider the wider socioeconomic sustainability.

The GNS concept shall be **consistent with the existing regulations and shall consolidate the relevant requirements as regards the inland waterway network which are covered by various paragraphs of the TEN-T Regulation 1315/2013**[2]. The specific GNS requirement as specified in TEN-T (article 15.3 b) will bring added value on top of the existing requirements as regards the state of the inland navigation transport network. The dimensions of waterways are already directly addressed by articles 15.3 a) and 16 b) of the TEN-T regulation. GNS as stipulated by article 15.3 b) can build on these provisions. Furthermore, article 15.3 c) makes provisions regarding RIS and 39.2 b) regarding the availability of the clean fuels infrastructure for propulsion of vessels.

An added value to be brought by elaborating "Good Navigation Status" is that the **GNS process shall include implementation of measures to improve the navigation quality on the network as well as monitoring of the status**. Furthermore, revision of the concept shall be foreseen to anticipate and profit from external developments such as new innovations, market demand and climate change. The process shall also include the issue of exemption criteria as defined in article 15.3 a).

Based on the TEN-T Regulation 1315/2013, achieving GNS in 2030 for the TEN-T comprehensive network -as described above - would require the following, broken down by **4 items**:

1) Implementation of article 15.3 a): **Class IV** dimensions and **minimum requirements**
2) Implementation of article 16.b): Introducing **higher targets than Class IV where appropriate**
3) Implementation of articles 15.3c) and 39.2 b): **RIS and clean fuels**
4) Implementation of article 15.3 b): the **overall concept of GNS which includes**
    - the items 1-3
    - the GNS process
    - the wider scope and application of **exemption criteria** as referred to in article 15.3a)

The overall concept of GNS is outlined in more detail in section 2.3 on the next pages, taking into account the links to the above mentioned articles in the TEN-T Regulation 1315/2013.

[2] Good Navigation Status is mentioned explicitly in the TEN-T regulation 1315/2013 in article 15.3b: http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1315&from=EN

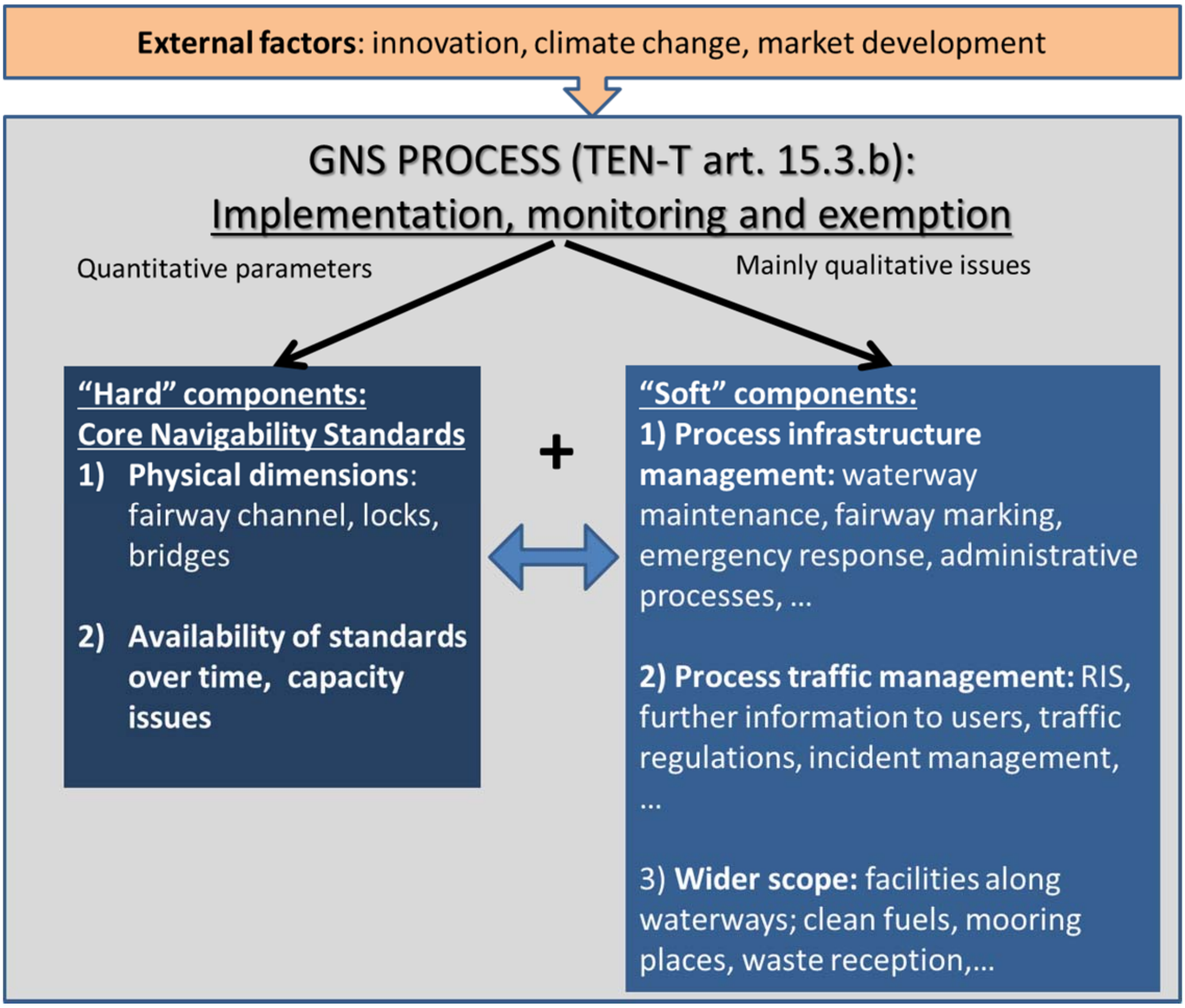
2.3 Implementation of the overall concept of GNS (article 15.3 b) according to minimum standards for a process and methodology

Article 15.3 b) states that “rivers, canals and lakes are maintained so as to preserve good navigation status”.

