ASTD DATA

INFORMATION DOCUMENT

ASTD DATA DOCUMENT

The *Cooperative Agreement among the Arctic States Regarding Arctic Ship Traffic Data Sharing* outlines access to the Arctic Ship Traffic Data (ASTD) System and the use of ASTD data.

This document outlines and explains the ASTD data.

The document is intended for all ASTD users.

Questions can be sent to the PAME Secretariat (pame@pame.is)

ASTD Data Document Version History

1.1: *January 2019.*

1.2: *April 2020.*

1.3: *January 2021.*

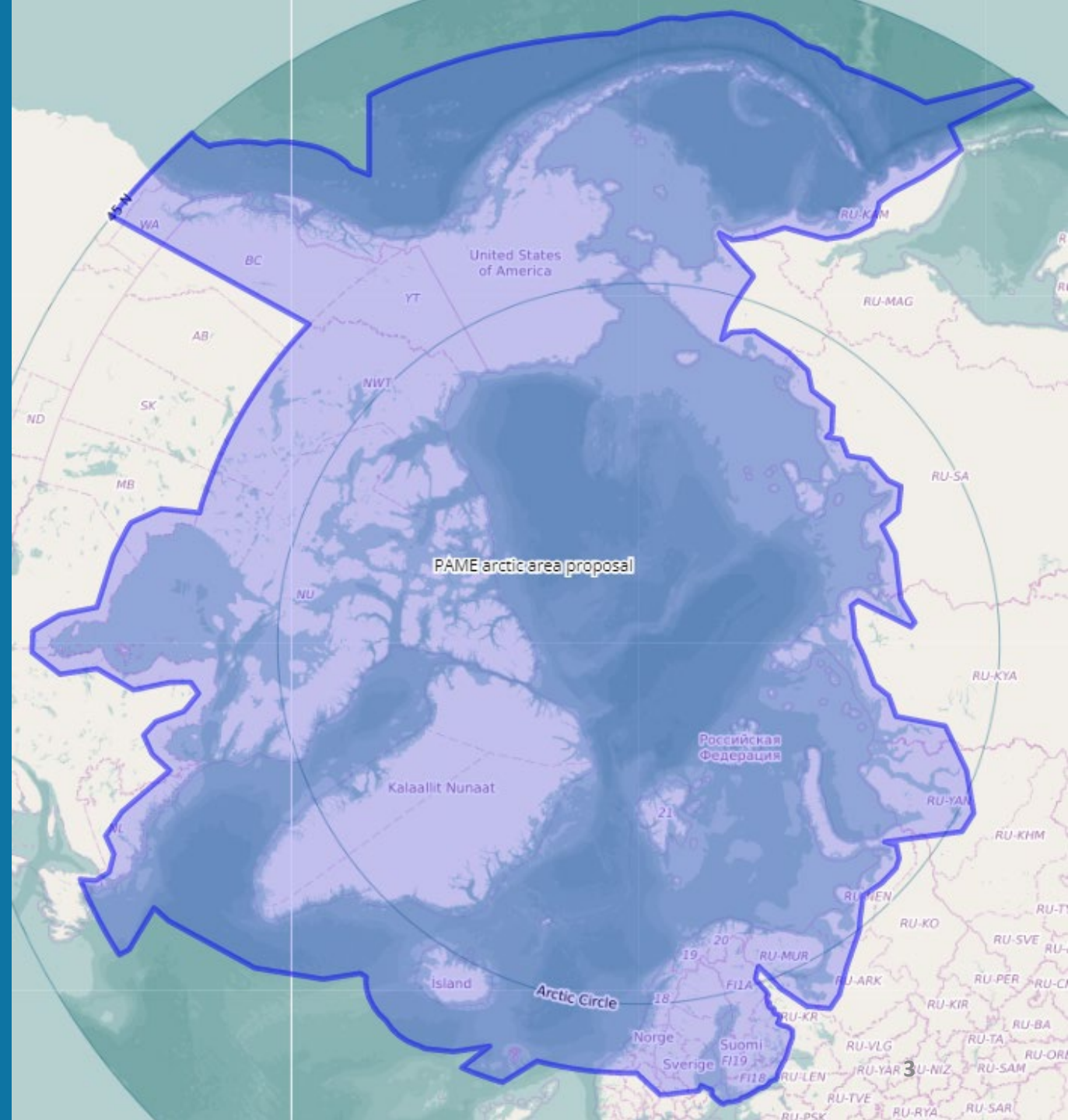1.4: *March 2021.*

1.5: *November 2022*

1.6: *January 2023*

1.7: *March 2023*

PAME
Protection of the Arctic Marine Environment

Geographic Scope

Data in ASTD is collected from over 20 satellites and multiple base stations. Data is collected from a defined area, shown on the map to the right.

PAME arctic area proposal

ASTD Data
The data from ASTD can be accessed by two means:

ASTD SYSTEM

✓ Easy access to data

✓ Quick analysis on pre-defined area

✓ Data is pre-calculated

✓ Simple to use

FTP SERVER

✓ Data in aggregated files for the whole of ASTD area

✓ Data needs to be filtered, cleaned

✓ Needs professional GIS experts

✓ Slightly more details in data

✓ Intended for specific analysis

✓ Contact PAME for access

ASTD DATA

The ASTD Database contains four types of information. These are:

1. Automatic Identification System (AIS data) received from ships operating in the Arctic. This data is collected by satellites and is provided by USA and Norway.

