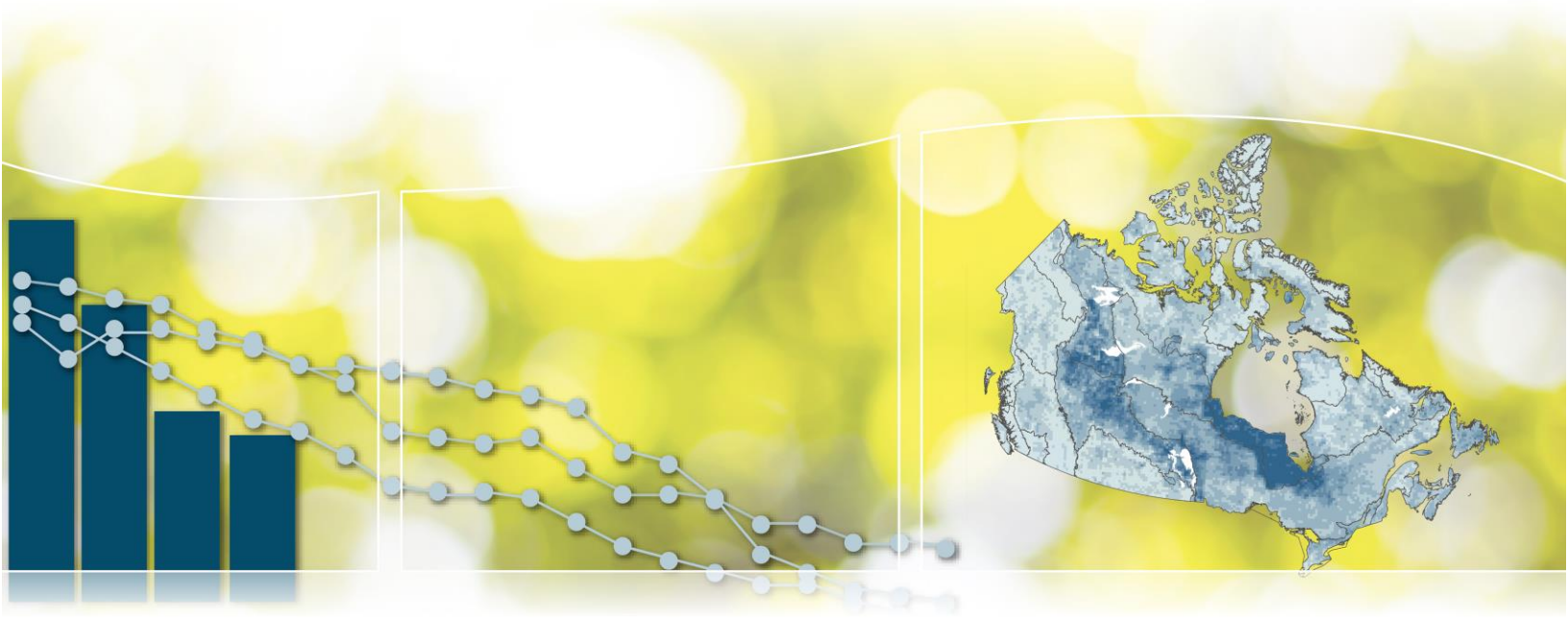
Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canadian Environmental Sustainability Indicators

Sea ice in Canada



Canada

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Canadian Environmental Sustainability Indicators

Sea ice in Canada

February 2019

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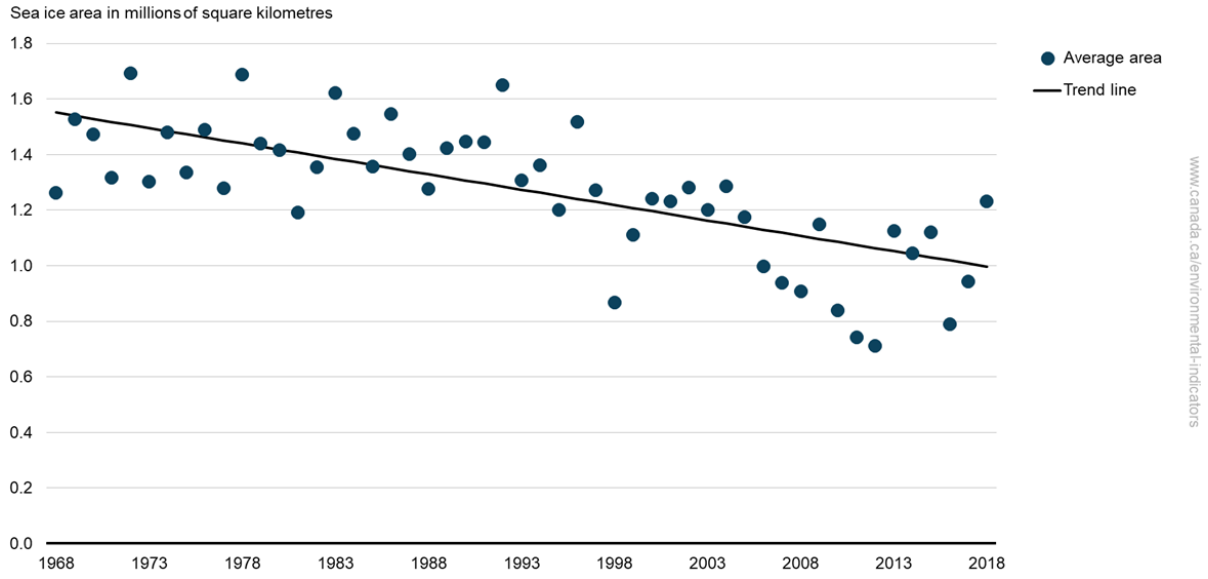
Sea ice in Canada

Sea ice is a prominent feature in the Northern Canadian Waters.[1] It consists of ice that grows and melts each year (referred to as first-year ice) and ice that remains present all-year round (referred to as multi-year ice). The amount and type of sea ice present, notably the total minimum area it covers in the summer season,[2] impacts human activity and biological habitat.

