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Work Package title	Network Integration and Improvement
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Executive summary

Led by the EuroGOOS Tide Gauge Task Team, and part-funded by the H2020 EuroSea project, an online live, managed tide gauge metadata catalogue for all permanent tide gauges along European and adjacent coastlines is now in version 1.0 of its development. This Tide Gauge Metadata Inventory was designed to address inconsistencies and omissions in metadata across European tide gauge data portals, enabling tide gauge operators to populate a single centralised tide gauge inventory with comprehensive metadata, which can then be accessed by data portals and data aggregators to standardise their own metadata records.

1. Introduction

"Sea level is one of the critical variables of our environment and clearly one of the marine parameters with more impact on the coastal population. Its measurement along the coasts has been made since the early XIX century by means of tide gauges that still today represent one of the fundamental methods of determination of trends in mean sea level and extremes (and their relation to climate change), tidal computation, geodetic applications, harbour operations and navigation and, more recently, integration in new sea level hazards warning systems (tsunamis and storm surges)"[1].

The EuroGOOS Tide Gauge Task Team (TGTT) expert group is an important operational component of the European Ocean Observing System (EOOS[2]) framework providing an environment for mutual cooperation across a European network of tide gauge operators where knowledge, expertise and data are shared and duplication of effort is reduced. The TGTT supports the development and maintenance of a permanent and sustainable tide gauge network connecting with existing initiatives such as Copernicus Marine Services (CMEMS) data exchange, the Global Sea Level Observing System (GLOSS) and the Permanent Service for Mean Sea Level (PSMSL). One of the thirteen EuroGOOS TGTT objectives or Terms of References (ToRs) is to "Contribute to the development of the EOOS with the identification of duplication and/or gaps on the geographical coverage and on the existing sea level data portals in Europe". To address the TGTT ToRs, one of three listed ToR deliverables focused on the "Development of the Tide Gauge Inventory, funded by EuroSea WP3" is addressed in this EuroSea report.

2. Development of a Tide Gauge Inventory

Local and national initiatives are critical for the operation and maintenance of tide gauge instruments, ensuring longevity in data acquisition. Such initiatives naturally lead to the development of internet web portals that provide information on marine and transitional water body level monitoring stations serving the local and national interests. In recent years, the EuroGOOS TGTT, a European network of tide gauge platforms, determined that metadata information for existing European tide gauges was often difficult to find online and this led the group to cooperative work developing a European tide gauge inventory. The European Union member states and adjacent coastal countries with discoverable tide gauge installations considered viable permanent sea level monitoring nodes were identified and collated (some adjacent states with no discoverable gauges were included for future reference). The resulting inventory includes both

[1] https://eurogoos.eu/download/tide-gauge-tt-tor/?wpdmdl=12115&refresh=645a0cf29c5631683623154
[2] https://www.eoos-ocean.eu/

regular managed tide gauges and Global Sea Level Observing System (GLOSS) equipped stations. All tide gauge information readily discoverable on line was captured in the list. Tide gauge developers and network operators had multiple meetings and discussions to agree on the inventory metadata fields and together collected the required information for the metadata catalogue. This is an iterative process with a lot of time required to check the database content for accuracy. The Marine Institute Application Development team created a database that is flexible to facilitate future changes to the catalogue.

2.1. Metadata fields in the Tide Gauge Inventory

One hundred and forty three metadata fields are contained within the European and adjacent areas Tide Gauge Network Inventory (EU-TGN; metadata fields are listed in Table 1).

Table 1. Target data fields captured in the tide gauge Inventory

No.	Metadata field
1	ID
2	Station Name
3	Abstract
4	Host Organisation
5	Contact details 1
6	Contact details 2
7	Contact details 3
8	Contact details 4
9	Contact details 5
10	Contact details 6
11	Contact details 7
12	Contact details 8
13	Program management contact
14	Technical contact
15	Funding source (main)
16	Is sensor managed (Yes , No)
17	Water level instrument(s) servicing frequency
18	Organisation performing water level instrument(s) service
19	Organisation performing water level instrument (s) service website
20	Water level instrument(s) calibration frequency
21	Organisation performing water level instrument(s) calibration
22	Organization performing water level instrument(s) calibration web site
23	Funding source sustainable (Secure , Not Secure)
24	National datum reference
25	Land survey reference system
26	Location WGS84 lat.
27	Location WGS84 lon.
28	Local calibration reference point datum offset
29	Number of water level sensors
30	Water level instrument type #1
31	Water level instrument type #2
32	Water level instrument type #3
33	Mean sea level sensor present (Yes , No, Unknown)
34	Mean sea level sensor type
35	Mean sea level sensor datum offset
36	Water level sensors sampling rate (seconds)
37	Water level sensors reporting rate (seconds)
38	Number of ancillary sensors
39	Type of ancillary sensor 1
40	Type of ancillary sensor 2
41	Type of ancillary sensor 3
42	Type of ancillary sensor 4
43	Type of ancillary sensor 5
44	Type of ancillary sensor 6
45	Data collection - water level logging frequency (seconds)
46	Data collection -water level measurement averaging between samples (seconds)
47	Data collection status - water level upload frequency (seconds)
48	Time series start date (mmyyyy)
49	Contact details for information
50	Base station software #1
51	Base station software #2
52	Web page for data requests
53	Are tidal predictions available for location (Yes, Yes, to the public, No)
54	Tidal predictions web site
55	Data portal 1
56	Data portal 2
57	Data portal 3
58	Data portal 4
59	Data portal 5
60	Data portal 6