2. Ship characteristic information (e.g., type, size, flag, gross tonnage) from S&P Global (formerly IHS Markit, which had acquired Lloyds Register in 2009). Lloyds Register had collected information on ships since 1790. On behalf of IMO, S&P Global hosts a ship information database and is the sole issuer of IMO numbers. An IMO number is a unique number assigned to each ship. The IMO ship identification number scheme was introduced in 1987 as a measure to enhance ship safety and security. It established a mechanism for assigning a permanent number to each ship for identification purposes. That number remains unchanged through the ship's life. From this, information in the table on page 8 is generated.

3. Information on the types of fuel ships are burning and calculated air emissions from such combustion are obtained from DNV. DNV makes these calculations using IMO emission factors. DNV is the world's largest classification society and a recognized advisor to the maritime industry. See pages 20-22.

4. Sea ice data from the U.S. National Snow and Ice Data Center (NSIDC). ASTD contains monthly sea ice extent information obtained from the NSIDC Sea Ice Index.

AIS DATA

S&P GLOBAL & DNV
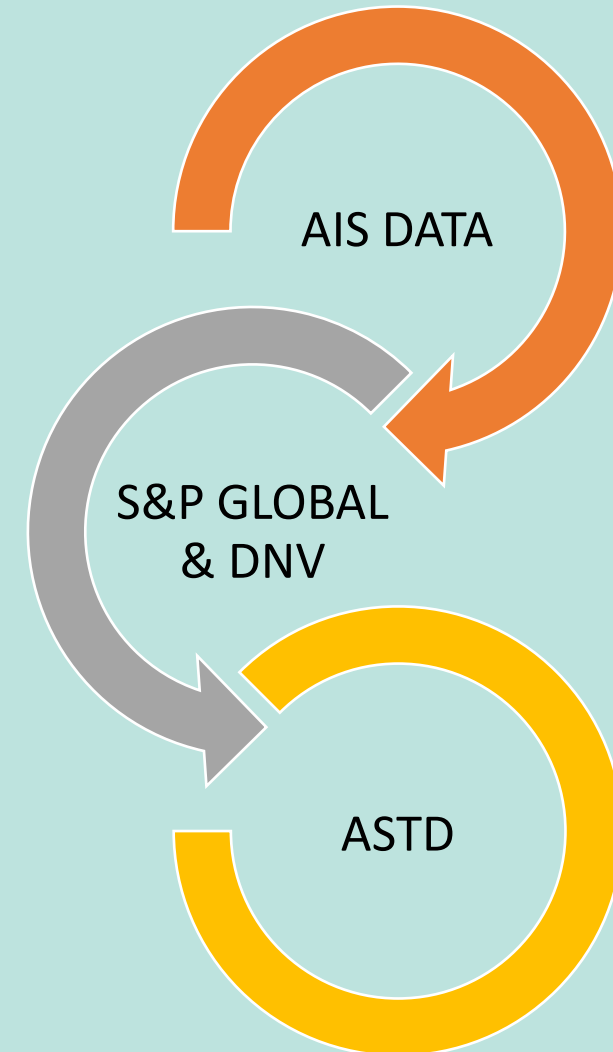
ASTD

ASTD DATA – ACCESS LEVELS

- Arctic State approved government agencies and ministries, Arctic Council Permanent Participants and Arctic Council Working Groups get free access to the database. Others, such as Arctic Council Observers, pay a small fee for access to ASTD. A document which outlines the access has been created and is available here.

- Access to ASTD data may be granted to eligible applicants at one of three access levels:
Level I, Level II and Level III

I	**Access to all available data**
II	**Access to all data in the System except that vessel identity data (MMSI, IMO ship identification number and ship name) is not included.**
III	**Access to the same data as under Level 2 except that ship type information is aggregated to 15 ship types instead of 56 ship types.**

See table on page 7 what is included in the ASTD Data for each access level.

ASTD SYSTEM

Data fields for each ship in ASTD for each access level when data is downloaded.

See example of data on page 8.

DATA FIELD	LEVEL 1	LEVEL 2	LEVEL 3	EXPLANATION
period	YES	YES	YES	Month and year chosen
area_type	YES	YES	YES	Type of area chosen (EEZ, LME etc.)
area_id	YES	YES	YES	Number of the area in the database
area_name	YES	YES	YES	Name of the area chosen
mmsi	YES	NO	NO	MMSI number of the ship
imonumber	YES	NO	NO	IMO number of the ship
ship_id	NO	YES	YES	Id of the ship – unique for each month.
Vesselname	YES	NO	NO	Name of the vessel
Flagcode	YES	YES	YES	Code for the ship flag, see page 13.
iceclass	YES	YES	YES	Ice class of the ship – see page 14.
norwegianshiptypeid	YES	YES	YES	ID of the type of ship (ASTD aggregation). See pages 15 & 16.
norwegianshiptypename	YES	YES	YES	Type of ship (Lloyds aggregation). See pages 15 & 16.
lloydsshiptypeid	YES	YES	NO	ID of the ship type (Lloyds aggregation). See pages 15 & 16.
lloydsshiptypename	YES	YES	NO	Type of ship (Lloyds aggregation). See pages 15 & 16.
lloyds5_cat	YES	NO	NO	Type of ship (Lloyds aggregation). See pages 15 and 16.
vesselsizeid	YES	YES	YES	ID of size of vessel on Gross Tons – see page 11
vesselsizedescription	YES	YES	YES	ID of size of vessel on Gross Tons – see page 11.
fuelquality	YES	YES	YES	Type of fuel used – See page 12.
distance_nm	YES	YES	YES	Distance sailed in nautical miles in chosen month
consumption	YES	YES	YES	Fuel consumption on cubic meters in chosen month, p.21.
co2emission	YES	YES	YES	Co2 emissions by ship in chosen month. See page 22.
coemission	YES	YES	YES	CoE emissions by ship in chosen month. See page 22.
noxemission	YES	YES	YES	NOX emissions by ship in chosen month. See page 22.
so2emission	YES	YES	YES	So2 emissions by ship in chosen month. See page 22.
operationhour	YES	YES	YES	Hours operated in chosen month.