In order to specify this requirement, the consortium proposes a concept with:

- output-oriented and quantitative measureable **GNS “hard” components in the core addressing the navigability standards and their parameter values,**
- **GNS “soft” components which are more indirect and/or qualitative** of nature**,**
- **minimum standards for the process** of achieving GNS for the relevant parts of the network including the implementation of measures, standards for monitoring and exemptions

This GNS concept shall be open to anticipate and benefit from external factors such as innovations, climate changes and market developments. Therefore it shall be regularly be updated



GNS “hard” components:

- The “hard” components have the **following characteristics**.
  - Focus on physical waterway infrastructure as core output of waterway management
  - Homogeneous parameters applicable to the entire TEN-T waterway network
  - They are directly targeted by TEN-T and/or AGN
  - They consist of quantitative parameters and it is feasible to make Good Navigation Status measureable, comparable on waterway sections of the TEN-T waterway network providing meaningful information using Key Performance Indicators
  - Experts in the GNS working group confirm priority

- Thus, the parameters for GNS “hard” components shall solely relate to **the physical waterway infrastructure** and its use. Parameters shall:
  - describe the **dimensions of the navigation channel in rivers, canals and lakes** (depth, width, height standards) which are determining the vessel dimensions
  - address the **availability** of the navigation channel
  - describe the **dimensions of locks, ship lifts and bridges**
  - describe the **availability and capacity** of locks, ship lifts and moveable bridges

- Based on these parameters and their values, core KPIs can be applied such as the “Navigation Reliability” according to TEN-T minimum requirements and local targeted dimensions and also KPIs to address the level of seamless transport (e.g. issue of waiting times). The **targets** as regards the parameters for the **GNS ”hard” components** shall be linked to implementation of articles 15.3 a) and 16 b) of the TEN-T guidelines:
  - Implementation of 15.3 a) The relevant TEN-T network waterways shall be compliant with the TEN-T minimum requirements, providing at least CEMT Class IV dimensions and are thereafter maintained properly to ensure these minimum values for parameters describing the dimensions for the transport users of the waterway notably the 2,5 metre draught and 5,25 metre available height under bridges on 365 days per year.
  - Implementation of article 16.b): Introducing higher targets than Class IV where appropriate: higher parameter values than class IV are to be defined on sections of the waterway network where necessary to meet user requirements / market demand. The consortium proposes that this shall be done by the responsible national/regional waterway authorities on basis of internationally agreed specifications (e.g. CEMT) or of an international agreement in force (e.g. AGN).

- For the **availability and capacity parameters**, targets – agreed transnational/ national/ regionally and across sectors - shall apply. These shall also be developed according to the minimum standards for the process and methodology for the on development of GNS taking into account the wider socioeconomic impacts / sustainability.

- For GNS ”hard” components, **exemption criteria** may apply as regards the TEN-T minimum requirements, both as regards the value on the draught and height under bridges as regards the full year availability.

- The parameter values shall be **monitored on section level via the TENtec database[3].**

GNS ”soft” components:

- The ”soft” components either relate to process-related aspects of infrastructure management (e.g. maintenance, marking) or of traffic management (e.g. information to users), which contribute to the score of ”hard” components, or to a wider scope of inland navigation infrastructure (e.g. facilities along waterways such as for example clean fuels).

- GNS ”soft” components have the following characteristics:
  - Process-related components for waterway and traffic management are important for GNS, but the indirect results of the quality of these processes are measured by scores on parameters for the ”hard” components (e.g. actual draught and waiting times).
  - The relevance of ”soft” components might be limited to specific regions and there can be large regional differences, depending for example on processes already in place
  - Specific EU regulations might already apply for these components
    - Implementation of standards set out in the RIS Directive on the comprehensive network (Article 15.3 c)
    - Implementation of the standards set out in the Clean Fuels Directive on the core network (Article 39.2 b)
  - ”Soft” components need not to be measurable in a quantitative manner across Europe on the level of specific sections. For example they can be monitored by means of more qualitative descriptions about processes relevant for reaching good scores on the ”hard” components
  - Experts in the GNS working group confirm their relevance as regards GNS, but not their priority compared to the output of waterway management in terms of physical dimensions of fairways, locks and bridges and their availability.

- **For ”soft” components**, targets and objectives– agreed transnational/national/regionally and across sectors - shall apply, which shall be developed according to the minimum standards for the development process of GNS.

- These targets and objectives shall be oriented on the **GNS good practice guidelines**, which can cover or refer to valuable sources of information about GNS aspect. This may include provision of information to users, communication with users of the river, lake or canal and sustainable waterway maintenance and management. The **guidelines shall be frequently updated and expanded** with additional guidance and good practices for topics, to take into account innovations, climate change and market developments.

[3] TENtec is the European Commission's information system to coordinate and support the Trans-European Transport Network Policy (TEN-T). The TENtec Public Portal provides timely information to the public (citizens and professionals) through interactive maps, a map library and various audio-visual elements.
See: http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/index_en.htm

- Monitoring and reporting about the progress made as regards the soft components of GNS may be done based on minimum requirements by means of checklists that also refer to the guidelines and good practices.

In chapter 3, the GNS "hard" and "soft" components are further specified. Parameters and a first draft of structure and contents of the guidance document as regards good practices for development of GNS are introduced.