No.	Metadata field
61	Data portal 7
62	Data portal 8
63	Data portal 9
64	Data portal 10
65	GNSS station: (Yes/No)
66	Distance GNSS-TG:
67	GNSS data processing institute:
68	Elipsoidal height to TGBM:
69	Vertical land movement trend:
70	IsGlossStation
71	Country_LocationGauge
72	LayerID_validated_location (1_Yes,2_No)
73	What3Words_geoCodeSystem
74	PlusCode_Google
75	Station Name
76	Host Organisation
77	Contact details 1
78	Contact details 2
79	Contact details 3
80	Contact details 4
81	Contact details 5
82	Contact details 6
83	Contact details 7
84	Contact details 8
85	Program management contact
86	Technical contact
87	Funding source (main)
88	Is sensor managed (1 yes, 2 no)
89	Water level instrument(s) servicing frequency
90	Organisation performing water level instrument(s) service
91	Organisation performing water level instrument (s) service web site
92	Water level instrument(s) calibration frequency
93	Organization performing water level instrument(s) calibration
94	Organization performing water level instrument(s) calibration web site
95	Funding source sustainable (1 secure, 2 not secure)
96	National datum reference
97	Land survey reference system
98	Latitude
99	Longitude
100	Local calibration reference point datum offset
101	Number of water level sensors
102	Water level instrument type #1
103	Water level instrument type #2
104	Water level instrument type #3
105	Mean sea level sensor present (1 yes, 2 no)
106	Mean sea level sensor type
107	Mean sea level sensor datum offset
108	Water level sensors sampling rate (seconds)
109	Water level sensors reporting rate (seconds)
110	Number of ancillary sensors
111	Type of ancillary sensor 1
112	Type of ancillary sensor 2
113	Type of ancillary sensor 3
114	Type of ancillary sensor 4
115	Type of ancillary sensor 5
116	Type of ancillary sensor 6
117	Data collection - water level logging frequency (seconds)
118	Data collection -water level measurement averaging between samples (seconds)
119	Data collection status - water level upload frequency (seconds)
120	Time series start date (mmyyyy)
121	Contact details for information
122	Base station software #1
123	Base station software #2
124	Web page for data requests
125	Are tidal predictions available for location (1 yes, 2 yes to public, 3 no)
126	Tidal predictions web site
127	Data portal 1
128	Data portal 2
129	Data portal 3
130	Data portal 4
131	Data portal 5
132	Data portal 6
133	Data portal 7
134	Data portal 8
135	Data portal 9
136	Data portal 10
137	GNSS station: (Yes/No)
138	Location WGS84 lat.
139	Location WGS84 lon.
140	Distance GNSS-TG:
141	GNSS data processing institute:
142	Ellipsoidal height to TGBM:
143	Vertical land movement trend:

2.2. Countries with metadata collected on tide gauges

EU Member States and adjacent non-EU countries with coastlines were included in the initial search for information (Table 2). Sea areas where tide gauge monitoring was identified cover the coastlines of the Atlantic Ocean, Irish Sea, Norwegian Sea, North Sea, Baltic Sea, Mediterranean Sea, Tyrrhenian Sea, Ionian Sea, Adriatic Sea and the Aegean Sea.

Landlocked countries or states with a Black Sea coastline such as Austria, Bulgaria, Czech Republic, Hungary, Luxembourg, Romania, Slovakia were considered out of scope in this task, but should be reconsidered in future iterations.

Table 2. European Union Member States and adjacent coastal countries included in V1.0 tide gauge catalogue development.

Subset #1	Subset # 2	Subset #3
Albania	Algeria	Belgium
Bosnia Herzegovina	Croatia	Cyprus
Denmark	Egypt	Estonia
Finland	France	Gaza Strip
Germany	Greece	Ireland
Israel	Italy	Kaliningrad
Latvia	Lebanon	Libya
Lithuania	Malta	Monaco
Montenegro	Morocco	Netherlands
Norway	Poland	Portugal
Slovenia	Spain	Sweden
Syria	Tunisia	Turkey (Med. coast)
United Kingdom		

Three volunteers were tasked to collate all readily discoverable tide gauge information in the catalogue. Populating the database was a process that followed the law of diminishing returns, with metadata information on fields such as geographic location usually easy to find on-line or through conversations with people responsible for the tide gauge stations, while other metadata field discovery in some cases was extremely challenging. The best approach in future iterations of the tide gauge database development is for the tide gauge network operators to populate and keep current the data relating to their own organisations.

A range of web sites and information sources were visited to collect tide gauge metadata information, including (but not limited) to the list in Table 3.

Table 3. Non-exhaustive list of websites with useful information for the tide gauge catalogue.

Region	Website address
Croatia	https://www.hhi.hr/en
Cyprus	http://www.oceanography.ucy.ac.cy/cycofos
France	https://data.shom.fr/
Global	https://webcritech.jrc.ec.europa.eu/SeaLevelsDb/Home
Global	http://ioc-sealevelmonitoring.org
Global	http://www.psmsl.org/data/obtaining
Global	http://www.sonel.org/?lang=en
Global	https://msi.nga.mil/NGAPortal/MSI.portal
Global	http://www.ioc-sealevelmonitoring.org/list.php?order=delay&dir=asc&contact=81
Ireland	Ireland www.irishtides.ie
Ireland	www.waterlevel.ie
Italy	www.mareografico.it
Malta	https://www.um.edu.mt/research/oceanographymalta/research/meteo-marine-observations/
Netherlands	https://www.agentschapmdk.be/en/flemish-hydrography
Netherlands	https://meetnetvlaamsebanken.be/?l=en
Poland	http://www.imgw.pl
Spain	https://www.puertos.es, https://portus.puertos.es/?locale=en#/
Sweden	https://www.smhi.se/oceanweb/sea-observations#ws=wpt-a,proxy=wpt-a,tab=vatten,param=sealevel
Turkey	http://www.koeri.boun.edu.tr/

3. Tide Gauge metadata catalogue Products

The two key products from the work presented in this report include the web portal, and the underlying database which are now sufficiently complete and accurate thanks to EuroSea task activities.

3.1. Web Portal

The web application uses GeoNetwork, a flexible catalogue application for managing spatially referenced resources. Implementation, management, maintenance and support for the EU-TGN is carried out by the Marine Institute following an IOC-IODE accredited Data Management - Quality Management Framework (see Appendix 1).

The web link, http://EUTGN.marine.ie opens in a home page (Fig. 1) with options to view a European Tide Gauge geographic locations map (Fig. 2), to browse tide gauge records (Fig. 3) and to drill down to a tide gauge station of interest (Fig. 4). The portal can also be accessed from the EuroGOOS TGTT website[3].