DATA EXAMPLE: ASTD System Data download function – Level 1

period	area_type	area_id	area_name	mmsi	imonumber	vesselname	flagcode	iceclass	norwegianshiptypeid	norwegianshiptypename	lloydsshiptypeid	lloydsshiptypename	lloyds5_cat	vesselsizeid	vesselsizedescription	fuelquality	distance_nm	consumption	co2emission	coemission	noxemission	so2emission	operationhour
2013-04	polarcode	1	Polarcode area	273296700	8134912	ACHINSK	RUS		13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	387.975346	10.2065183	32.3546631	0.07552823	0.45133116	0.01837173	153.8761111
2013-04	polarcode	1	Polarcode area	331168000	9228928	AKAMALIK	DEN	FS Ice Class 1B	13	Fishing vessels	B11	Fish Catching	B12A2FF	2	1000 - 4999 GT	0	1615.87621	74.2301087	235.309445	0.5493028	3.29113852	0.1336142	719.3272222
2013-04	polarcode	1	Polarcode area	273349220	8811015	AKHILLES	RUS		15	Oil product tankers	A13	Oil	A13B2TP	2	1000 - 4999 GT	1	104.802355	1.94329452	6.16024364	0.01438038	0.08586554	0.00816184	97.20555556
2013-04	polarcode	1	Polarcode area	2738497000	9055216	ALANETT	RUS	FS Ice Class II	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	166.886043	7.20506771	22.8400646	0.0533175	0.31794896	0.01296912	115.0858333
2013-04	polarcode	1	Polarcode area	2734437900	7720025	ALIOT	RUS	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	563.983912	8.55310881	27.1133549	0.06329301	0.37633679	0.0153956	124.7077778
2013-04	polarcode	1	Polarcode area	2734293000	9076222	ANDROMEDA	RUS		13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	1072.6771	15.378587	48.7501209	0.11380154	0.67665783	0.02768146	353.0461111
2013-04	polarcode	1	Polarcode area	273312530	9310018	ANTEY	RUS		10	Offshore supply ships	B21	Offshore Supply	B21B2OA	3	5000 - 9999 GT	0	985.098539	231.61864	734.231088	1.71397794	10.8462793	0.41691355	485.9561111
2013-04	polarcode	1	Polarcode area	273311280	8616221	AQUAMARINE	RUS		13	Fishing vessels	B11	Fish Catching	B12A2FF	2	1000 - 4999 GT	0	211.931313	12.4092362	39.3372788	0.09182835	0.5500658	0.02233663	68.0175
2013-04	polarcode	1	Polarcode area	2732199000	7604403	ARCTIC PRINCESS	RUS		8	Refrigerated cargo ships	A34	Refrigerated Cargo	A34A2GR	2	1000 - 4999 GT	1	205.591365	6.79479816	21.5395102	0.0502815	0.30074522	0.02853814	273.5475
2013-04	polarcode	1	Polarcode area	2585350000	9258739	ARCTIC SWAN	NOR	FS Ice Class 1B	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	2341.9418	118.777312	376.52408	0.8789521	5.29994933	0.21379916	658.1366667
2013-04	polarcode	1	Polarcode area	2310530000	8517437	ARCTIC VIKING	FAR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	2025.45609	86.64113	274.652382	0.64114436	3.83629198	0.15595403	614.1652778
2013-04	polarcode	1	Polarcode area	2248710000	8617469	AROSA NUEVE	SPN	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	1068.92061	13.7096945	43.4597315	0.10145174	0.60322656	0.02467745	409.7125
2013-04	polarcode	1	Polarcode area	3410490000	8860444	ASIAN ENTERPRISE	SKN		8	Refrigerated cargo ships	A34	Refrigerated Cargo	A21A2BC	3	5000 - 9999 GT	1	181.656708	28.9922618	91.9054698	0.21454273	1.30882491	0.12176748	359.4775
2013-04	polarcode	1	Polarcode area	3529860000	9648491	ASTRA-G	PAN		12	Other activities	B31	Research	B31A2SR	1	< 1000 GT	2	1040.69866	5.19044797	16.4537201	0.03840931	0.22837971	0.00934281	265.4608333
2013-04	polarcode	1	Polarcode area	3163230000	9252515	ATLANTIC ENTERPRISE	CAN	FS Ice Class 1B	13	Fishing vessels	B11	Fish Catching	B12A2FF	2	1000 - 4999 GT	0	441.419929	46.934891	148.783604	0.34731819	2.06613296	0.0844828	200.7741667
2013-04	polarcode	1	Polarcode area	2575910000	9239355	ATLANTIC GUARDIAN	NIS		12	Other activities	B34	Other Activities	B34D2SB	3	5000 - 9999 GT	0	1005.68958	20.5852283	65.2551736	0.15233069	0.98850497	0.03705341	374.2336111
2013-04	polarcode	1	Polarcode area	2585630000	9134555	ATLANTIC STAR	NOR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	242.50584	22.4048219	71.0232856	0.16579568	0.99005484	0.04032868	139.4513889
2013-04	polarcode	1	Polarcode area	2734368930	6808674	AZURIT	RUS		13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	405.773216	0.91125949	2.88869258	0.00674332	0.04009542	0.00164027	157.1944444
2013-04	polarcode	1	Polarcode area	273148810	78083334	BELOMORYE	RUS	FS Ice Class II	8	Refrigerated cargo ships	A34	Refrigerated Cargo	A34A2GR	2	1000 - 4999 GT	1	840.653884	23.6767626	75.0553374	0.17520804	1.04776008	0.0994424	419.7719444
2013-04	polarcode	1	Polarcode area	273217010	8620179	BOOTES	RUS	FS Ice Class 1B	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	165.999611	10.0124344	31.739417	0.07409201	0.44591782	0.01802238	40.51222222
2013-04	polarcode	1	Polarcode area	2734515760	7720001	BOREY	RUS	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	373.828783	5.63602399	17.866196	0.04170658	0.24798506	0.01014484	63.18111111