Minimum standards for the process and methodology

The GNS concept does include minimum standards for the process and methodology for achieving "Good Navigation Status" in a systematic way for all the sections of the TEN-T network. Achieving GNS by 2030 will require to deploy a process which is characterised by the following features:

a. Identifying waterway sections for which GNS will be defined. As a starting point, these sections are the ones referred to in the TENtec system.

b. Setting for each of the sections objectives/targets in a coordinated way between waterway managers (if applicable – (trans-)nationally/regionally coordinated) and with consultation of the various stakeholders, taking systematically consideration of:
   - The minimum TEN-T requirements
   - The transport potential demand and user requirements of a waterway section
   - Local conditions as regards the waterway sections (hydrology, hydro-morphology, extreme weather events)
   - Further uses of a river, lake or canal; application of a cross-sectoral approach
   - The applicable environmental law and where possible creating synergies ("working with nature") linking to for example the Water Framework Directive
   - Cost and benefits of measures from a broad socio-economic perspective
   - Possibilities of innovation and technological development (e.g. ship design, maintenance technologies)

c. Based on a systematic consideration of criteria above and other exemption criteria to be defined, according to article 15.3 a), at request of a Member State in duly justified cases, exemptions can be granted by the European Commission from the minimum requirements on draught (less than 2,50 m) and from minimum height under bridges (less than 5,25 m) as well as the continuous availability of these minimum dimensions during 365 days a year.

d. Regularly monitoring of status of the inland waterway sections as regards the GNS "hard" and "soft" components parameters and KPIs for GNS and the progress

e. Implementation of remediating measures in case of deviation, targeting full compliance by 2030

f. Communicating status and measures to the involved users of the river, lake or canal by the waterway managers and discussing them jointly before realisation

3. Specification of hard and soft components

The overall framework of the GNS concept is provided in the previous chapter. This chapter 3 provides more details on the hard and soft GNS components. For the hard components the parameters provide the basis. KPIs can be defined for the monitoring of the development of values of the parameters in relation to targets. For the soft components a list is provided of topics to be covered.

3.1 Hard GNS components and parameters

Various studies and cost-benefit analyses have shown the strong relation between parameter values for the waterway dimensions and the sustainability, efficiency and reliability of inland waterway transport (IWT). The sustainability, efficiency and reliability are decisive for the attractiveness of IWT and therefore are essential for the modal share of IWT and generating benefits for society.

In general, for highly efficient transport by inland waterways to reach economies of scale, there is a need to be able to execute transport using the maximum load capacity of the vessel/convoy. The payload shall be as high as safely possible, navigating from origin to destination without delays (no waiting times) while taking into account the fuel consumption (speed/power profile depending on the waterway conditions on the section). Moreover, depending on the size of the transport volume, there can be a socio-economic rationale based on Cost Benefit Analyses to increase the waterway dimensions available for inland navigation and to increase the reliability and productivity (for example expansion of service times and capacity of locks and by minimising closure times of links and objects).

The load can be defined in terms of tons (weight) but also in volume (e.g. m^3 or number of containers/TEUs). Therefore, the following waterway parameters provide the foundation for the definition and evaluation if a section is reaching a good navigation status:

- Possible **draft** of the vessel, the minimum **depth** on a stretch of the waterway
- The possible **beam** of the vessel, the **width** of the waterway and the curve radius
- Possible **height** of the vessel, the **air clearance** under bridges and other infrastructure
- Possible **length** of a vessel, depending on the curve radius and size of locks

In order to allow higher efficiencies, the waterways in Europe and beyond have been classified according to standards. We refer in this respect to the measurement of dimensions according to the ECMT classification table[4] which serves as the main reference in the TEN-T guidelines and also AGN as this is setting the basic principles in waterway design and maintenance for the parameter values to be reached.

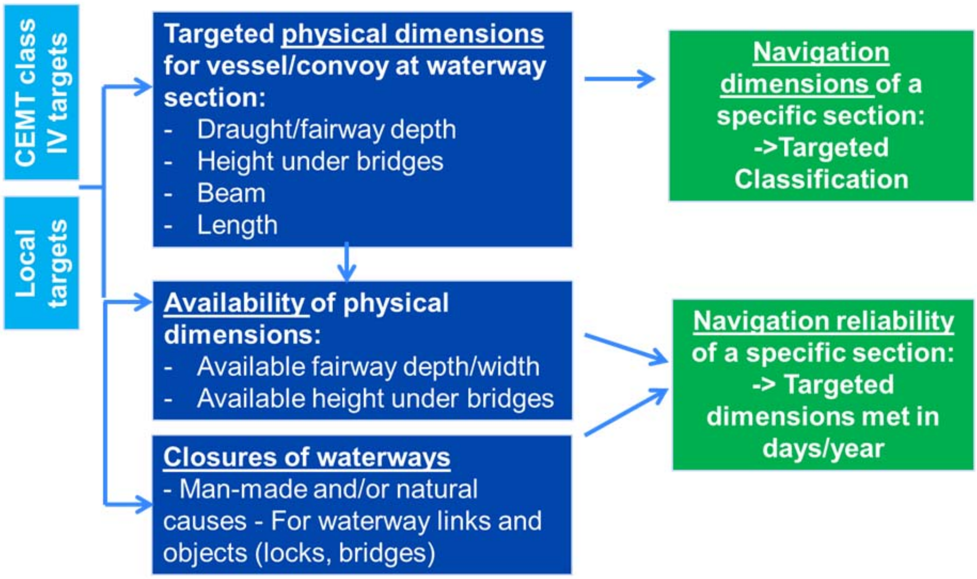
[4] ECMT RESOLUTION No. 92/2 ON NEW CLASSIFICATION OF INLAND WATERWAYS,
see http://www.itf-oecd.org/sites/default/files/docs/wat19922e.pdf

However, it is not only about the static values of parameters for the targeted dimensions of waterways, but into large extent the efficiency and **reliability of inland navigation depends on dynamic factors** such as the actual available depth and **waiting times for vessels**. **The 'time' dimension is quite relevant**.