The system is simple, intuitive and incorporates useful graphics organising and describing the records.

A colour scheme is used to indicate the amount of metadata information which exists relating to a given monitoring site, where red indicates a low level of metadata fields populated and green a relatively large level of data input (Fig. 2).

[3] https://eurogoos.eu/tide-gauge-task-team/

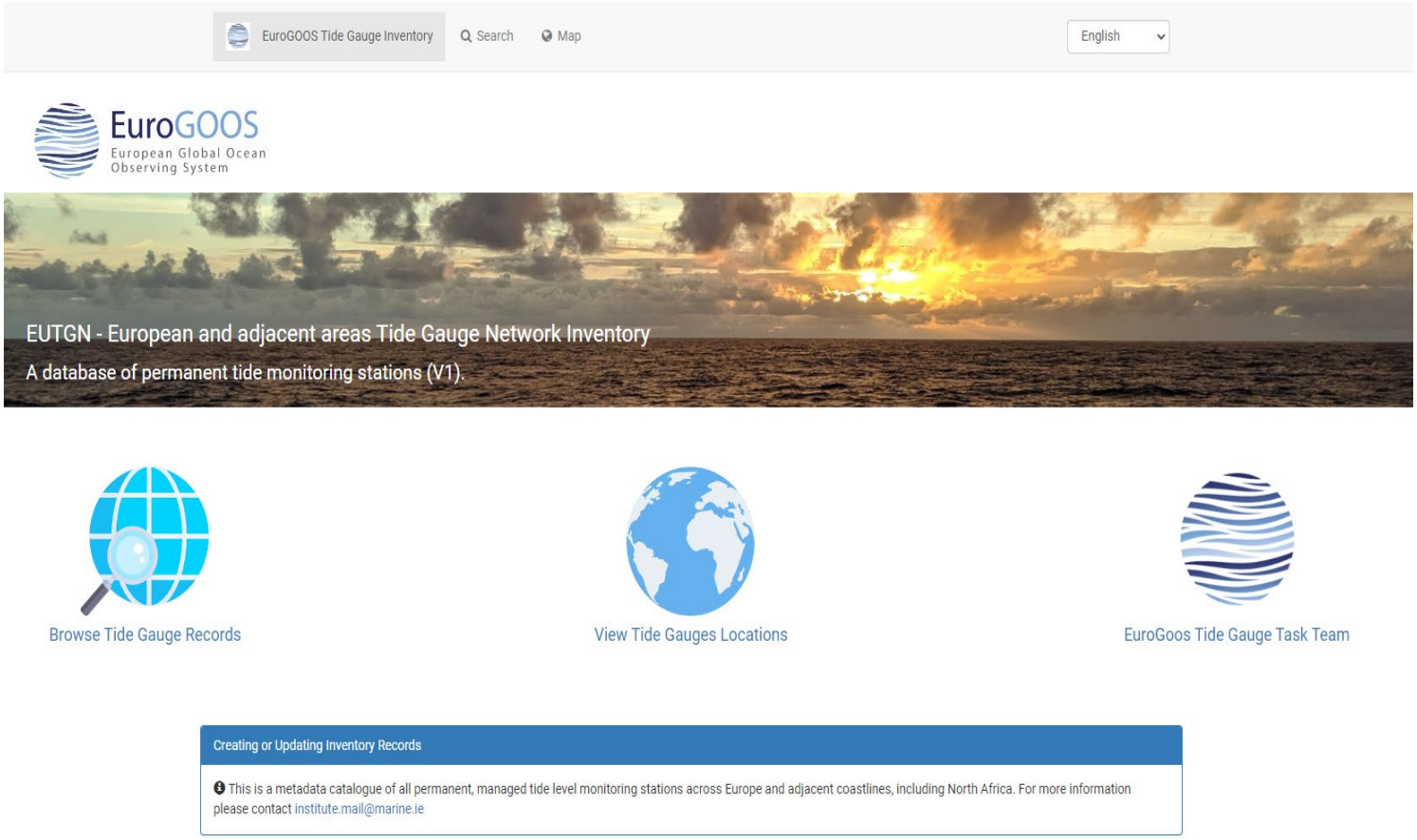


Figure 1. Visualisation of the web portal Landing page (EU-TGN.marine.ie).