Key results

- In 2018, the Northern Canadian Waters were covered by an average sea ice area of 1.23 million square kilometres, which represents 32.8% of its area
- Over the past 5 decades, the area covered by sea ice in the Northern Canadian Waters, measured during the summer season, has been decreasing
- Between 1968 and 2018, sea ice area in the Northern Canadian Waters declined at a rate of 7.0% per decade

Figure 1. Average sea ice area, Northern Canadian Waters, 1968 to 2018



Data for Figure 1

Note: Sea ice is measured during the summer season. For the Northern Canadian Waters, the summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

[1] The Northern Canadian Waters are composed of the Canadian Arctic domain and the Hudson Bay domain.

[2] Sea ice is measured during the summer season. The summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain.

Sea ice area decline in Northern Canadian Waters is the result of a combination of factors. Human-induced warming from greenhouse gas emissions and climate variability has resulted in an unprecedented loss of sea ice within the last 50 years in comparison to the last 1450 years.

The Arctic region is very sensitive to climate change because of feedback involving sea ice that influences the reflectivity of the Earth's surface. As sea ice area declines due to warming temperatures, darker ocean surfaces are exposed that can absorb more sunlight and in turn cause more warming and sea ice melting. This feedback cycle is an important factor in amplifying Arctic temperatures. Research has shown that the loss of Arctic sea ice is a very significant contributor to the recent amplification of Arctic temperature change compared to the global average.

Changes in the amount of sea ice, the location of ice edges and the timing of seasonal cycles have complex, cascading ecosystem impacts. Sea ice declines result in a loss of wildlife habitat, as it serves as hunting platforms for polar bears and as resting grounds and nursery areas for walruses and seals. Algae that grow on the underside of sea ice are also important to the marine food supply.

These changes also have an impact on safety of northerners who use sea ice as a transportation route or platform for hunting/fishing. More than ever, decisions on whether to go out on the ice must be made on the basis of weather and sea ice condition reports, as northerners can no longer rely on traditional knowledge of when it is safe to venture out on the ice.

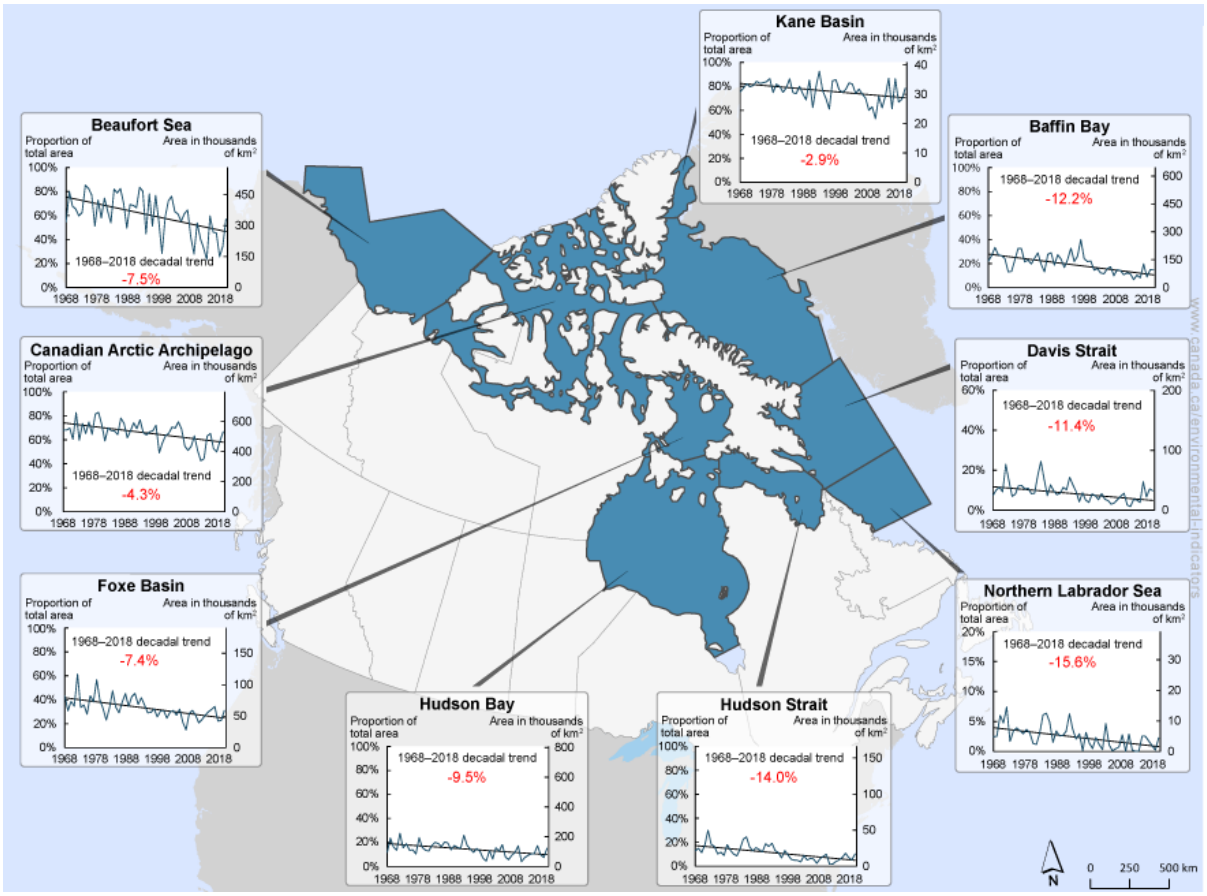
Regional sea ice

In the Northern Canadian Waters, the area covered by sea ice, measured during the summer season, varies by sub-region. Five (5) sub-regions make up the Canadian Arctic domain (Kane Basin, Foxe Basin, Baffin Bay, the Beaufort Sea and the Canadian Arctic Archipelago) and 4 sub-regions comprise the Hudson Bay domain (Hudson Bay, Hudson Strait, Davis Strait and the Northern Labrador Sea).