2013-04	polarcode	1	Polarcode area	2635160000	7107431	BRITES	PTG		13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	603.305897	10.6353492	33.714057	0.07870158	0.47348591	0.01914363	119.8536111
2013-04	polarcode	1	Polarcode area	273317810	7700087	CANOPUS	RUS	FS Ice Class II	8	Refrigerated cargo ships	A34	Refrigerated Cargo	A34A2GR	2	1000 - 4999 GT	1	356.147301	20.260546	64.2259307	0.14992804	0.89388276	0.0850943	456.6391667
2013-04	polarcode	1	Polarcode area	273558310	8401236	CAPTAIN STAROSTIN	RUS	FS Ice Class 1A	5	General cargo ships	A31	General Cargo	A31A2GX	2	1000 - 4999 GT	0	31.5669737	6.39359221	20.2676873	0.04731258	0.28240096	0.02685309	121.5075
2013-04	polarcode	1	Polarcode area	2635010000	8803537	CIDADE DE AMARANTE	PTG		13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	1087.9862	24.570772	77.8893473	0.18182371	1.08795068	0.04422739	259.1941667
2013-04	polarcode	1	Polarcode area	2735595900	9076636	DISTINKT	RUS		13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	1174.18618	18.7385779	59.4012918	0.13866548	0.82449743	0.03372944	395.3813889
2013-04	polarcode	1	Polarcode area	273573300	9585273	ENISEY	RUS	FS Ice Class 1A Super	15	Oil product tankers	A13	Oil	A13B2TP	4	10000 - 24999	2	2771.43524	280.029327	895.554654	2.07221702	21.4932607	3.3249848	366.2658333
2013-04	polarcode	1	Polarcode area	2310450000	8816974	ENNIBERG	FAR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B12A2FF	2	1000 - 4999 GT	0	1484.23231	84.013226	266.321926	0.62169787	3.70497467	0.15122381	586.5691667
2013-04	polarcode	1	Polarcode area	257563600	9234563	FISKENES	NOR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	601.221313	6.95500005	22.0473502	0.051467	0.30602	0.012519	489.3408333
2013-04	polarcode	1	Polarcode area	2594570000	9169263	FJELLMOY	NOR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	592.56299	7.35990514	23.3308993	0.0544633	0.32383583	0.01324783	215.4666667
2013-04	polarcode	1	Polarcode area	257105000	9260316	G. O. SARS	NOR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	385.177344	26.9301987	85.3687298	0.1205942	1.2059942	0.04847436	85.71666667
2013-04	polarcode	1	Polarcode area	2317510000	8615318	GADUS	FAR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	589.62826	27.3656013	86.7489561	0.20250545	1.20587216	0.04925808	484.4677778
2013-04	polarcode	1	Polarcode area	2735144800	8721935	GEMMA	RUS		13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	449.475916	7.12840098	22.5970311	0.05275017	0.31364964	0.01283112	140.9541667
2013-04	polarcode	1	Polarcode area	2112142000	8716928	GERDA MARIA	GEU		13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	793.040731	43.2405378	137.072505	0.31997998	1.90492366	0.07783297	446.9027778
2013-04	polarcode	1	Polarcode area	354498000	8521658	GLOMAR 4-WINDS	PAN		11	Other service offshore vess	B22	Other Offshore	B22G2OY	1	< 1000 GT	0	835.92832	3.29540003	10.4464181	0.02438596	0.14449976	0.00593172	189.5108333
2013-04	polarcode	1	Polarcode area	2590500000	9312107	HARSTAD	NOR		12	Other activities	B34	Other Activities	B34H2SQ	2	1000 - 4999 GT	0	261.022847	6.24847899	19.8076784	0.04623874	0.27739805	0.01124726	104.065
2013-04	polarcode	1	Polarcode area	2574610000	9418042	HAVILA JUPITER	NOR	FS Ice Class 1C	10	Offshore supply ships	B21	Offshore Supply	B21B2OA	3	5000 - 9999 GT	0	80.0465953	48.5426763	153.880284	0.3592158	2.16270316	0.08737682	81.05777778
2013-04	polarcode	1	Polarcode area	2575244500	7817256	HAVSEL	NOR		12	Other activities	B12	Other Fishing	B12E2FX	1	< 1000 GT	0	265.383041	1.69658452	5.37817292	0.01255473	0.07464972	0.00305385	126.2544444
2013-04	polarcode	1	Polarcode area	2574715500	8716655	HELMER HANSSEN	NOR		12	Other activities	B31	Research	B31A2SR	2	1000 - 4999 GT	0	567.262329	17.2449765	54.6665757	0.1276123	0.76746346	0.03104096	100.5002778
2013-04	polarcode	1	Polarcode area	2584100000	9230036	HERMES	NOR	FS Ice Class 1B	13	Fishing vessels	B11	Fish Catching	B12A2FF	2	1000 - 4999 GT	0	964.376688	33.7645248	107.033544	0.24985748	1.50696802	0.06077614	181.7538889
2013-04	polarcode	1	Polarcode area	2733199940	9338230	HERMES	RUS		12	Other activities	B32	Towing / Pushing	B21B2OA	3	5000 - 9999 GT	0	639.714343	122.909721	389.623817	0.90953194	5.91957755	0.2212375	586.4472222
2013-04	polarcode	1	Polarcode area	2310420000	8609357	HOGABERG	FAR	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	2	1000 - 4999 GT	0	679.154768	61.1851578	193.95695	0.45277017	2.69941248	0.11013328	458.625
2013-04	polarcode	1	Polarcode area	2734445430	7383011	HUGINN	RUS	FS Ice Class 1C	13	Fishing vessels	B11	Fish Catching	B11B2FV	1	< 1000 GT	0	1348.10112	11.1928169	35.4812295	0.08282684	0.49248394	0.02014707	400.2333333
2013-04	polarcode	1	Polarcode area	273554480	8502107	INZHENER VESHNYAKOV	RUS	FS Ice Class 1A Supe	5	General cargo ships	A31	General Cargo	A31A2GX	3	5000 - 9999 GT	1	1778.0855	90.0163031	285.351681	0.66612064	4.61762609	0.37806847	366.2619444