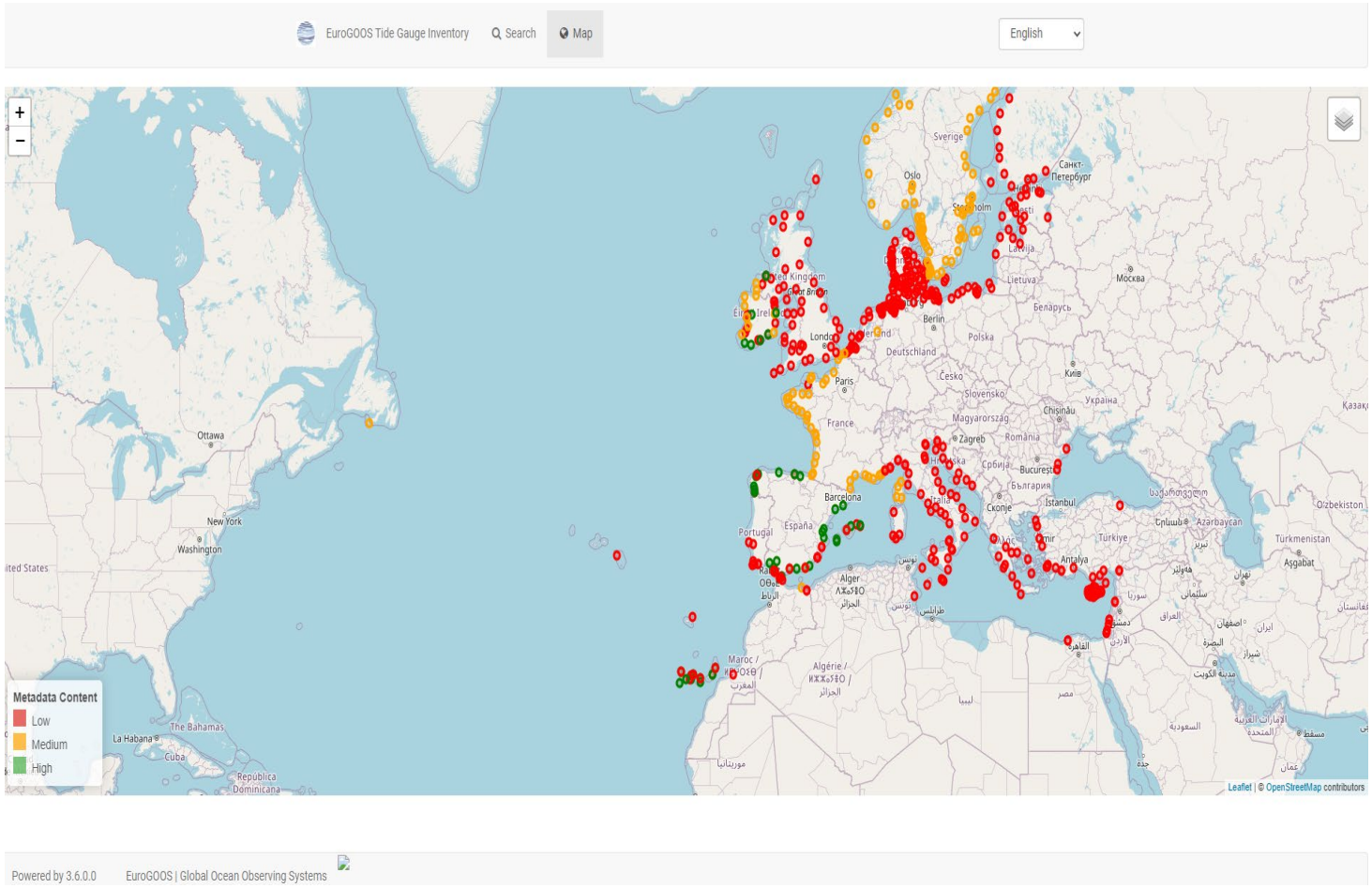


Figure 2. Visualisation of the web portal Interactive map showing all the database entries.

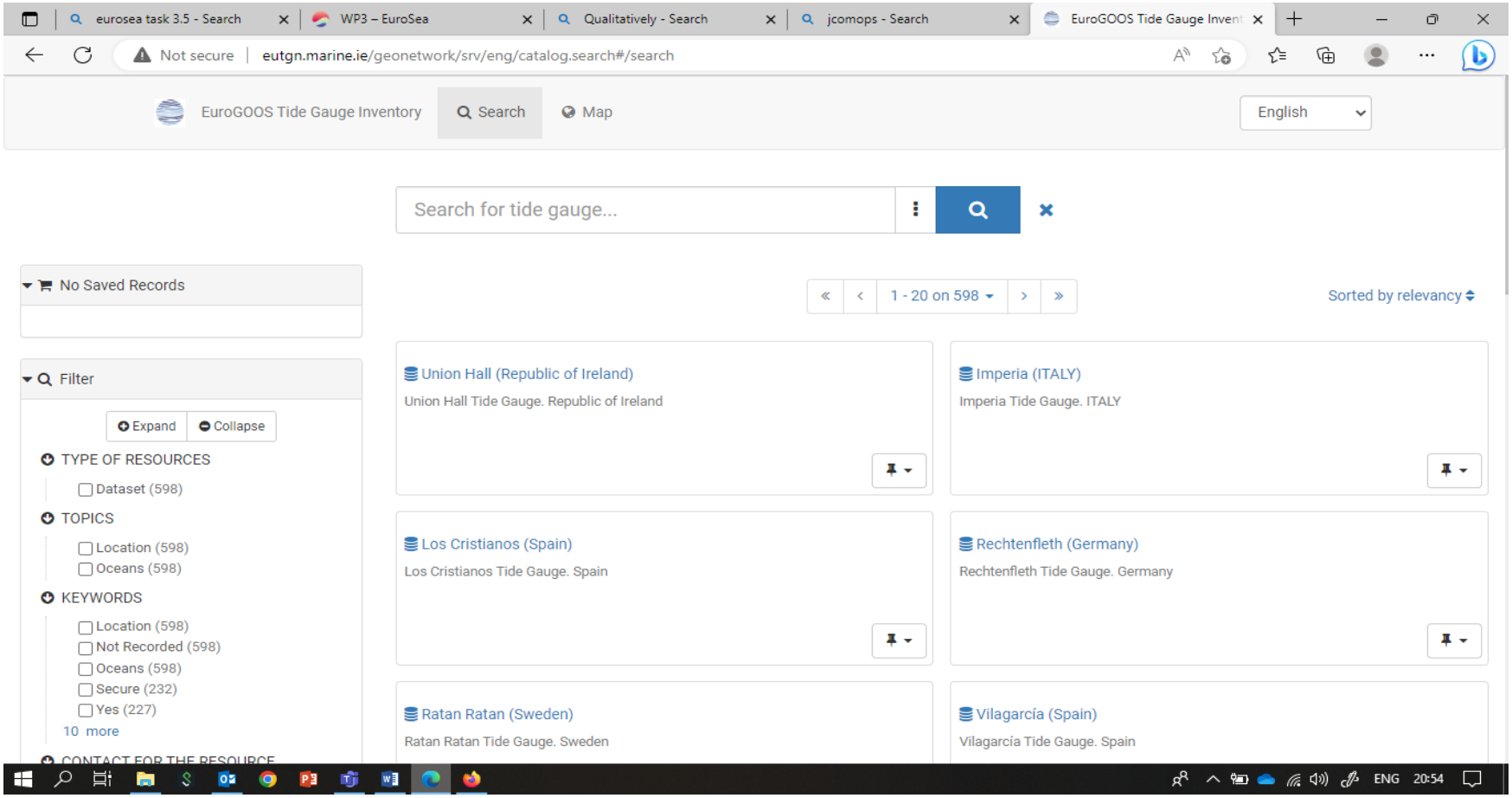


Figure 3. Visualisation of the web page to browse tide gauge records.