Key results

- The Canadian Arctic Archipelago, Beaufort Sea and Kane Basin sub-regions usually remain covered by ice in the summer because they contain a mix of multi-year and seasonal ice
- The 4 sub-regions of the Hudson Bay domain (Hudson Bay, Hudson Strait, Davis Strait and Northern Labrador Sea) are typically sea ice free because they are seasonal ice regions
- All sub-regions have statistically significant decreasing trends over the 1968 to 2018 period, ranging from a 2.9% per decade in the Kane Basin to a 15.6% per decade in the Northern Labrador Sea

Figure 2. Sub-region sea ice area trends, Northern Canadian Waters, 1968 to 2018



Data for Figure 2

Note: Sea ice is measured during the summer season. For the Northern Canadian Waters, the summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

In absolute terms, the largest sea ice area loss over the 1968 to 2018 period was found in the Beaufort Sea sub-region, where about 187 000 km^2 of sea ice area was lost. The Canadian Arctic Archipelago, Baffin Bay and Hudson Bay sub-regions also lost a large amount of sea ice area over the same period, with a detected loss of about 134 000 km^2, 102 000 km^2 and 73 000 km^2, respectively.

Based on projections from the latest state-of-the-art climate models, a nearly sea ice-free summer is considered a strong possibility for the Arctic Ocean by the middle of the century although sea ice may persist longer in the Canadian Arctic Archipelago region.

Multi-year sea ice

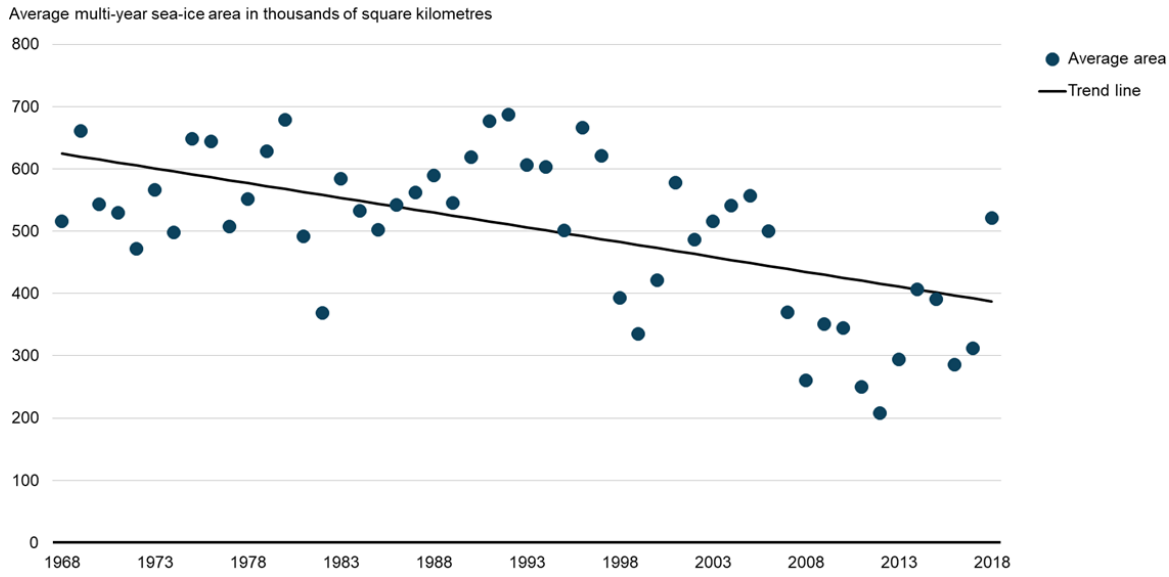
Multi-year sea ice corresponds to ice that has survived at least one summer's melt. Multi-year sea ice contains less salt and is usually thicker than first-year sea ice. Because it contains less salt, it is harder and more difficult for icebreakers to navigate and clear.

Key results

In the Canadian Arctic domain:

- multi-year sea ice area, measured during the summer season, declined by 7.4% per decade over the 1968 to 2018 period
- total sea ice area declined by 7.0% per decade over the same period