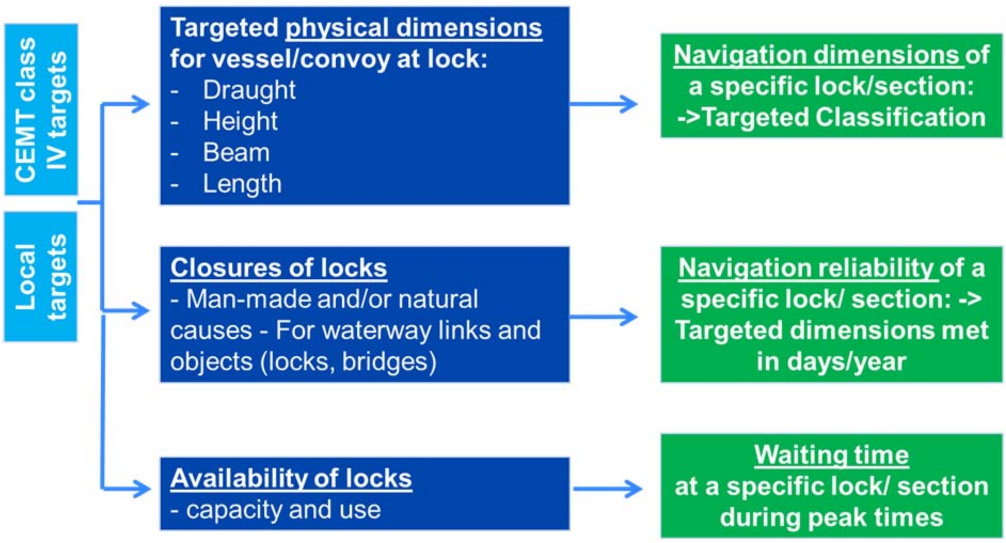
Based on the scores on the parameters (the actual day-to-day values) the navigation reliability can be estimated. **The navigation reliability is a KPI for the hard component of GNS. Another KPI is the waiting times at objects in the waterway network**, depending on the traffic intensity in relation to the capacity of waterways (including locks, bridges, lifts).

The next two figures present both KPIs and their relation to parameters for the hard components of GNS.

Scheme for waterway sections (links):



Scheme for locks in the inland waterway network:



Navigation Reliability
The journeys on the inland waterways are covering multiple sections of the waterway network. From the viewpoint of efficiency the section with the smallest value on the waterway parameters is decisive for the type of vessel and the dimensions and the load (draught, height).

The values for the parameters need to be made visible for various sections, in particular at sections where bottlenecks can occur and where water levels are dynamic and can be critical in terms of low depth on the fairway channel that may restrict the draught of the available vessels. It shall be monitored on day-to day basis into what extent the parameter values on the sections of the waterways are available and/or affected. Moreover, it is recommended to identify the reasons for not achieving the targeted values. In this respect natural factors can be distinguished such as low water discharge, ice and floods but also man-made reasons that can cause reduced availability of the section such as maintenance works and accidents that may block the waterway or reduce the capacity.

Waiting times
Furthermore there can be specific locations in the network where waiting times occur. The **KPI** which is strongly demanded by the transport industry is the **waiting time during peak times at locks and bridges**. However, for waiting times there is no common European definition and data is scattered. Information on underlying factors (e.g. service times of locks/bridges, physical characteristics like number and dimensions of lock chambers) is available in better quality. Furthermore, alternatives may be used, such as the average number of vessels waiting at the lock or the intensity of chamber utilisation. It is therefore questionable if it is feasible to include this KPI in the GNS concept and it shall be discussed what steps are possible needed to do this.

Since data for parameters and KPIs shall be available across Europe on section level and shall lead to meaningful and comparable information, there is a limitation to the range of KPIs that can be applied.. Building upon work carried out by a group of experts under PLATINA II[5], in which data availability was screened, a revision was made on the OMC Glossary for TENtec taking into account the first results of the GNS study. After a screening and filtering process a list of parameters was prepared to describe the situation for the hard components in a quantitative way using parameters. The monitoring of values for these parameters shall take place by means of TENtec. The latest version of the updated Glossary for TENtec for the Inland Waterways is presented in the Annex of this discussion paper. The parameters which are in particular relevant for output on the hard components of GNS are highlighted in yellow while the relevant KPIs for GNS are highlighted in green. Furthermore, for the dynamic parameters, their number is indicated in red colour.

As regards the current TENtec Glossary, there are some open issues that are proposed for a further discussion at the regional workshops and/or with experts in a bilateral way.

[5] For more information on this extensive PLATINA II work, please see the downloads page of www.NAIADES.info:
http://www.naiades.info/repository/public/documents/Downloads/31_D4.2_Information%20Architecture_2015-04-22.pdf
http://www.naiades.info/repository/public/documents/Downloads/31_Platina_Glossary_30.xlsx

These questions to address are:

- What is your view on the KPI for navigation reliability? Do you agree that this is a core KPI for GNS? What are your comments? Do you have suggestions for modification?
- There is a need for a common standard on the measurement and reporting of waiting times at locks and bridges. Do you have suggestions how to develop a common standard for Europe? What is the recommended method for measurement and definition?
- To what extent is the information on closures broken down to the waterway link and/or objects such as locks and bridges? What is the standard period for closures taken into account (12h – 24h – other)? How was this standards period chosen?
- What would be the criteria to judge whether a man-made closure is properly announced? Which limit in advance to users is appropriate (6 weeks – 12 weeks – 6 months – 1 year)? How was this standards period chosen?
- For what elements and indicators can significant developments be expected towards the year 2030 as regards data availability, e.g. using modern technologies to collect fairway channel depth data from vessels (Covadem, Prominent), using AIS for tracking/tracking (e.g. waiting times), others?

3.2 Soft GNS components and topics

The soft components cover **process related** components and a **wider range of topics** which are not directly linked to the physical waterway infrastructure in the first place. Furthermore, in order to avoid duplication, some of the soft components refer to directives that are already in place, for example as regards the monitoring and measures to comply with these directives.