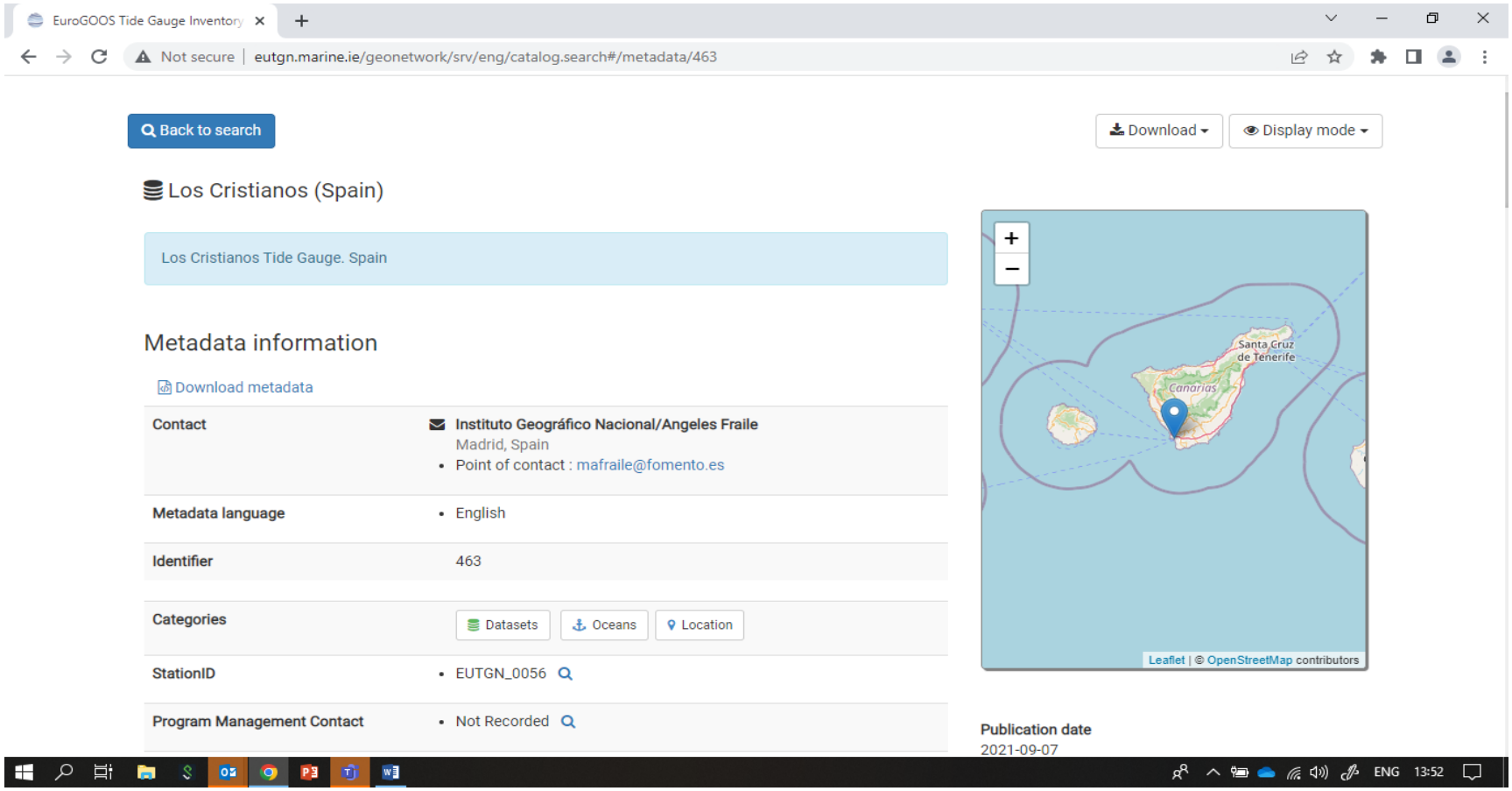


Figure 4. Visualisation of a sample station entry in the web portal.

3.2. Database: Procedure to update metadata fields

Overview

Trusted parties can edit the metadata directly in the database through the use of a Google Sheet which 'feeds' into the EU-TGN application.

The tide gauge inventory is currently maintained in a live Google Sheet and any update made in this sheet is automatically saved. Access to the Google Sheet is granted by submitting a request directly to the system administrator, or alternatively when signed into a user Gmail account via a link. Each row in the Google Sheet represents a separate monitoring station. To add a new gauge station a new row of data must be added, ensuring that a minimum information on station name, country, latitude and longitude are populated. Edits made in the Google Sheet are updated and reflected in the web application on a weekly basis.

A unique ID is generated for each new station entered (see example "EUTGN-0056" in Fig. 4). The database format is flexible in case the EuroGOOS TGTT want to include other key identifiers at a later date. For example, there is a need to cross referenced existing records with geographic locations for duplicates in the catalogue and to cross reference stations with external databases.

Procedure to add information in the Google Sheet

The tide gauge inventory is currently maintained in a Google Sheet[4] (Fig. 5). Data in the Google Sheet feeds into the EU-TGN web application. Any update to the Google Sheet is automatically saved. Edit access is granted to members of the task team and other trusted parties who request it. Once a user has access to the Google Sheet they can grant access to teams who plan to populate the database.

To edit the sheet, one must have a Google Account and a Gmail address, one can use a personal account or set up a personal account if needed.

Edits made on the Google Sheet are reflected in the application every Thursday, the sheet has a version history to keep track of changes made, in the case data needs to be retrieved

Included in the Google Sheet is a tab called 'How to use' with additional information on using the Google Sheet.