Figure 3. Average multi-year sea ice area, Canadian Arctic domain, 1968 to 2018



Data for Figure 3

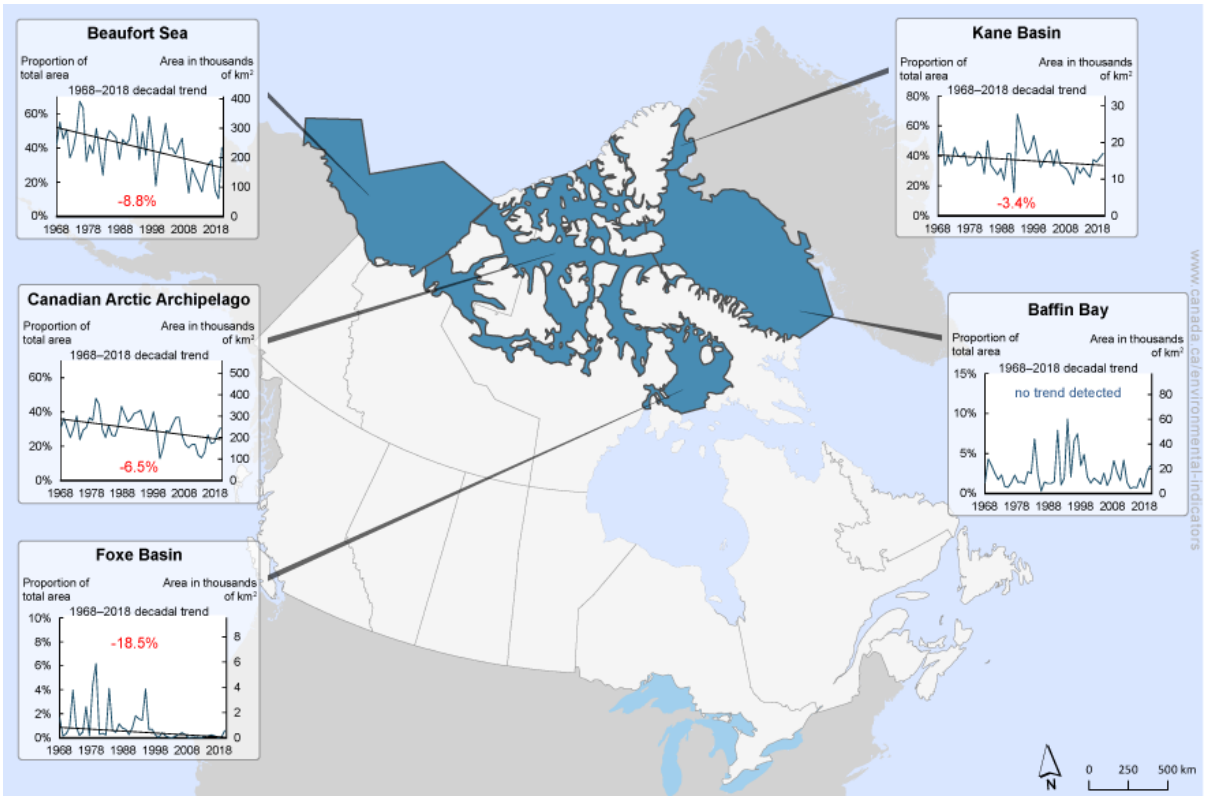
Note: Sea ice is measured during the summer season. For the Canadian Arctic domain, the summer season is defined as the period from June 25 to October 15. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Regional multi-year sea ice

Key results

- In the Canadian Arctic domain, decreasing trends in multi-year sea ice, measured during the summer season, were found for the Foxe Basin, Kane Basin, Beaufort Sea and Canadian Arctic Archipelago sub-regions
- The Baffin Bay sub-region showed no significant increasing or decreasing trends from 1968 to 2018
- The sub-regions of the Hudson Bay domain were found to be free of multi-year ice over the whole time period because they are seasonal ice regions

Figure 4. Multi-year sea ice area in Canadian Arctic sub-regions, 1968 to 2018



Data for Figure 4

Note: Sea ice is measured during the summer season. For the Canadian Arctic domain, the summer season is defined as the period from June 25 to October 15. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

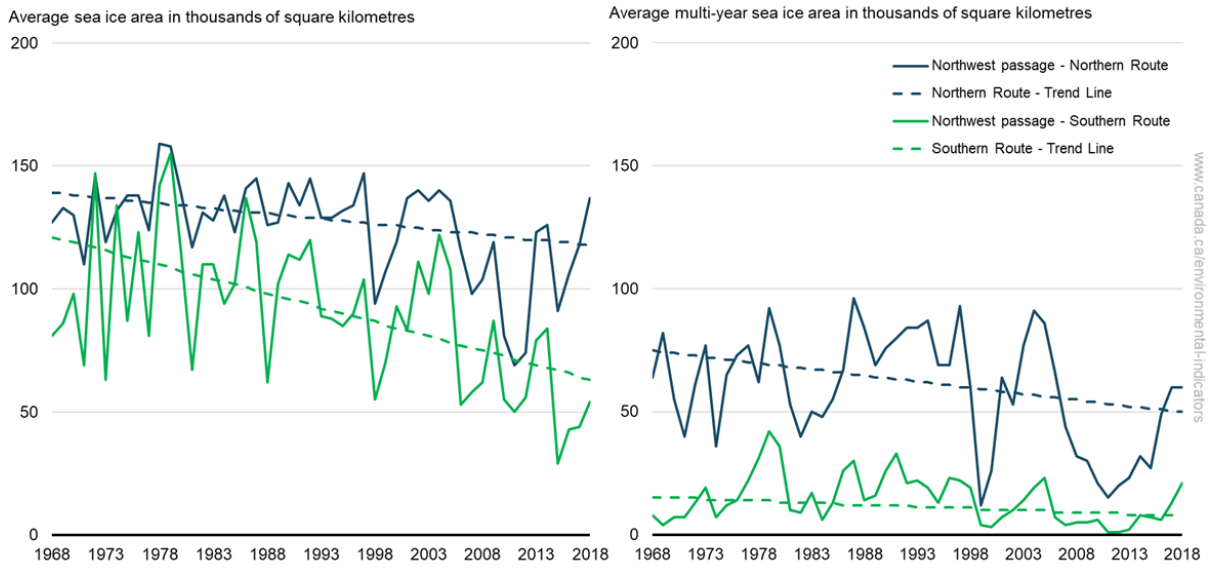
Sea ice area in Canada's Northwest Passage

Canada's Northwest Passage is a system of gulfs, straits, sounds and channels in the Canadian Arctic Archipelago connecting the Beaufort Sea in the west with Baffin Bay in the east. The Northwest Passage provides 2 main navigation paths on its western side: a northern route and a southern route.