Existing directives (RIS, Clean fuels)
Here we can specifically mention River Information Services (RIS) Directive. RIS are of key importance to transport users and waterway managers for safe, reliable and efficient navigation on the inland waterway network. It has its own EU legal framework with specific regulations and expert groups. GNS does not duplicate this, but it shall be made sure that RIS is fully implemented, at least according to the minimum legal requirements. Furthermore, it may also go beyond the minimum requirements depending on user needs, market conditions etc..

As regards the sustainability of navigation of vessels, there is an obvious link to the availability of clean fuels (e.g. LNG) and also availability of shore power. Therefore, an element of Good Navigation Status is the compliance with the Clean Fuel Directives framework which specifies the minimum requirements for the clean fuel infrastructure along rivers, canals and lakes. Similar to RIS, the Clean Fuels Directive has its own process of implementation and monitoring on EU level and does not need to be duplicated but a reference shall be made as regards the GNS development process.

<u>Process related components: infrastructure and traffic management</u>
Topics which are included under the soft GNS components in relation to processes for **infrastructure management** and **traffic management** are:

- Providing further information to users
- Traffic regulations
- Incident management
- Administrative processes
- Emergency response

<u>Wider scope as regards facilities and services</u>
Furthermore there is the category of soft components relate to a wider scope such as facilities along waterways. This may take into account mooring places, internet access, waste reception facilities, etc.

It shall be noted that "soft" components may be rather regional specific, depending on the local conditions and processes already in place.

For many of these aspects, no distinctive, quantitative targets can be defined on the level of individual TENtec sections and objects. Thus, **benchmarks need to be identified** and ways towards their realisation on the European waterway network outlined. For that purpose, **Good Practice Guidelines for Development of GNS** will be elaborated, which have also been demanded by the GNS Expert Group. Selected Good Practices in developing GNS will be collected, outlined and analysed for their transferability to other European waterways.

4. Guideline document and monitoring of GNS

4.1 GNS Guideline document

The following topics are seen as the key topics to be addressed in the further work of the consortium. The list represents a selection made from the viewpoint of the consortium. This selection however is based on long list that was compiled together with the expert group and on bilateral discussions. The aim is to keep the Guidelines focused on the most important issues that were mentioned – harmonisation of key expressions and concepts, illustrating the definition of GNS as proposed by the study, outlining the minimum standards of a process to develop GNS as well as good practices for maintenance and rehabilitation concepts for fairway, locks and bridges. A list of further topics that are of interest due to their relevance for GNS is also provided.

The guidance document shall be seen as a living document which needs to be regularly updated and expanded with additional information. The next table of contents is proposed in this first version to be prepared in the framework of this study in 2016-2017:

1. Introduction and reference to further manuals
2. Basic information on fairway parameters and navigability (hard components)
    a. Key vocabulary and definitions
    b. Reference water levels
    c. Water levels and fairway depth
    d. Fairway depth and draught
    e. …
3. Definition of GNS and implications
4. Minimum standards of a process on GNS development and monitoring
5. Good Practices for maintenance and rehabilitation concepts (fairway, locks, bridges)
6. Further topics in need of discussion (information to users, technological development, emergency response …)

The following questions as regards the ”soft” components and GNS guideline document are proposed for a further discussion at the regional workshops and/or with experts in a bilateral way:

- Do you agree with the selection of topics to be addressed in the first version?
- On which topics is guidance most needed?
- Which good practices on GNS would you like to provide from your background/expertise?
- Are there specific requirements towards the form/methodology of the guideline document?

4.2 Monitoring

Monitoring shall be a consolidated action based on the guidelines applying KPIs and checklists in relation to the guidelines. The monitoring of development and status of waterway sections as regards their ‘Good Navigation Status’ shall **cover both values for parameter values and KPIs for the hard components and also address topics for the soft components**. The latter can be done by means of a checklist with reference to the guidelines, good practices and their transferability.
Furthermore, also the link between the hard and soft components (e.g. quality of processes that have a positive contribution on the parameter values of hard components) is relevant to take into account.

The monitoring results are input for the discussion about measures, for example in case targets are not reached. Subsequently the measures need to be developed also according to a set of minimum requirements and can be inspired by means of good practice examples.

For the monitoring also minimum requirements need to be developed (later in the GNS study as part of the guidelines). The deployment of monitoring can be part of the roadmap. It is rather obvious that a big part of the monitoring will be done by means of TENtec. Already significant work has been carried out to define the glossary and to include parameters and some KPIs relevant for GNS as well.

For this reason the TENtec details are further presented and specific comments are to be made to feed the further development of the monitoring process based on TENtec:

Monitoring using TENtec

First basic parameters are the **physical dimensions** of vessels that are targeted to navigate on a waterway link or an object such as a lock or bridge. These data are available, e.g. referring to ECMT classification. The parameter that represents the real **navigation reliability** of a waterway section (taking into account dynamic day-to-day values) is seen as a **core KPI building on the parameters for physical dimensions and availability.** In this indicator, several pieces of information come together as regards the achievement of the targeted physical dimensions over time (see parameter 26 and 27 in the Annex on the TENtec list). This is more challenging as it shall take into account the dynamics of water levels and riverbed morphology as well as closures of waterway links and objects such as locks and bridges. This is especially relevant for free-flowing river sections as they are often very dynamic as regards their depth and width.

Within the framework of data collection for TENtec, data will be collected for the defined parameters in the Annex for the various TENtec sections of the inland waterway network. This data provides the basis for monitoring the Good Navigation Status as regards the hard components. The latest version of the Glossary contains four categories for data to be collected:

- Waterways links: 35 parameters, of which 20 parameters are considered static
- Lock complexes: 8 parameters, of which 2 are considered to be static
- Lock chambers: 9 parameters, of which 8 are considered to be static
- Bridges: 6 parameters, all considered to be static

These 58 parameters contain a number of parameters that are considered as KPIs for Good Navigation Status. Basically all relevant GNS parameters are captured for the monitoring purposes in the revised TENtec glossary as regards waterway dimensions, their dynamic performance during the year (reference water levels) and also closures and waiting times (parameters to describe elements for capacity and intensity).