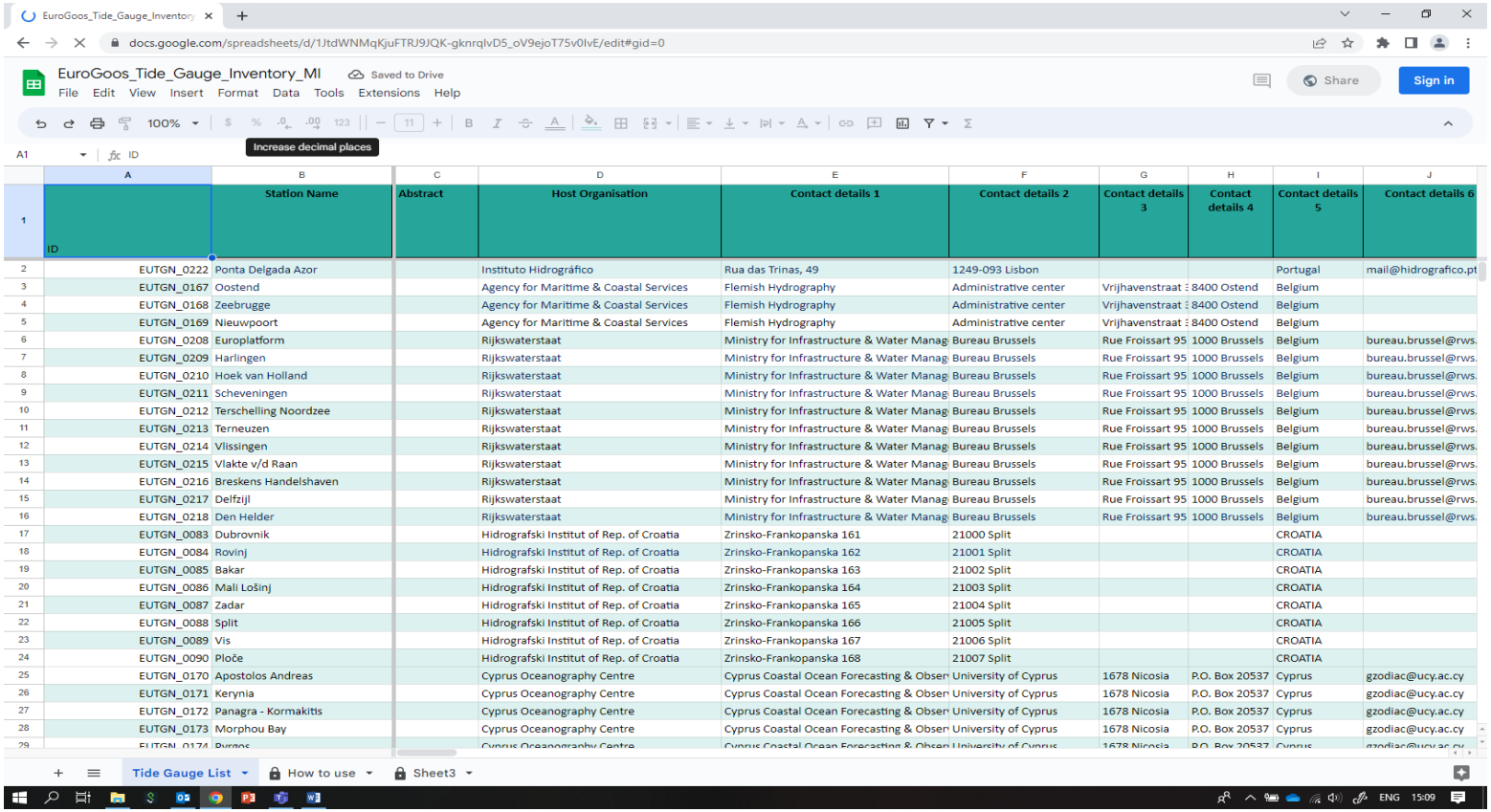
Support is provided on an ongoing basis and queries can be sent by email to institute@marine.ie for the attention of the Irish National Tide gauge Network office where queries will be responded to.

How to get access

To get access to the Google Sheet please send your Gmail address to the system administrator and editing rights will be assigned.

Alternatively, when signed into a Gmail account, please select the link below and click on 'request access'
https://docs.google.com/spreadsheets/d/1JtdWNMqKjuFTRJ9JQK-gknrqlvD5_oV9ejoT75v0IvE/edit#gid=0

[4] https://docs.google.com/spreadsheets/d/1JtdWNMqKjuFTRJ9JQK-gknrqlvD5_oV9ejoT75v0IvE/edit#gid=0