Key results

- Over the 1968 to 2018 period, the amount of sea ice area covering the Northwest Passage, measured during the summer season, fluctuated in a similar way to the rest of the Canadian Arctic Waters
- Statistical decreasing trends were detected over this period for the sea ice and multi-year sea ice areas of the northern and southern routes
- The southern route was virtually free of multi-year sea ice for several of the recent years

Figure 5. Average sea ice and multi-year sea ice area, Canada's Northwest Passage, 1968 to 2018



Data for Figure 5

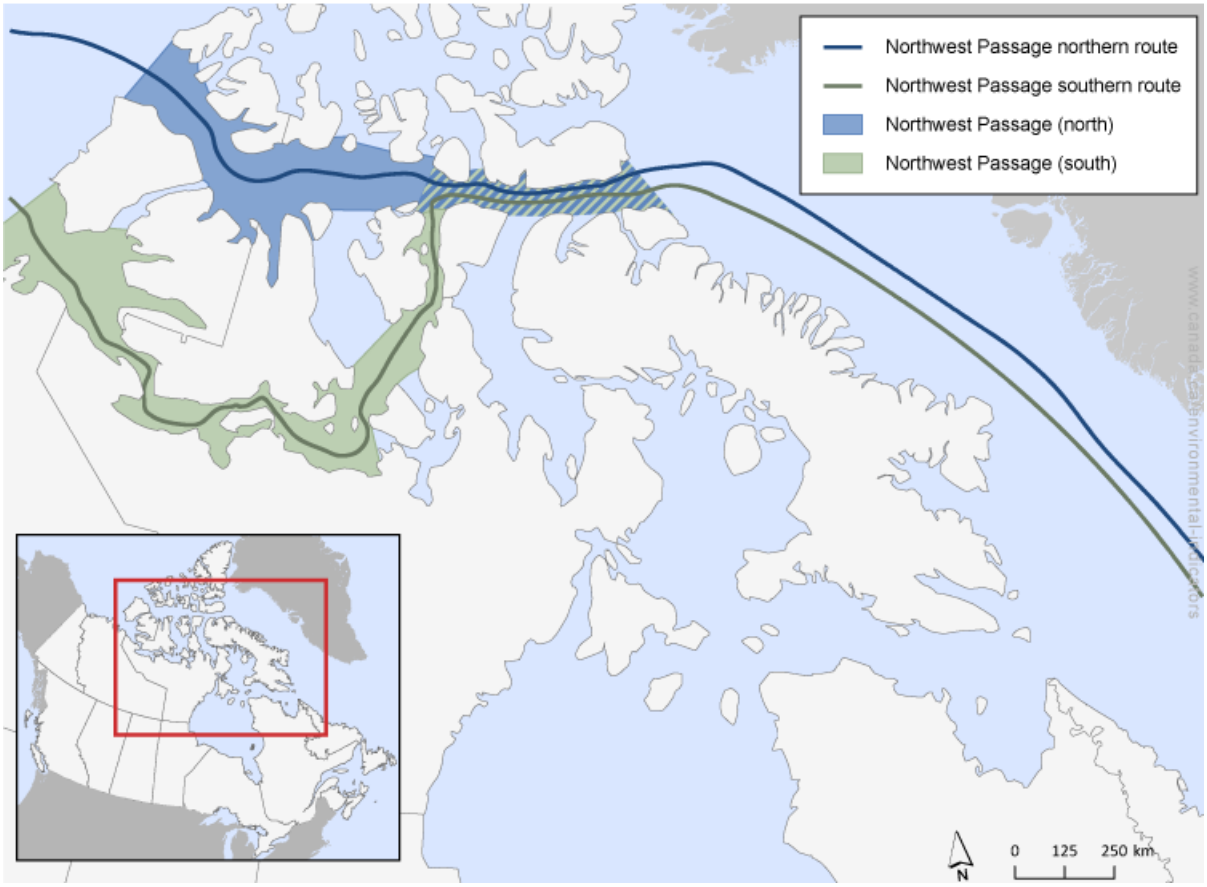
Note: Sea ice is measured during the summer season. For the Canadian Arctic domain, the summer season is defined as the period from June 25 to October 15. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Over the 1968 to 2018 period, statistical decreasing trends of 3.1% and 9.6% were detected for the sea ice areas of the northern and southern routes of the Northwest Passage. For multi-year sea ice, a decreasing trend of 6.7% per decade was detected for the northern route, while a decreasing trend of 10.0% was detected for the southern route.

Canada's Northwest Passage

Canada's Northwest Passage presents a potential deep-water Arctic shipping route between the northern Pacific and Atlantic regions that is much shorter than routes through the Panama or Suez canals. The Northwest Passage is covered by floating or land-fast sea ice[3] for most of the year, making it a navigation obstacle for ice-breaking ships and a safety hazard for non-ice strengthened ships.

Figure 6. Canada's Northwest Passage



Reduced sea ice is increasing opportunities for shipping, tourism, resource exploration and industrial activities in the North.

However, these activities bring new risks of accidents and spills under harsher conditions, including floating ice, changing sea ice cover and extreme weather. These factors can put people and ecosystems at risk and place additional stress on limited search and rescue, and disaster response capacity.

[3] Ice which forms and remains attached to the coast.

About the indicators

What the indicators measure

The Sea ice in Canada indicators provide information on the area of sea in Canada covered by ice during the summer season. Sea ice area represents the portion of marine area covered by ice. The area is evaluated using the Canadian Ice Service Digital Archive and is expressed in thousands or millions of square kilometres. The Sea ice in Canada indicators are provided for the Northern Canadian Waters, by sub-region and for the Northwest Passage. The indicators also present trends in total sea ice area and multi-year sea ice area. Multi-year sea ice is defined as sea ice that has survived at least one summer's melt.

Why these indicators are important

Sea ice is an indicator of how the climate is changing. It is a critical component of our planet because it influences the Arctic and global climate, ecosystems, and people who live in polar regions. Sea ice influences the climate through the sea ice–albedo feedback effect (or reflectivity of the Earth's surface). Changes in sea ice can also affect ocean currents and the exchange of heat and water vapour from ocean to atmosphere.