It shall be kept in mind that the efforts to collect the data shall not be too high. In this respect, it shall be remarked that the number of parameters for which the value will change is limited. Out of 58 parameters there are 22 dynamic parameters while 36 are considered to be static and are not expected to change on a year-by-year basis. Furthermore, it is taken into account that the data for these parameters shall be already available in a digital way, therefore reducing the efforts to collect and process the data for the TENtec database on Inland Waterways.

The TENtec data collection work started in June and shall be finished by October 2016 (carried out by another consortium). Next a first network assessment will be made for GNS based on the collected data. Further data collections for TENtec are planned for 2017 and the data shall be updated each year. Data to be collected in 2017 is expected to cover also parameters about port related issues and facilities along waterways.

Based on the current parameter values also a discussion can start between stakeholders about the targets for these parameters (e.g. minimum draught, % navigation reliability, metres of bridge clearance, maximum times for closures per year). Furthermore, the basic requirements from TEN-T regulations such as minimum Class IV draught and height under bridges already provides a set of targets in case no higher targets are feasible according the GNS development process.

Annex: TENtec Glossary for Inland Waterways – version 4 July 2016

Waterways

New ID	TENtec Technical Parameter Name	Definition	Data type	Remarks
1	Waterway name	Identifier for river or canal (Suggest to use the RIS-Index WWNAME)	string	
2	Fairway Section Code	RIS Index Fairway section code assigned by the national authorities. It represents the coding of a waterway section within a national network and is only unique in combination with the country code. Cross references to RIS implementation tables. e.g. DE-00700 for the Elbe River in Germany	string	
3	Waterway type	1) Free flowing river section, 2) Impounded river section, 3) Canal, 4) Lake or 5) Estuary with tidal influence (sea level).	enumeration	See PLATINA II Manual on Waterway Maintenance, p. 10 for the definition of free flowing river section. A canal has a flat bed. Water levels can fluctuate. An impounded section has no flat bed, but a bed that can change morphology and also fairway depth. But not as much as a free flowing section. It is the same as an impounded section, but water levels and riverbed morphology vary much, much more. If it is a mixed section, then record the type that is prevailing on that section.

4	Active	Whether stretch is open/operational.	boolean	Allows inclusion of planned infrastructure within the network if it is included already in the TEN-T maps (1315/2013 EC) and definition of TEN-T core network and/or included as a planned project in the Corridor Work Plans.
5	Water flow direction	"Yes" - for the sections where the direction of the section in GIS layer corresponds to the water flow "No" -for the sections where the direction of the section in GIS layer does not correspond to the water flow For a canal this sequence will follow the distance marks defined by the waterway authority.	boolean	General remark: if a section is longer and comprises several values for the parameter, the prevailing one shall be given
6	CEMT class	Lowest categories of navigable inland waterways on the section : Class (length/beam) I to III, IV, V a, V b, VI a, VI b, VI c, VII According to the definition in 1992: see also http://www.itf-oecd.org/resolution-no-922-new-classification-inland-waterways	enumeration	
7	Zone	I, II, III, IV, R (Directive 2006/87/EC)	enumeration	
8	Local Knowledge Requirements	Whether local knowledge requirements (LKR) are applicable on this stretch, normally due to difficult nautical conditions. Refer to: http://www.unece.org/fileadmin/DAM/trans/doc/2010/sc3wp3/ECE-TRANS-SC3-2010-12e.pdf http://www.unece.org/fileadmin/DAM/trans/doc/2014/sc3wp3/ECE-TRANS-SC3-2010-12-c1e.pdf	boolean	

9	Maximum length of vessel/convoy	Maximum allowed vessel/convoy size in length for the width defined in Parameter 10. Please encode 999 for “no limit”. A default value is provided based on the CEMT classification (Parameter 6).	double	This parameter shall be adapted if the allowed dimensions based on national legislation for the waterway (Police Regulations, e.g. Binnenvaartpolitiereglement in The Netherlands and Chapter 11 of the Police Regulations for the Navigation of the Rhine (RPNR)) differ from the dimensions based on the CEMT class. This shall not take into account special (oversized) transports that require special permits. Note: the maximum length needs to be filled in an then the maximum width for a vessel with the indicated maximum length may be completed
10	Maximum width of vessel/convoy	Maximum allowed vessel/convoy size in width for maximum length defined in Parameter 9. Please encode 999 for “no limit”. A default value is provided based on the CEMT classification (Parameter 6).	double	This parameter shall be adapted if the allowed dimensions based on national legislation for the waterway (Police Regulations, e.g. Binnenvaartpolitiereglement in The Netherlands and Chapter 11 of the Police Regulations for the Navigation of the Rhine (RPNR)) differ from the dimensions based on the CEMT class. This shall not take into account special (oversized) transports that require special permits. Note: the maximum length needs to be filled in an then the maximum width for a vessel with the indicated maximum length may be completed
11	Maximum draught of vessel/convoy	Maximum allowed vessel/convoy size in draught at reference water level. Please encode 999 for “no limit”. A default value is provided based on the CEMT classification (Parameter 6).	double	This parameter shall be adapted if the allowed dimensions based on national legislation for the waterway (Police Regulations, e.g. Binnenvaartpolitiereglement in The Netherlands and Chapter 11 of the Police Regulations for the Navigation of the Rhine (RPNR)) differ from the dimensions based on the CEMT class. This shall not take into account special (oversized) transports that require special permits.
12	Minimum bridge clearance	Minimum height under bridges on the section at reference high water level available for vessel/convoy to pass the section. Please encode 999 for “no limit”. A default value is provided based on the CEMT classification (Parameter 6).	double	This parameter shall be adapted if the allowed dimensions based on national legislation for the waterway (Police Regulations, e.g. Binnenvaartpolitiereglement in The Netherlands and Chapter 11 of the Police Regulations for the Navigation of the Rhine (RPNR)) differ from the dimensions based on the CEMT class. This shall not take into account special (oversized) transports that require special permits. Furthermore, there is a direct relation with Parameter 3 of the BRIDGES layer (“Passage height limit (meters)”)). Possibly there is more than one bridge on the section. Therefore the parameter shall take the smallest value of the bridge height limit.

