



**BSI Standards Publication**

## **Optimal design of hydrometric networks**

---

## National foreword

This British Standard is the UK implementation of CEN/TR 17798:2022.

The UK participation in its preparation was entrusted to Technical Committee CPI/113, Hydrometry.

A list of organizations represented on this committee can be obtained on request to its committee manager.

### Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2022  
Published by BSI Standards Limited 2022

ISBN 978 0 539 16365 0

ICS 07.060

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2022.

### Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

---

TECHNICAL REPORT

**CEN/TR 17798**

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

April 2022

ICS 07.060

English Version

## Optimal design of hydrometric networks

Conception optimale des réseaux hydrométriques

Hydrometrisches Datenetz und Optimierung

This Technical Report was approved by CEN on 27 March 2022. It has been drawn up by the Technical Committee CEN/TC 318.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

<b>Contents</b>	<b>Page</b>
<b>European foreword</b> .....	<b>4</b>
<b>1 Scope</b> .....	<b>5</b>
<b>2 Normative references</b> .....	<b>5</b>
<b>3 Terms and definitions</b> .....	<b>5</b>
<b>4 Nomenclature</b> .....	<b>6</b>
4.1 <b>Categories</b> .....	<b>6</b>
4.2 <b>Geophysical and other restraints originating from the river basin</b> .....	<b>6</b>
4.3 <b>The need for data and information</b> .....	<b>6</b>
4.4 <b>Technical and economic considerations due to data capture, data processing and data archival</b> .....	<b>7</b>
<b>5 Strategic considerations</b> .....	<b>7</b>
5.1 <b>The need for hydrometric data</b> .....	<b>7</b>
5.2 <b>Network requirements</b> .....	<b>8</b>
5.3 <b>Existing and potential users of the catchment data</b> .....	<b>8</b>
5.4 <b>Water resources utilization and demand for water</b> .....	<b>9</b>
5.5 <b>National and international needs</b> .....	<b>10</b>
5.6 <b>Consideration of other hydrological monitoring networks</b> .....	<b>11</b>
<b>6 Factors affecting hydrometric design</b> .....	<b>11</b>
6.1 <b>Patterns of runoff</b> .....	<b>11</b>
6.2 <b>Catchment morphology</b> .....	<b>11</b>
6.3 <b>Winter conditions and snow melt</b> .....	<b>11</b>
6.4 <b>Availability of surrogate gauged catchments</b> .....	<b>12</b>
6.5 <b>Environmental and legislative constraints</b> .....	<b>13</b>
<b>7 Technical considerations</b> .....	<b>13</b>
7.1 <b>Use of temporary networks</b> .....	<b>13</b>
7.2 <b>Choice of measuring technique</b> .....	<b>14</b>
7.2.1 <b>General</b> .....	<b>14</b>
7.2.2 <b>Open channel flow measuring techniques</b> .....	<b>14</b>
7.3 <b>Permanent flow measuring structures</b> .....	<b>15</b>
7.3.1 <b>General</b> .....	<b>15</b>
7.3.2 <b>Accessibility</b> .....	<b>16</b>
7.3.3 <b>Length and quality of established data records</b> .....	<b>16</b>
7.3.4 <b>Distribution of gauging stations</b> .....	<b>16</b>
7.3.5 <b>Representative basins</b> .....	<b>16</b>
7.3.6 <b>Coastal floodplains and other low gradient environments</b> .....	<b>17</b>
<b>8 Methods of network design</b> .....	<b>17</b>
8.1 <b>User survey</b> .....	<b>17</b>
8.2 <b>Prioritization</b> .....	<b>17</b>
8.3 <b>Physiographic impacts</b> .....	<b>18</b>
8.4 <b>The use of deterministic models to inform hydrometric network design</b> .....	<b>18</b>
8.5 <b>Statistical techniques</b> .....	<b>19</b>
8.6 <b>Optimization and review</b> .....	<b>20</b>
<b>9 Addressing uncertainty in network design</b> .....	<b>21</b>

<b>9.1</b>	<b>The concept of uncertainty .....</b>	<b>21</b>
<b>9.2</b>	<b>Uncertainty inherent in hydrometric networks.....</b>	<b>21</b>
<b>10</b>	<b>The socio-economic importance of the network.....</b>	<b>22</b>
<b>10.1</b>	<b>Techniques to justify a hydrometric network – use of cost benefit analyses .....</b>	<b>22</b>
<b>10.2</b>	<b>Techniques to justify a hydrometric network – evaluating the strategic value of a network.....</b>	<b>22</b>
<b>10.2.1</b>	<b>Data requirements .....</b>	<b>22</b>
<b>10.3</b>	<b>Network reviews and cost benefit analysis.....</b>	<b>24</b>
<b>10.4</b>	<b>Socio-economic costs of not having hydrometric data.....</b>	<b>25</b>
<b>11</b>	<b>Ensuring sustainability.....</b>	<b>26</b>
<b>11.1</b>	<b>The sustainability of the network.....</b>	<b>26</b>
<b>11.2</b>	<b>Carbon footprint and maintaining sustainability .....</b>	<b>26</b>
<b>11.3</b>	<b>The impact of climate change and change in land use .....</b>	<b>26</b>
<b>12</b>	<b>Decommissioning sites in a network.....</b>	<b>27</b>
	<b>Annex A (informative) Typical operating costs of a hydrometric network.....</b>	<b>28</b>
	<b>Bibliography .....</b>	<b>29</b>

## **European foreword**

This document (CEN/TR 17798:2022) has been prepared by Technical Committee CEN/TC 318 “Hydrometry”, the secretariat of which is held by BSI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

## 1 Scope

This document provides guidance to assist with the planning and design of hydrometric networks, to ensure a better understanding of the water cycle and that any data are observed and collated in an effective and appropriate manner. This document is intended for use when:

- a new network is being planned and designed;
- the nature, value and extent of an existing network is being reviewed;
- a redundant network is being decommissioned or modified.

This is to ensure that the impacts of these changes are considered objectively, and all changes are adequately monitored and recorded.

Even though this document covers network design principles in general it focuses mainly on river (streamflow) monitoring networks.

This document covers all aspects that are considered pertinent to the design of hydrometric networks. The guidance is intended to be used to inform the decision-making process employed by the network's owners and operators. The objective nature of the review will ensure that all influential factors, both beneficial and otherwise, are considered. This will ensure that primary and potential alternative uses of the network are considered. It will also ensure compliance with any extant environmental legislation.

The intended audience for this document may include:

- Government, Non-Government Organizations (NGOs), agencies and other organisations which are responsible for designing and developing hydrometric networks that provide data to support a public service.
- Research and academic institutions that aim to develop a better understanding of the natural and human influences on the hydrological cycle.
- Developers of the built environment seeking to comply with environmental legislation that requires them to monitor those parts of the natural hydrological cycle that have been, or will be, impacted by their activities.
- Any individual seeking a better understanding of the water cycle for private and personal reasons.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>