Sea ice affects marine transportation, commercial fishing, offshore resource development, the hunting and fishing patterns of Indigenous people, and tourism and recreation. Understanding how Canada's climate is changing is important for developing adaptive responses. The Sea ice in Canada indicators provide a way to communicate to Canadians how Canada's Arctic sea ice has changed.

The Intergovernmental Panel on Climate Change and the World Meteorological Organization use sea ice, among several other variables, to assess long-term changes in climate. Sea ice is considered by the World Meteorological Organization's Global Climate Observing System to be an Essential Climate Variable.

Related indicators

The Temperature change in Canada indicator measures yearly and seasonal surface air temperature departures in Canada, while the Precipitation change in Canada indicator measures annual and seasonal precipitation departures.

The Snow cover indicators provide information on spring snow cover extent and annual snow cover duration in Canada.

Data sources and methods

Data sources

Sea ice data used in these indicators were provided by Environment and Climate Change Canada's Climate Research Division. The sea ice area data were computed from the weekly sea ice charts (Canadian Ice Service Digital Archive) produced by Environment and Climate Change Canada's Canadian Ice Service.

More information

Spatial coverage

The indicators provide coverage for the Northern Canadian Waters which are comprised of the Canadian Arctic domain and the Hudson Bay domain. Five sub-regions make up the Canadian Arctic domain (Kane Basin, Foxe Basin, Baffin Bay, the Beaufort Sea and the Canadian Arctic Archipelago) and four sub-regions comprise the Hudson Bay domain (Hudson Bay, Hudson Strait, Davis Strait and the Northern Labrador Sea).

Figure 7. Sea ice sub-regions of the Northern Canadian Waters

Source: Environment and Climate Change Canada (2018) Canadian Ice Service.

Temporal coverage

The indicators are calculated using data for the summer sea ice season for the years 1968 to 2018. The summer sea ice season is defined as the period from June 25 to October 15 for the Canadian Arctic domain and from June 19 to November 19 for the Hudson Bay domain. These intervals correspond to the summer shipping season of each domain, a period during which the Canadian Ice Service produces weekly regional sea ice charts.

Data completeness

The data for these indicators are compiled by the Canadian Ice Service and grouped into time series by the Climate Research Division to ensure comparability. The data incorporate information from many different sources such as satellite data, surface observations, airborne and ship reports, and model results, along with the expertise of experienced ice forecasters. The Canadian Ice Service sea ice data provide the authoritative Canadian record for sea ice in Canada.

Data timeliness

The data used in the Sea ice in Canada indicators are current up to 2018.

Methods

The Sea ice in Canada indicators are based on the sea ice area data provided by Environment and Climate Change Canada's Climate Research Division.

For each region and sub-region, an average sea ice area is calculated from the summer season weekly sea ice charts for each year, from 1968 to 2018.

A statistical analysis is carried out using the Mann-Kendall and SEN's methods (Kendall-tau) to identify the presence of statistical linear trends at the 95% confidence level.

More information

The Sea ice in Canada indicators use the weekly sea ice charts produced by the Canadian Ice Service. Weekly sea ice charts are primarily produced using imagery from RADARSAT-1 (since 1996) and RADARSAT-2 (since 2008) satellites. Other remote sensing data sources are also used, such as the National Oceanic and Atmospheric Administration's Advanced Very High Resolution Radiometer and Moderate-Resolution Imagine Spectrometer imagery. Where possible, the interpretation of satellite data is verified using observations from the Canadian Ice Service specialists onboard dedicated aircraft and Canadian Coast Guard ships.[4]

The Canadian Ice Service ice charts indicate the ice concentration in tenths and its stage of development. They also list the mean and normal 1981 to 2010 temperatures of some of the region's stations, which give an indication of one of the factors contributing to current ice conditions. Ice information is presented using the World Meteorological Organization's terminology. For more information about how the Canadian Ice Service produces weekly sea ice charts and maps, consult the Regional Ice Charts or the Manual of Standard Procedures for Observing and Reporting Ice Conditions.

The weekly sea ice charts are compiled into time series by the Climate Research Division for each region and sub-region. The sea ice area for a given year corresponds to the average area calculated from the weekly sea ice charts of the summer season.

The summer season was chosen because it represents the time when the amount of sea ice reaches its minimum, which is widely utilized within the scientific community as a measure of climate variability. It is also the time period when the most visible changes in sea ice occur. Historically, sea ice charts have been generated to support the shipping season, which is highest during the summer.

[4] Environment and Climate Change Canada (2015) Sea Ice Climatic Atlas for the Northern Canadian Waters 1981-2010.

Non-parametric statistical tests were carried out on temporal sea ice area data to detect the presence of a linear trend and, if present, to determine the orientation (positive or negative) and magnitude of the rate of change (slope). The standard Mann-Kendall trend test was used to detect trend presence and orientation, while the Sen's pairwise slope method was used to estimate the slope. A trend was reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.

Caveats and limitations

Care should be taken when using these indicators as proxies of the actual sea ice area change in specific locations. Sea ice area change could vary considerably within a sub-region, the smallest unit of analysis in these indicators.