13	Maintenance target: Fairway width	Minimum targeted width of the fairway bottom in the section for the targeted minimum fairway depth (Parameter 14) This value will be collected especially if there is no direct value for the maximum allowed width of the vessel (Parameter 10: Maximum width of vessel/convoy). This is also related to the maximum width at specific points of the fairway to pass bridges. The cell will be left blank if no additional targets apply. This shall allow potentially different targets compared to standards for CEMT IV waterways width.	double	
14	Maintenance target: Fairway depth	Minimum targeted depth of the fairway bottom in the section for the fairway width specified in Parameter 13. This value will be collected especially if there is no direct value for the maximum allowed draughtof the vessel (Parameter 11: Maximum draught of vessel/convoy).This shall allow potentially different targets compared to standards for CEMT IV waterways depth. The cell will be left blank if no additional targets apply.	double	

15	Reference Low Water Level	State the applicable reference gauging station, the type of minimum water level value (e.g. GIW, RNW, MLW, NAP, Adriatic Sea) and the value for the Pegel that is decisive for the TENtec section as regards the available depth / possible draught of the vessel. (e.g. 'Maxau/GIW/369')	string	The actual water levels alone (pegel values) do not provide information on the actual fairway depth and available air clearance (container layers). The water levels needs to be provided at a statistical reference water level, such as GIW (Gleichwertiger Wasserstand, Rhine) or RNW (Regulated Niedrigwasserstand, Danube) in order to calculate the actual fairway depth. Parameter 15 is needed to correctly interpret Parameter 17 and Parameter 18. Also for canals reference values are commonly used. However, a split needs to be made between reference (low) water levels for the depth and related targets for maintenance and between the reference (high) water level used for the air clearance of the waterway (e.g. bridges). Furthermore it is recommended to add as well the relevant gauging station along the waterway which serves as the reference point for the reference water level. Examples are: http://www.platformzeroincidents.nl/wp-content/uploads/2016/01/Calculation-navigational-depth-R0.pdf, http://www.viadonau.org/en/business/online-services/calculating-loading-capacities/
16	Reference High Water Level	State the applicable reference gauging station, the type of high water level value (e.g. HSW, HNWL, MHW, NAP) and the value	string	See also the regulation on Notices to Skippers (416-2007) a table that provides already a list of gauging stations and references: see the PDF of the regulation, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R0416&from=EN , => page 98 onwards. For an example of head room for a bridge based on the reference high water value, see page 98 of next PDF: https://staticresources.rijkswaterstaat.nl/binaries/Waterway%20guidelines%202011_tcm224-320740_tcm21-37559.pdf
17	Number of days below reference low water level	The number of days per year at which the recorded water level is below the relevant reference low water level (stated in Parameter 15).	integer	
18	Number of days below regulation CEMT class IV draught	The number of days per year at which 2.5m draught was not reached with a safety margin of at least 20cm	integer	This value is specifically aimed on the compliance to the TEN-T regulation 1315/2013 and needs to be considered in relation to Parameter 17

19	Number of days below targeted depth according to waterway manager	The number of days per year at the targeted depth (as specified in Parameter 14) is not achieved.	integer	
20	Number of days above reference high water level	Number of days above reference high water level (see Parameter 16) in the last year	integer	
21	Number of days below regulation CEMT class IV air clearance	The number of days per year at which 5.25m air clearance is not achieved. This value is specifically aimed on the compliance to the TEN-T regulation 1315/2013 and already includes a safety margin of 30 cm according to the CEMT agreement (1992).	integer	
22	Waterway closure manmade-planned	Total number of days when the waterway section is closed for a period longer than 24 hours due to manmade reasons which were planned and announced at least 12 weeks in advance for waterway users	integer	The minimum notification time of at least 12 weeks is based on the RWS guidelines, page 154, link to document: https://staticresources.rijkswaterstaat.nl/binaries/Waterway%20guidelines%202011_tcm224-320740_tcm21-37559.pdf
23	Waterway closure manmade- not planned	Total number of days when the waterway section is closed for a period longer than 24 hours due manmade reasons which were not planned	integer	Includes closures due to accidents.
24	Waterway closure natural events - ice	Total number of days the waterway section was closed for a period longer than 24 hours due to ice	integer	

25	Waterway closure natural events – high water	Total number of days the waterway section was closed for a period longer than 24 hours due to high water	integer	
26	Navigation reliability (%)	Percentage based on the number of days per year, on which the waterway is available for navigation and meets the targeted requirements for fairway depth (specified in Parameter 14), width (specified in Parameter 13) and for height under bridges (as specified in Parameter 12). This parameter measures the combined score on targets that differ from CEMT class , including national applied targets and also uprated targets for the corridor and days of closure of the waterway	double	
27	Navigation reliability according to CEMT IV (%)	Percentage based on the number of days per year, on which the waterway is available for navigation and meets the targeted requirements as specified in 1315/2013 which specifies the minimum draught, width, length and height under bridges as specified according to CEMT IV. This parameter combines information on the score as regards reaching the CEMT IV vessel dimensions and the number of days of closures of the waterway section.	double	