ASTD FTP SERVER

Data fields for each ship in ASTD for each access level.

See example of data on page 10.

DATA FIELD	LEVEL 1	LEVEL 2	LEVEL 3	EXPLANATION
mmsi	YES	NO	NO	MMSI number of the ship.
imonumber	YES	NO	NO	IMO number of the ship
ship_id	NO	YES	YES	Id of the ship – unique for each month.
date_time_utc	YES	YES	YES	Date and time of signal collected
vesselname	YES	NO	NO	Name of the ship
flagname	YES	YES	YES	Name of the ship flag.
flagcode	YES	YES	YES	Code for the ship flag, see page 13.
iceclass	YES	YES	YES	Ice class of the ship – see page 14.
astd_cat	YES	YES	YES	Type of ship (ASTD aggregation). See pages 15 and 16.
lloyds3_	YES	YES	NO	Type of ship (Lloyds aggregation). See pages 15 and 16.
lloyds5_cat	YES	NO	NO	Type of ship (Lloyds aggregation). See pages 15 and 16.
sizegroup_gt	YES	YES	YES	Size of ship (ASTD aggregation). See page 11.
fuelquality	YES	YES	YES	Type of fuel used. See page 12.
fuelcons	YES	YES	YES	Fuel consumption. See page 21.
co	YES	YES	YES	Co emissions from last signal. See page 22.
co2	YES	YES	YES	Co emissions from last signal. See page 22.
so2	YES	YES	YES	So2 emissions from last signal. See page 22.
nox	YES	YES	YES	Nox emissions from last signal. See page 22.
n2o	YES	YES	YES	n2o emissions from last signal. See page 22.
nmvoc	YES	YES	YES	Non-methane volatile organic compounds (NMVOCs) emissions from last signal. See page 22.
ch4	YES	YES	YES	Methane emissions from last signal. See page 22.
blackcarbon	YES	YES	YES	Black carbon emissions from last signal. See page 22.
organiccarbon	YES	YES	YES	Co emissions from last signal. See page 22.
oilbilgewater	YES	YES	YES	Production of bilge oil (liters). See page 22.
blackwater	YES	YES	YES	The amount of black water produced (m3). See page 22.
greywater	YES	YES	YES	Grey water production volume (m3). See page 22.
garbage	YES	YES	YES	Garbage production mass (kg). See page 22.
dist_nextpoint	YES	YES	YES	Distance sailed since last point
sec_nextpoint	YES	YES	YES	Seconds from last point
longitude	YES	YES	YES	Longitude position signal
latitude	YES	YES	YES	Latitude position signal

DATA EXAMPLE: FTP Server Data download – Level 1
Opened in Notepad++ - imported to Excel

ASTD SIZE AGGREGATION

ASTD Aggregates ships to 7 categories:

- o   *<1000 GT*
- o   *1000-4999 GT*
- o   *5000-9999 GT*
- o   *10.000-24.999 GT*
- o   *25.000-49.999 GT*
- o   *50.000-99.999 GT*
- o   *>=100.000 GT*

Ship size in ASTD is categorized to certain categories, according to the ship's Gross Tonnage (GT). The gross tonnage is a function of the molded volume of all enclosed spaces of the ship.

The International Convention on Tonnage Measurement of Ships adopted by IMO in 1969, was the first successful attempt to introduce a universal tonnage measurement system.

The Convention meant a transition from the traditionally used terms gross register tons (grt) and net register tons (nrt) **to gross tonnage (GT)** and net tonnage (NT).
Gross tonnage forms the basis for manning regulations, safety rules and registration fees. Both gross and net tonnages are used to calculate port dues.

From IMO:
International Convention on Tonnage Measurement of Ships

ASTD FUEL INFORMATION

As IMO changed the regulations on sulphur content in fuel as of 1.1.2020, fuel information in ASTD is different before and after that date.

READ MORE:

IMO 2020 sulphur limit implementation - carriage ban enters into force

IMO: March 2020

BEFORE 1.1.2020
Fuel information is categorized by <u>six</u> types of fuel

0	Distillate marine fuel (MGO/MDO)
1	Residual marine fuel and heavy distillate (ISO-F-10 - 80)
2	Residual marine fuel (IFO-F-80 - 180) heavy fuel oil
3	Residual marine fuel (IFO-F-180 - 380 or above) heavy fuel oil
4	Liquid natural gas (LNG)
5	Battery power

AFTER 1.1.2020
Fuel information is categorized by <u>four</u> types of fuel

0	Distillate marine fuel (MGO/MDO)
4	Liquid natural gas (LNG)
5	Battery power
6	Residual marine fuel

Flag Codes

- ASTD includes what it calls "Flag Codes" for each ship. A Flag Code represents the national ship registry where the ship is registered. Some countries have more then one national ship registry.

- Users should match the Flag Code to the National Ship Registry if it is unknown to them.