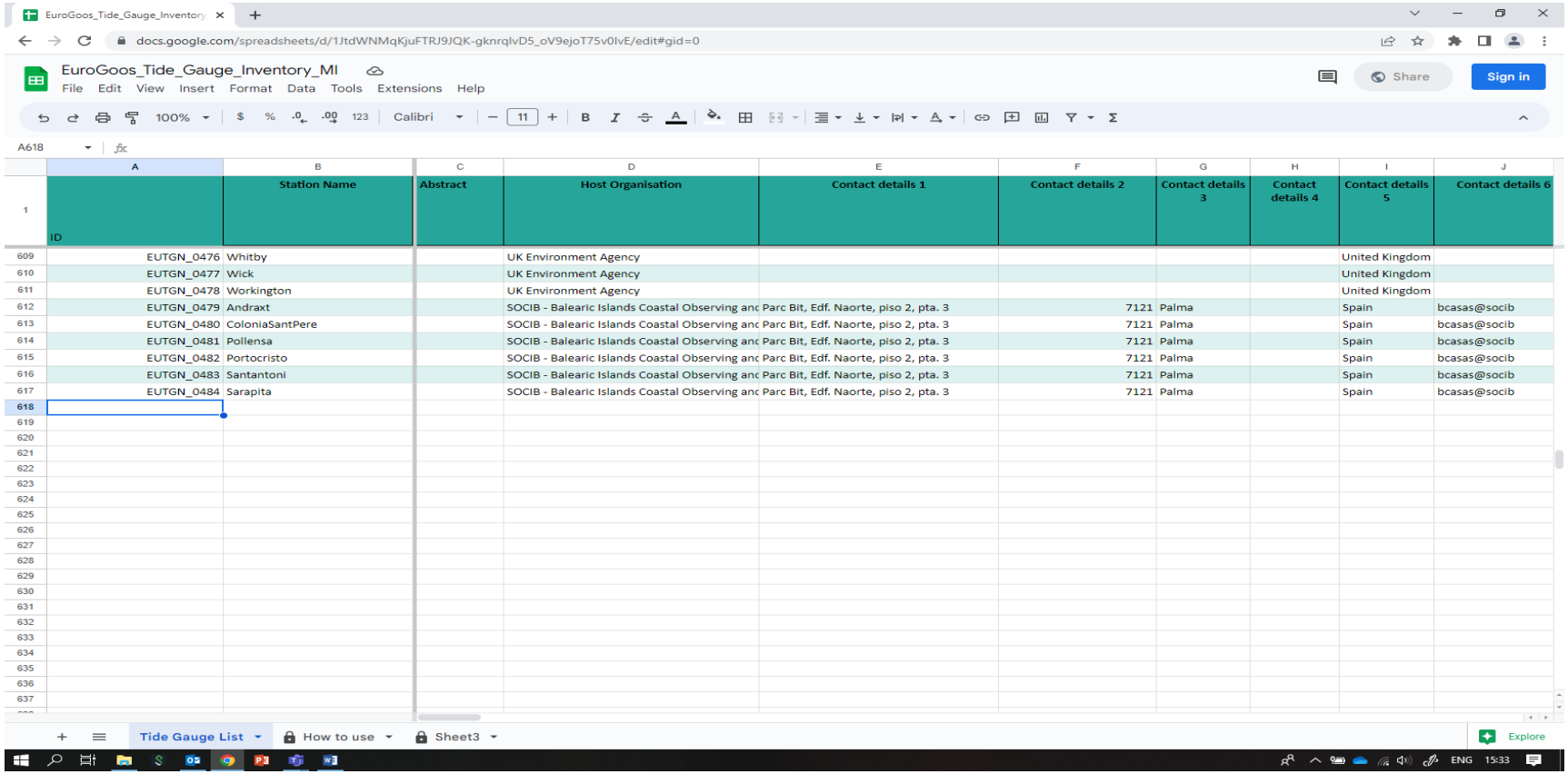


ID	Station Name	Abstract	Host Organisation	Contact details 1	Contact details 2	Contact details 3	Contact details 4	Contact details 5	Contact details 6
EUTGN_0222	Ponta Delgada Azor		Instituto Hidrográfico	Rua das Trinas, 49	1249-093 Lisbon			Portugal	mail@hidrografico.pt
EUTGN_0167	Oostend		Agency for Maritime & Coastal Services	Flemish Hydrography	Administrative center	Vrijhavenstraat 3	8400 Ostend	Belgium	
EUTGN_0168	Zeebrugge		Agency for Maritime & Coastal Services	Flemish Hydrography	Administrative center	Vrijhavenstraat 3	8400 Ostend	Belgium	
EUTGN_0169	Nieuwpoort		Agency for Maritime & Coastal Services	Flemish Hydrography	Administrative center	Vrijhavenstraat 3	8400 Ostend	Belgium	
EUTGN_0208	Europlatform		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0209	Harlingen		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0210	Hoek van Holland		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0211	Scheveningen		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0212	Terschelling Noordzee		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0213	Terneuzen		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0214	Vlissingen		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0215	Vlakte v/d Raan		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0216	Breskens Handelshaven		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0217	Delfzijl		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0218	Den Helder		Rijkswaterstaat	Ministry for Infrastructure & Water Manag	Bureau Brussels	Rue Froissart 95	1000 Brussels	Belgium	bureau.brussel@rws.
EUTGN_0083	Dubrovnik		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 161	21000 Split			CROATIA	
EUTGN_0084	Rovinj		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 162	21001 Split			CROATIA	
EUTGN_0085	Bakar		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 163	21002 Split			CROATIA	
EUTGN_0086	Mali Lošinj		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 164	21003 Split			CROATIA	
EUTGN_0087	Zadar		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 165	21004 Split			CROATIA	
EUTGN_0088	Split		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 166	21005 Split			CROATIA	
EUTGN_0089	Vis		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 167	21006 Split			CROATIA	
EUTGN_0090	Ploče		Hidrografski Institut of Rep. of Croatia	Zrinsko-Frankopanska 168	21007 Split			CROATIA	
EUTGN_0170	Apostolos Andreas		Cyprus Oceanography Centre	Cyprus Coastal Ocean Forecasting & Obser	University of Cyprus	1678 Nicosia	P.O. Box 20537	Cyprus	gzodiac@ucy.ac.cy
EUTGN_0171	Kerynia		Cyprus Oceanography Centre	Cyprus Coastal Ocean Forecasting & Obser	University of Cyprus	1678 Nicosia	P.O. Box 20537	Cyprus	gzodiac@ucy.ac.cy
EUTGN_0172	Panagra - Kormakitis		Cyprus Oceanography Centre	Cyprus Coastal Ocean Forecasting & Obser	University of Cyprus	1678 Nicosia	P.O. Box 20537	Cyprus	gzodiac@ucy.ac.cy
EUTGN_0173	Morphou Bay		Cyprus Oceanography Centre	Cyprus Coastal Ocean Forecasting & Obser	University of Cyprus	1678 Nicosia	P.O. Box 20537	Cyprus	gzodiac@ucy.ac.cy

Figure 5. A web browser view of the Google Sheet.

Adding Data

Each row in the Google Sheet represents an individual tide gauge, to add a new gauge start a new row of data as shown in figure 6.



	A	B	C	D	E	F	G	H	I	J
1	ID	Station Name	Abstract	Host Organisation	Contact details 1	Contact details 2	Contact details 3	Contact details 4	Contact details 5	Contact details 6
609	EUTGN_0476	Whitby		UK Environment Agency					United Kingdom	
610	EUTGN_0477	Wick		UK Environment Agency					United Kingdom	
611	EUTGN_0478	Workington		UK Environment Agency					United Kingdom	
612	EUTGN_0479	Andraxt		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
613	EUTGN_0480	ColoniaSantPere		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
614	EUTGN_0481	Pollensa		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
615	EUTGN_0482	Portocristo		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
616	EUTGN_0483	Santantoni		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
617	EUTGN_0484	Sarapita		SOCIB - Balearic Islands Coastal Observing anc	Parc Bit, Edf. Naorte, piso 2, pta. 3	7121	Palma		Spain	bcasas@socib
618										

Figure 6. Highlighted cell on the Google Sheet where metadata is entered for a new tide gauge station.