Resources

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Annexes

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Average sea ice area, Northern Canadian Waters, 1968 to 2018

Year	Northern Canadian Waters sea ice area (millions of square kilometres)
1968	1.26
1969	1.53
1970	1.47
1971	1.32
1972	1.69
1973	1.30
1974	1.48
1975	1.34
1976	1.49
1977	1.28
1978	1.69
1979	1.44
1980	1.42
1981	1.19
1982	1.35
1983	1.62
1984	1.47
1985	1.36
1986	1.55
1987	1.40
1988	1.28
1989	1.42
1990	1.45
1991	1.44
1992	1.65
1993	1.31
1994	1.36
1995	1.20
1996	1.52
1997	1.27
1998	0.87
1999	1.11
2000	1.24
2001	1.23
2002	1.28
2003	1.20
2004	1.29
2005	1.17
2006	1.00
2007	0.94
2008	0.91
2009	1.15
2010	0.84
2011	0.74
2012	0.71
2013	1.13
2014	1.04
2015	1.12
2016	0.79
2017	0.94
2018	1.23

Note: Sea ice is measured during the summer season. For the Northern Canadian Waters, the summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Table A.2. Data for Figure 2. Sub-region sea ice area trends, Northern Canadian Waters, 1968 to 2018

Year	Foxe Basin sea ice area (thousands of square kilometres)	Kane Basin sea ice area (thousands of square kilometres)	Baffin Bay sea ice area (thousands of square kilometres)	Beaufort Sea sea ice area (thousands of square kilometres)	Canadian Arctic Archipelago sea ice area (thousands of square kilometres)	Hudson Bay sea ice area (thousands of square kilometres)	Hudson Strait sea ice area (thousands of square kilometres)	Davis Strait sea ice area (thousands of square kilometres)	North Labrador Sea sea ice area (thousands of square kilometres)
1968	83	31	143	311	542	94	21	25	5
1969	59	32	172	431	544	191	25	34	5
1970	74	34	216	390	556	130	19	38	12
1971	66	33	177	354	482	109	30	31	9
1972	117	33	171	335	659	223	50	77	15
1973	64	34	157	375	476	125	30	49	3
1974	68	34	85	478	587	154	27	23	7
1975	53	34	87	457	520	109	17	27	8
1976	82	34	147	427	597	113	19	41	7
1977	73	35	210	286	515	84	15	41	6
1978	108	31	210	412	649	194	30	35	7
1979	76	33	139	327	662	127	22	37	6
1980	62	33	149	417	581	110	17	28	3
1981	44	31	127	353	471	104	14	28	2
1982	63	32	158	299	558	142	24	58	6
1983	90	35	187	453	539	162	38	81	12
1984	65	31	124	442	538	154	41	52	12
1985	56	30	85	459	513	133	27	24	10
1986	72	33	179	397	622	165	21	42	3
1987	86	30	188	275	587	158	26	32	7
1988	66	28	121	379	492	112	23	26	5
1989	81	35	177	388	537	141	20	28	5

Year	Foxe Basin sea ice area (thousands of square kilometres)	Kane Basin sea ice area (thousands of square kilometres)	Baffin Bay sea ice area (thousands of square kilometres)	Beaufort Sea sea ice area (thousands of square kilometres)	Canadian Arctic Archipelago sea ice area (thousands of square kilometres)	Hudson Bay sea ice area (thousands of square kilometres)	Hudson Strait sea ice area (thousands of square kilometres)	Davis Strait sea ice area (thousands of square kilometres)	North Labrador Sea sea ice area (thousands of square kilometres)
1990	86	26	153	377	592	128	31	38	7
1991	69	33	108	467	553	122	27	34	12
1992	79	38	151	450	612	210	32	55	7
1993	68	31	212	253	526	142	21	42	4
1994	56	29	140	437	511	116	19	31	6
1995	56	25	169	284	531	94	12	14	0
1996	61	35	258	454	538	121	22	29	6
1997	49	35	156	312	576	102	16	17	3
1998	58	32	140	155	392	55	10	13	1
1999	59	31	144	335	458	37	8	27	5
2000	47	32	94	406	506	107	8	24	2
2001	57	34	102	425	522	51	6	18	1
2002	59	34	79	358	564	126	15	28	9
2003	52	30	74	352	556	103	9	18	2
2004	61	32	101	314	598	147	11	16	0
2005	40	30	112	354	549	64	10	10	1
2006	28	29	64	360	436	46	4	12	1
2007	54	25	96	242	408	76	10	18	5
2008	59	26	92	158	435	94	14	24	0
2009	52	22	69	306	505	139	17	28	6
2010	39	29	79	233	408	33	3	9	0
2011	45	25	73	190	340	59	3	6	0
2012	52	29	43	126	353	74	6	18	0
2013	57	35	67	339	504	84	9	17	5

Year	Foxe Basin sea ice area (thousands of square kilometres)	Kane Basin sea ice area (thousands of square kilometres)	Baffin Bay sea ice area (thousands of square kilometres)	Beaufort Sea sea ice area (thousands of square kilometres)	Canadian Arctic Archipelago sea ice area (thousands of square kilometres)	Hudson Bay sea ice area (thousands of square kilometres)	Hudson Strait sea ice area (thousands of square kilometres)	Davis Strait sea ice area (thousands of square kilometres)	North Labrador Sea sea ice area (thousands of square kilometres)
2014	61	25	52	260	520	86	12	13	5
2015	65	35	128	261	418	140	18	47	3
2016	42	27	57	149	399	79	12	22	2
2017	43	28	96	199	471	60	9	36	0
2018	59	32	98	333	532	123	17	33	4
1968 to 2018 decadal trend	-7.4%	-2.9%	-12.2%	-7.5%	-4.3%	-9.5%	-14.0%	-11.4%	-15.6%

Note: Sea ice is measured during the summer season. For the Northern Canadian Waters, the summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Table A.3. Data for Figure 3. Average multi-year sea ice area, Canadian Arctic domain, 1968 to 2018

Year	Canadian Arctic domain multi-year sea ice area (thousands of square kilometres)
1968	516
1969	661
1970	543
1971	530
1972	472
1973	566
1974	498
1975	648
1976	644
1977	508
1978	551
1979	628
1980	679
1981	492
1982	369
1983	584
1984	533
1985	502
1986	542
1987	562
1988	589
1989	545
1990	619
1991	676
1992	687
1993	606
1994	603
1995	501
1996	666
1997	621
1998	393
1999	335
2000	421
2001	578
2002	486
2003	516
2004	541
2005	557
2006	500
2007	370
2008	260
2009	351
2010	345
2011	250
2012	207
2013	295
2014	406
2015	391
2016	286
2017	312
2018	521