- A document with ASTD Flag Codes is available to download here.

The first two columns show ASTD info when data is downloaded. The National Ship Registry Column is made using the Flag Code document.

NAME OF SHIP	FLAG CODE	NATIONAL SHIP REGISTRY
SUNNANVIK	SWD	Sweden
SVYATOY PETR	RUS	Russia
ORASILA	DIS	Danish International Ship Registry
ISFJORD	NIS	Norway International Ship Registry
BRUARFOSS	FAS	Faroe Islands
BORIS SOKOLOV	CYP	Cyprus
SJOVEIEN	PAN	Panama
REMBRANDT VAN RIJN	VAN	Vanuatu
NATIONAL GEOGRAPHIC	BAH	Bahamas
ANTIGUA	NTH	Netherlands
OSTERFJORD	NOR	Norway
POLAR NATAARNAQ	DEN	Denmark
PISON	FAR	Faroe Islands
U. S. LIBERATOR	USA	United States
STEFFANO	ETN	Estonia
KIRKELLA	GBI	United Kingdom
CIDADE DE AMARANTE	PTG	Portugal
GERDA MARIA	GEU	Germany
TAURUS	LTH	Lithuania
SOLBERG	ICL	Iceland
MONTE MEIXUEIRO	SPN	Spain
NIKOLAY URVANTSEV	HKG	Hong Kong
DORADO 2	LAV	Latvia
POLARFRONT	FIS	French International Ship Registry

Ice Class of Ships in ASTD

- Ice class refers to a notation assigned by a classification society or a national maritime authority to denote the additional level of strengthening as well as other arrangements that enable a ship to navigate through sea ice. Some ice classes also have requirements for the ice-going performance of the vessel.

- ASTD ice classes are based on the Finnish-Swedish Ice Class Rules, which are cooperatively developed by the Finnish and Swedish maritime authorities.

- If ice class information is missing in the ASTD, the vessel does not have a registered ice class.

ICE CLASSES OF SHIPS:
Finnish-Swedish Ice Class Rules explained

Ship Type Aggregation

- S&P Global is the originating source for the International Maritime Organization (IMO) Ship Number and is the sole authority with responsibility for assigning and validating these numbers. ASTD uses the AIS number to identify each ship, including its type.

- S&P Global uses the *Statcode 5 Shiptype Coding System.* ASTD uses the same system to aggregate ship types to the "ASTD Ship Types" which is the only ship type information for ASTD Level 3 users. See an example on next page.

  - ASTD Level 2 users can access ship types on Level 3.

  - ASTD Level 1 users can access ship types on Level 5.

A document showing how the ASTD System aggregates ship types is available to download here.

S&P Global website for IMO number scheme

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Ship Type Aggregation - Example

	StatCode Level 5	Level 5 Ship Type	StatCode Level 3	Level 3 Ship Type	ASTD Ship Type	Description
	Available to ASTD Level 1 users		*Available to ASTD Level 2 users*		*Available to ASTD Level 3 users*	
CHEMICAL TANKERS	A12A2LP	Molten Sulphur Tanker	A12	Chemical	Chemical tankers	A tanker for the bulk carriage of molten sulphur in insulated tanks at a high temperature
	A12A2TC	Chemical Tanker	A12	Chemical	Chemical tankers	A tanker for the bulk carriage of chemical cargoes, lube oils, vegetable/animal oils and other chemicals as defined in the International Bulk Chemical Code. Tanks are coated with suitable materials which are inert to the cargo
	A12B2TR	Chemical/Products Tanker	A12	Chemical	Chemical tankers	A chemical tanker additionally capable of the carriage of clean petroleum products
	A12C2LW	Wine Tanker	A12	Chemical	Chemical tankers	A cargo ship designed for the bulk transport of wine in tanks. Tanks will be stainless steel or lined. New vessels will be classified as chemical carriers
	A12D2LV	Vegetable Oil Tanker	A12	Chemical	Chemical tankers	A cargo ship designed for the bulk transport of vegetable oils in tanks. Tanks will be stainless steel or lined. New vessels will be classified as chemical carriers
	A12E2LE	Edible Oil Tanker	A12	Chemical	Chemical tankers	A cargo ship designed for the bulk transport of edible oils in tanks. Tanks will be stainless steel or lined. New vessels will be classified as chemical carriers
	A12F2LB	Beer Tanker	A12	Chemical	Chemical tankers	A tanker for the bulk carriage of beer
	A12G2LT	Latex Tanker	A12	Chemical	Chemical tankers	A tanker for the bulk carriage of latex
	A14E2LJ	Fruit Juice Carrier, Refrigerated	A14	Other Liquids	Chemical tankers	A tanker for the bulk carriage of fruit juice concentrate in refrigerated tanks. May be arranged for the additional carriage of containers on deck
	A14F2LM	Molasses Tanker	A14	Other Liquids	Chemical tankers	A tanker for the bulk carriage of molasses
	A14G2LG	Glue Tanker	A14	Other Liquids	Chemical tankers	A tanker for the bulk carriage of glue
	A14H2LH	Alcohol Tanker	A14	Other Liquids	Chemical tankers	A tanker for the bulk carriage of alcohol
	A14N2LL	Caprolactam Tanker	A14	Other Liquids	Chemical tankers	A tanker for the bulk carriage of caprolactam, a chemical used in the plastics industry for the production of polyamides
	A22A2BN	Bulk/Caustic Soda Carrier (CABU)	A22	Bulk Dry / Oil	Chemical tankers	A bulk carrier with certain holds arranged with tanks for the alternative (but not simultaneous) carriage of caustic soda
	A22A2BX	Bulk/Sulphuric Acid Carrier	A22	Bulk Dry / Oil	Chemical tankers	A bulk carrier arranged for the alternative (but not simultaneous) carriage of sulphuric acid
	A22B2BQ	Bulk/Oil/Chemical Carrier (CLEANBU)	A22	Bulk Dry / Oil	Chemical tankers	A bulk carrier with arranged for the alternative (but not simultaneous) carriage of clean petroleum and chemical products.
	W11A5TC	Chemical Tanker, Inland Waterways	W11	Tanker	Chemical tankers	A tanker for the bulk carriage of chemical cargoes, lube oils, vegetable/animal oils and other chemicals as defined in the International Bulk Chemical Code which is not suitable for trading in open waters. Tanks are coated with suitable materials which a