Users are asked to ensure at a minimum information on station name, country, latitude and longitude are populated when adding a new gauge.

Observing station location

Additional fields were added to check precise locations as data transcription errors are easily entered. Different parties will have different views on how best to tackle the issue of precisely locating a station, but access to the 'what 3 words' and 'PlusCode' systems have been included and are detailed below.

To access the What3Words_geoCodeSystem: please go to:
https://what3words.com/replic%C3%B3.colcha.sepas

To access the PlusCode_Google please go to: https://maps.google.com/pluscodes/

4. Conclusion and next steps

Key Messages from the EuroSea activities to support the European Sea Level Network described in this deliverable report are as follows:

1. EuroSea funding was instrumental to arrive at V1.0 of the metadata database on water level stations, enabling the careful checking of data accuracy in the EU-TGN, while augmenting and improving the organisation of information in the database.
2. The EU-TGN portal is a credible contribution to the marine and transitional water level monitoring community. The tide gauge metadata catalogue V1.0 is ready for further development to provide additional information on permanent, managed monitoring nodes.
3. A proposed unique station identifier is included in the metadata. Additional fields can be added and collated so multiple identifiers for individual stations can be cross referenced and matched to check for duplicates.
4. Further security needs to be considered so the Google Sheet and the underlying data is safe while allowing public open access to the information held.
5. Two areas where additional enhancements are required in the next version (V2.0) release of the European and adjacent areas Tide Gauge Network Inventory:
    - The python script is rejecting some input formats resulting in the failure to update the metadata fields. This happens when the Google Sheet text format schema and field data types are not adhered to when edited. This will either be solved through automated or manual intervention.
    - The Google Sheet is saved using version control so all edits are safe. However, the method of accessing the Google Sheet requires an increased level of security that reduces the possibility of access by bad actors and does not impede access to genuine interested parties. This will be solved though consultation and included in the next release.
6. Activities of expert groups like the EuroGOOS TGTT is challenging. Urgent strategic activities are quickly identified and considered by the experts, but there is very limited resource allocation available to the participants to complete the desired tasks. Where resources can be meaningfully deployed, EC project funding through projects such as EuroSea are welcome opportunities to enhance the Tide gauge Task Team activities.

5. Appendix 1

The Marine Institute operates an International Oceanographic Data and Information Exchange of UNESCO's Intergovernmental Oceanographic Commission (IOC-IODE) accredited Data Management - Quality Management Framework (DM-QMF), which governs all application development and operational systems, including the European Tide gauge Network portal (EU-TGN).

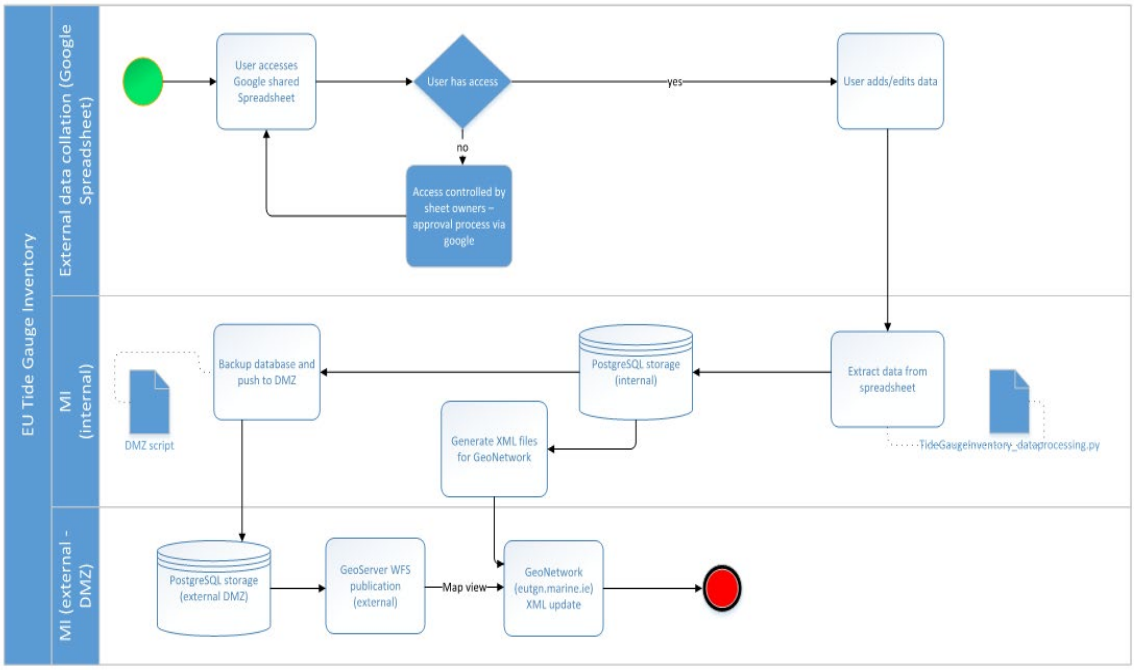


Figure 7. The DM-QMF process flow chart for the EU-TGN application.

The Tide Gauge inventory is a system with 3 components (see Fig. 7):

(1) External data collection via the Google Sheet
(2) Internal (behind the scenes) processing of metadata entries
(3) Feeding the metadata through to the DMZ (Demilitarized Zone) to EU-TGN.marine.ie.

The EU-TGN.marine.ie web application is a Geonetwork which is an open source off-the-shelf service (please see https://www.geonetwork-opensource.org). Geonetwork has an inbuilt Geoserver Instance that is used to provide the map service functionality.

A Python script is run manually, to take the content in the Google Sheet and update the metadata content in the Geonetwork Instance.

The Google Sheet is also used to update the spatial data layer in the geodatabase used by the Geoserver map service.