28	Ship passages both directions	Total number of commercial ship passages (both directions), per year. Commercial is defined as registered as passenger or cargo ship according to regulation 2006/87, applying to vessels of a length of 20 metres or more and a volume of at least 100 m3. It also applies to floating equipment, tugs and pushers, and vessels intended for passenger transport carrying more than 12 passengers in addition to the crew. Convoys shall be counted as one unit. If alternative national definitions are used, these should be used instead.	integer	
29	Ship passages downstream	Number of commercial ship passages upstream, per year.	integer	For rivers, upstream and downstream refer to the natural direction of waterflow, not the way in which the link is directed in TENTEC. For canals, 'downstream' means following the ascending sequence of distance markers, and 'upstream' means following the descending sequence of distance markers.
30	Ship passages upstream	Number of commercial ship passages downstream, per year.	integer	For rivers, upstream and downstream refer to the natural direction of waterflow, not the way in which the link is directed in TENTEC. For canals, 'downstream' means following the ascending sequence of distance markers, and 'upstream' means following the descending sequence of distance markers.
31	Freight traffic flow (tonnes per year)	Tonnes transported on the section, per year.	double	
32	River Information Services	Are the minimum requirements set out by the RIS Directive met on this section?	boolean	

33	Hydrological services	Low water level forecast period (days) with accuracy of ± 10 cm independent from the restricted meteorological forecasts	integer	Probably different confidence intervals and number of days of forecasts are applied and provided by countries. Therefore it is suggested to apply a strict definition and test for feasibility of data collection.
34	Maximum sailing speed	Maximum allowed vessel/convoy speed relative to the ground (not water). In case of differentiated speed per draught, the speed of the maximum allowed vessel type to be filled in. The default value for no regulation is 99 (e.g .for the Rhine)	double	
35	Access charge	Whether distance based access charges are applied on this section: 1) free of charge 2) charge per km 3) charge per ton-km	enumeration	

Lock Complexes

	TENtec Technical Parameter Name	Definition	Data type	Remarks
1	Service times	Total operational hours per year / total hours in the year (%) "Operational" is defined as "non-closure", if 1 or 2 lock chambers are operated, the lock is operational	double	
2	Vessel Traffic	Number of (commercial) vessels through the lock system per year. Commercial is defined as registered as passenger or cargo ship according to regulation 2006/87, applying to vessels of a length of 20 metres or more and a volume of at least 100 m3. It also applies to floating equipment, tugs and pushers, and vessels intended for passenger transport carrying more than 12 passengers in addition to the crew. If alternative national definitions are used, these should be used instead.	integer	
3	Full Year Lock Operation?	Days per year when the doors of the chamber remain open and the vessels can pass the lock when no levelling of water takes place at the lock complex (e.g. in cases of (relatively) high water).	integer	

4	Average Waiting Time at Lock		integer	Record in the remarks at the data the local applied definition for the average waiting time at locks
5	Lock closure natural events - high water	Total number of days the waterway section was closed for a period longer than 24 hours due to high water	integer	
6	Lock closure natural events - ice	Total number of days the waterway section was closed for a period longer than 24 hours due to ice	integer	
7	Lock closure manmade-not planned	Total number of days when the waterway section is closed for a period longer than 24 hours due manmade reasons which were not planned	integer	
8	Lock closure manmade-planned	Total number of days when the waterway section is closed for a period longer than 24 hours due manmade reasons which were planned and announced in advance at least 12 weeks in advance to waterway users	integer	The minimum notification time of at least 12 weeks is based on the RWS guidelines, page 154, link to document: https://staticresources.rijkswaterstaat.nl/binaries/Waterway%20guidelines%202011_tcm224-320740_tcm21-37559.pdf

Lock Chambers

	TENtec Technical Parameter Name	Definition	Data type	Remarks
1	Chamber Configuration	Dropdown List: Single, Double, Three or more	enumeration	
2	Chamber lock width	Width (metres) inside chamber	double	
3	Chamber lock length	Length (metres) inside chamber	double	
4	Chamber lock depth	Depth of water at lock (centimetres) entrance/exit	double	The sill depth at the reference low water level (MLW). (Rijkswaterstaat, 2011, Waterway guidelines, P61) link to guideline document: https://staticresources.rijkswaterstaat.nl/binaries/Waterway%20guidelines%202011_tcm224-320740_tcm21-37559.pdf
5	Chamber lock height	Air-draft Restriction (centimetres) if applicable	double	The headroom under the lift gates and any bridges over the lock. (Rijkswaterstaat, 2011, Waterway guidelines, P61) link to guideline document: https://staticresources.rijkswaterstaat.nl/binaries/Waterway%20guidelines%202011_tcm224-320740_tcm21-37559.pdf
6	Width of lock bay	Minimum Width (metres) of Lock Gates (at entrance or exit)	double	
7	Average operation time	Length of time in minutes to operate one lock cycle, this shall be strictly the lock cycle, excluding transition time of the vessel.	integer	
8	Average chamber utilisation	Total hours per year in which chamber is operational and occupied by one or more vessels / total operational hours of the year (%)	integer	
9	Maximum lock lift capacity	Maximum difference in water level that the lock can handle between the connecting sections (centimetres)	Double	

Bridges

	TENtec Technical Parameter Name	Definition	Data type	Remarks
1	Movable bridge	Whether bridge is moveable (to allow ships to pass)	boolean	
2	Full span of fairway	Does bridge cover the full span of the fairway?	boolean	Reasoning: the objective is to be able to determine whether the bridge is a bottleneck (in terms of bridge clearance, width limit, etc.). Another parameter 'Bridges'/'Passage width limit' captures 'only' the bottleneck in terms of width, so these two parameters are not interchangeable. In addition, in some cases, eg. if there is an island in the middle of the river and both branches of the river form a single waterway section, the parameter 'Bridges'/'Full span of fairway' is useful for both the bridge clearance and width limit for the entire section (meaning for both river branches).
3	Passage height limit	Height limit (centimetres) above reference high water level for fixed bridges, closed moveable bridges, or other overhead structures.	double	
4	Movable bridge passage height (raised/open)	Height limit (centimetres) above reference high water level, for moveable bridge when raised/open (if applicable).	double	
5	Passage width limit.	Width limit (metres) through bridge or equivalent overhead structures measured at reference low water level.	double	
6	Movable bridge service times	Number of hours per year that movable bridge service is available / total hours in the year (%)	double	