AIS

Automatic Identification System

AIS is a maritime navigation safety communications system standardized by the International Telecommunication Union (ITU) and adopted by the International Maritime Organization (IMO) to provide information about ship type, position (<u>recorded every 6 minutes in ASTD</u>), course, speed, navigational status, and other safety-related information.

SOLAS regulation 19 requires AIS to be fitted aboard all ships of 300 or more gross tonnage engaged on international voyages; cargo ships of 500 or more gross tonnage not engaged on international voyages; and all passenger ships irrespective of size. SOLAS regulation 19 became effective 31 December 2004.

IMO: Automatic identification systems (AIS)

AIS TRANSCEIVERS
Automatic identification system (AIS) transceivers automatically provide position, identification and static data (vessel details) to nearby ships, land based stations and satellites. There are two types of AIS transceivers: Class A and Class B.

Class A transceivers transmit with a power of 12.5W. Position is reported autonomously every 2-10 seconds dependent on the vessel's speed and/or course changes (every three minutes or less when at anchor or moored); and the vessel's static and voyage related information every 6 minutes. Class A transceivers are also capable of text messaging safety related information and AIS Application Specific Messages, such as meteorological and hydrological data, electronic Broadcast Notice to Mariners, and other marine safety data.

Class B transceivers do not meet the SOLAS 19 regulation requirements, but provide similar benefits to smaller vessels at a lower cost and with a simpler installation. Generally they report less frequently than Class A transceivers. Transmit power is 2W. They can receive safety related text and application specific messages but cannot transmit them. The vessel's static data is reported, however none of the voyage related information is.

Types Of Automatic Identification Systems (Per ITU-R M.1371 And IEC Standards) | Navigation Center (uscg.gov)

ASTD only includes signals transmitted by ships carrying AIS Class A transceivers. Thus, ASTD includes information on all ships that are required to carry AIS Class A transponders as well as any other ships not subject to SOLAS Regulation 19 that voluntarily opt to carry AIS Class A transceivers.

General AIS Limitations

AIS data in the ASTD System does not cover 100% of all ship traffic, but data quality is very high. This has been confirmed by comparing ASTD System data with data from other sources, including national collected information. Identifying pleasure craft and smaller fishing vessels can be challenging because these vessels are not required to carry AIS Class A transceivers.

In addition, numerous factors can affect the transmission and/or receipt of AIS signals, including:

- Technical failures due to faulty infrastructure (vessel and data flow)

- Erroneous onboard installation of AIS transceiver

- Problems with data links/networks

- Manipulation of AIS signals

- Data noise

- Satellite coverage limitations

The image below shows how AIS Class A transceiver data from the USA (yellow dots) supplements AIS Class A transceiver data from Norway (black dots) to give ASTD a more detailed and accurate picture of ship traffic.

MapBox - Terms & Feedback - ©Mapbox © OpenStreetMap Improve this map
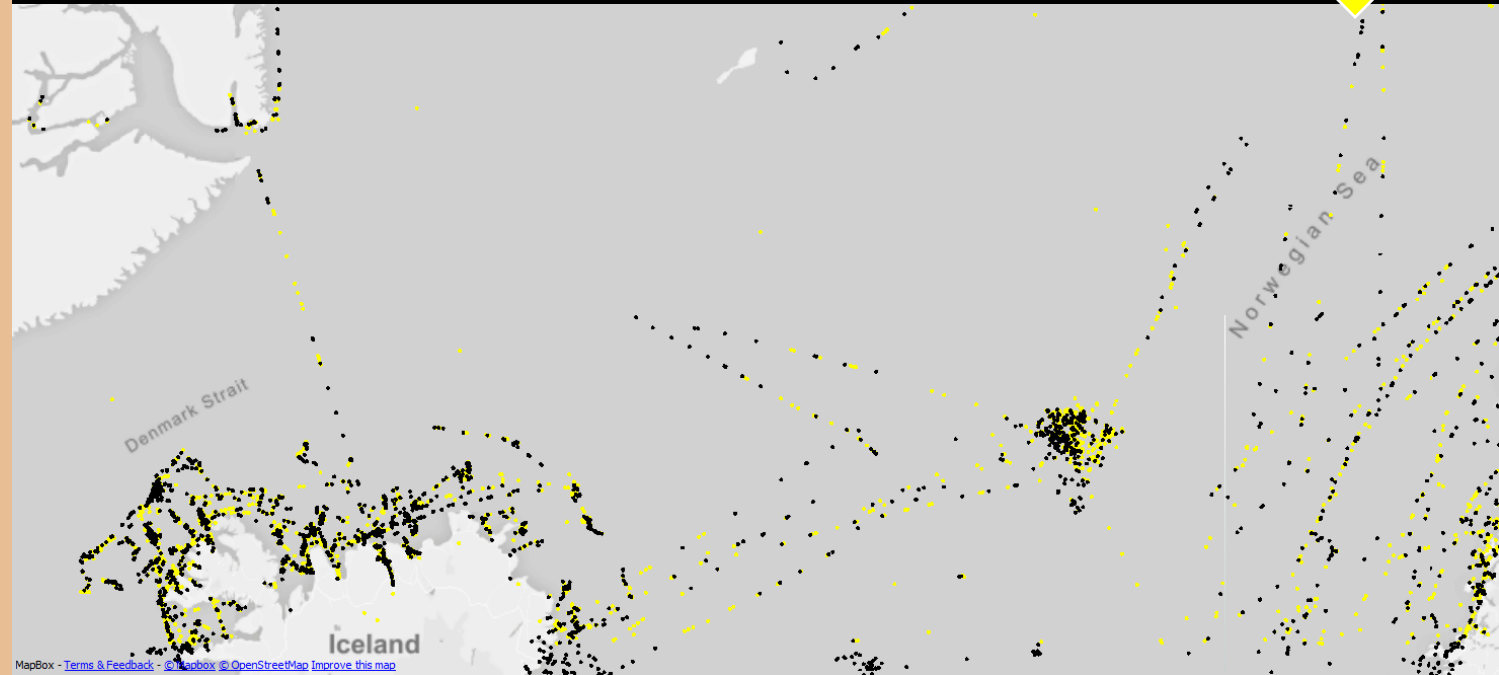
ASTD Data Quality