Note: Sea ice is measured during the summer season. For the Northern Canadian Waters, the summer season is defined as the period from June 19 to November 19 for the Hudson Bay domain and from June 25 to October 15 for the Canadian Arctic domain. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Table A.4. Data for Figure 4. Multi-year sea ice area in Canadian Arctic sub-regions, 1968 to 2018

Year	Foxe Basin multi-year sea ice area (thousands of square kilometres)	Kane Basin multi-year sea ice area (thousands of square kilometres)	Baffin Bay multi-year sea ice area (thousands of square kilometres)	Beaufort Sea multi-year sea ice area (thousands of square kilometres)	Canadian Arctic Archipelago multi-year sea ice area (thousands of square kilometres)
1968	1.58	17	8	216	244
1969	0.14	23	28	319	289
1970	0.32	14	23	234	243
1971	0.83	16	16	256	201
1972	3.77	14	11	181	243
1973	0.88	19	15	202	301
1974	0.18	16	6	285	190
1975	0.45	16	5	374	235
1976	2.46	17	9	350	247
1977	0.16	14	15	181	293
1978	4.16	14	9	240	281
1979	5.88	15	10	213	383
1980	0.26	18	8	291	354
1981	0.35	16	18	213	237
1982	0.22	12	16	140	201
1983	3.91	21	44	252	255
1984	0.57	14	16	287	211
1985	0.43	13	2	271	207
1986	1.09	11	9	265	253
1987	0.77	13	8	190	346
1988	0.66	10	8	253	308
1989	0.24	17	10	245	273
1990	0.79	17	51	260	288
1991	1.74	6	7	340	313
1992	1.49	28	12	320	318
1993	1.37	24	60	190	328
1994	3.85	20	13	281	279
1995	0.65	17	43	203	233
1996	0.67	18	48	344	260
1997	0.21	22	22	255	320
1998	0.02	17	32	103	240
1999	0.40	13	13	205	102

Year	Foxe Basin multi-year sea ice area (thousands of square kilometres)	Kane Basin multi-year sea ice area (thousands of square kilometres)	Baffin Bay multi-year sea ice area (thousands of square kilometres)	Beaufort Sea multi-year sea ice area (thousands of square kilometres)	Canadian Arctic Archipelago multi-year sea ice area (thousands of square kilometres)
2000	0.16	15	8	239	151
2001	0.03	17	12	308	232
2002	<0.01	18	10	229	228
2003	0.11	14	8	232	263
2004	0.25	18	16	205	294
2005	0.39	14	7	240	295
2006	0.26	13	12	254	208
2007	0.00	13	27	163	168
2008	0.04	11	17	79	152
2009	0.06	9	10	164	168
2010	0.02	14	27	134	169
2011	0.00	12	9	111	119
2012	0.10	13	4	77	106
2013	0.16	12	5	146	131
2014	0.22	11	5	178	212
2015	0.13	15	12	191	172
2016	<0.01	15	5	89	177
2017	0.06	16	16	60	220
2018	0.56	17	22	234	246
1968 to 2018 decadal trend	-18.5%	-3.4%	No trend	-8.8%	-6.5%

Note: Sea ice is measured during the summer season. For the Canadian Arctic domain, the summer season is defined as the period from June 25 to October 15. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Table A.5. Data for Figure 5. Average sea ice and multi-year sea ice area, Canada's Northwest Passage, 1968 to 2018 Error! Reference source not found.

Year	Northwest Passage northern route sea ice area (thousands of square kilometres)	Northwest Passage southern route sea ice area (thousands of square kilometres)	Northwest Passage northern route multi-year sea ice area (thousands of square kilometres)	Northwest Passage southern route multi-year sea ice area (thousands of square kilometres)
1968	127	81	64	8
1969	133	86	82	4
1970	130	98	55	7
1971	110	69	40	7
1972	146	147	61	13
1973	119	63	77	19
1974	132	134	36	7
1975	138	87	65	12
1976	138	123	73	14
1977	124	81	77	22
1978	159	142	62	31
1979	158	155	92	42
1980	139	115	77	36
1981	117	67	53	10
1982	131	110	40	9
1983	128	110	50	17
1984	138	94	48	6
1985	123	102	55	13
1986	141	137	67	26
1987	145	119	96	30
1988	126	62	84	14
1989	127	102	69	16
1990	143	114	76	26
1991	134	112	80	33
1992	145	120	84	21
1993	129	89	84	22
1994	129	88	87	19
1995	132	85	69	13
1996	134	90	69	23
1997	147	104	93	22
1998	94	55	60	19
1999	107	70	12	4
2000	119	93	26	3
2001	137	83	64	7

Year	Northwest Passage northern route sea ice area (thousands of square kilometres)	Northwest Passage southern route sea ice area (thousands of square kilometres)	Northwest Passage northern route multi-year sea ice area (thousands of square kilometres)	Northwest Passage southern route multi-year sea ice area (thousands of square kilometres)
2002	140	111	53	10
2003	136	98	77	14
2004	140	122	91	19
2005	136	108	86	23
2006	116	53	66	7
2007	98	58	44	4
2008	104	62	32	5
2009	119	87	30	5
2010	81	55	21	6
2011	69	50	15	1
2012	74	56	20	1
2013	123	79	23	2
2014	126	84	32	8
2015	91	29	27	7
2016	106	43	49	6
2017	118	44	60	13
2018	137	54	60	21
1968 to 2018 decadal trend	-3.1%	-9.6%	-6.7%	-10.0%

Note: Sea ice is measured during the summer season. For the Canadian Arctic domain, the summer season is defined as the period from June 25 to October 15. A statistically significant trend is reported when the Mann-Kendall test indicated the presence of a trend at the 95% confidence level.
Source: Environment and Climate Change Canada (2018) Climate Research Division.

Additional information can be obtained at:

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