The data in ASTD is very accurate. The data collected is vast, hundreds of gigabytes every year. Approximately 4 million records are added to the database every 24 hours. As outlined on page 18 of this document, AIS signals are not 100% accurate.

There are many variables which affect databases like ASTD. When comparing data between AIS databases, the information might not be 100% aligned. For example, there could be differences in the number, position and range in satellites which collect AIS signals. Data quality in ASTD is <u>very high.</u>

ASTD Data Calculations

Within ASTD, calculations of fuel consumption, emissions to air and discharges to sea are made. The two main data sources for the calculations are the AIS ship movement data and the ship register.

This includes all the information in the *Statistics* section in *Arctic area traffic in ASTD.* The calculation is prepared for each ship.

The methodology is from the IMO and is continuously updated.

However, the system requires supporting data when making calculations not directly linked to information in the ship register or when the two data sources contain incomplete data. This work has been conducted by DNV.

IMO SHIP EMISSION TOOLKIT

MORE FROM THE IMO ON CALCULATIONS OF EMISSIONS: GUIDELINES ON THE METHOD OF CALCULATION OF THE ATTAINED ENERGY EFFICIENCY DESIGN INDEX (EEDI) FOR NEW SHIPS

ASTD Fuel Consumption Calculations

Fuel oil consumption depends on a range of parameters including engine size, age and fuel energy density.

The fuel consumption for main and auxiliary engines is set for each ship based on the relation between ship year of build (DOB) and engine size (kW) and are performed for each ship for a specific time period.

The time period represents the time between two following ship positions (AIS) messages. For the given time period the appurtenant sailing distance is calculated. The time period and sailing distance are stored in the AIS database fields "SecondsNextPoint" and "DistanceNextPoint" respectively together with information identifying the actual ship.

Based on the time period and sailing distance, the average ship speed over ground (in knots) can be calculated.

By comparing the average ship speed over ground and the ship speed capabilities (defined as service speed), the main engine load factor can be calculated.

By multiplying the total engine power, engine load factor and specific fuel consumption for the given period of time, the total amount of fuel consumed for the actual segment is calculated.

ASTD Air Emission Calculations

The calculation of air emissions is based on applying the fuel consumption and the emission factors for each pollutant. The emission factors are given as kg pollutant per tonne fuel.

For the air emissions Carbon dioxide (CO_2), Non-methane volatile organic compounds (NMVOC) emissions, Methane (CH_4), Nitrous oxide (N_2O), Carbon monoxide (CO), black carbon (BC) and organic carbon (OC), the emission factors are based on recognized emission factors (ref. *The Oil Industry International Exploration and Production Forum (1993), LR (1995), EMEP/CORINAIR Atmospheric emission inventory guidebook (1999).*

Exhaust gas component	Emission factors for engines (kg / ton fuel)
nmVOC_EmFactor (kg/ton fuel)	2.4
CH4_EmFactor (kg/ton fuel)	0.3
N2O_EmFactor (kg/ton fuel)	0.08
CO_EmFactor (kg/ton fuel)	7.4
BC_EmFactor (kg/ton fuel)	0.18
OC_EmFactor (kg/ton fuel)	0.608

DISCHARGE TO SEA CALCULATIONS

Please contact the PAME Secretariat for information on the methodologies used to calculate vessel discharges to sea.

Working with ASTD Data

Data downloaded from the FTP Server (example on page 10) requires sufficient computing capacity and the expertise of a GIS analyst.

Examples of software programs needed to work with ASTD data include CSV Explore, Python, or SQL databases like MySQL and PostgreSQL.

Keep this in mind when downloading large amounts of data.

However, smaller data samples can be downloaded by regular users, not specific GIS experts, and analyzed Excel. One has to download data and convert from CSV but from there analysis can be performed.

Working with Data – "Data cleaning"

Please note that specific corrections are needed after downloading data to have as correct data as possible.

Satellites in orbit may pick up AIS signals from vessels located outside the geographic area covered by ASTD under certain atmospheric conditions.

In reports which the ASTD System can automatically generate, the ASTD System filters out all AIS Class A transceiver signals from ships for which satellites have picked up fewer than 10 positions in one month. ASTD users who download data from the FTP server for analysis must filter out this type of information themselves.

Please be aware when downloading data from the FTP server, data cleanup must be undertaken by the user to remove anomalies and other signals which could result in inaccurate analysis.

PAME
Protection of the Arctic Marine Environment

ARCTIC SHIP TRAFFIC DATA
ASTD.IS
BASED ON HAVBASE.NO

More information: hjalti@pame.is