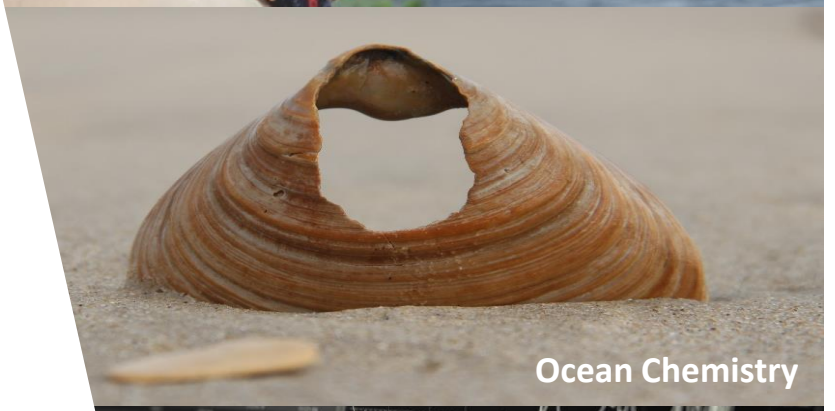
Fisheries and Oceans Canada | Pêches et Océans Canada

Evaluation of the Aquatic Climate Change Adaptation Services Program (ACCASP)

FINAL REPORT

March 10, 2020

Project Number: 96265



Canada

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Evaluation Context

Overview

- This report presents the results of the Evaluation of Fisheries and Oceans Canada's (DFO) Aquatic Climate Change Adaptation Services Program (ACCASP).
- The evaluation was conducted as identified in **DFO's 2019-20 to 2023-24 Departmental Evaluation Plan**, and as required by the Treasury Board Secretariat for the **Horizontal Roll-up Evaluation of the Adapting to the Impacts of Climate Change Initiative,** which is led by Environment and Climate Change Canada.
- The evaluation was conducted by DFO's Evaluation Division between August 2019 and January 2020 in accordance with the Policy on Results (2016) and included all DFO regions: National Capital Region (NCR); Newfoundland and Labrador (N&L); Maritimes; Gulf; Quebec; Central and Arctic (C&A); and Pacific. The evaluation covered a period of four years from **2016-2017** to **2019-2020**.

Links to Previous Evaluations and Audits

The **2017 Horizontal Evaluation of the Adaptation Theme**[1] assessed the overall relevance and performance of the federal government's Clean Air Agenda Adaptation Theme to which the ACCASP contributed as one of 10 program elements. In response to the recommendations of the evaluation, the ACCASP developed a management action plan[2]; then implemented it by 2018-19.

The **2017 Commissioner of the Environment and Sustainable Development (CESD) Report "Adapting to the Impacts of Climate Change"**[3] examined the extent to which 19 federal departments and agencies implemented the Federal Adaptation Policy Framework. The framework states that all federal departments and agencies must take action and consider climate change impacts in their programs, policies, and operations.

- DFO was one of the five departments that identified and assessed its climate change risks and initiated measures to adapt to climate change in their areas of responsibility. The ACCASP played a key role in the departmental efforts and results.

DFO's **Evaluation of Science Funding (2018-19)**[4] assessed the efficiency of 16 funding programs, including the ACCASP, of the Ecosystems and Oceans Science (EOS) sector and whether the application, selection and/or administration processes support equity and diversity.

- The evaluation made recommendations related to the overall research funding allocation process of the EOS sector. In response, EOS is developing a new funding allocation system by March 2021. The new system will increase efficiencies, standardize communication and establish a formal priority setting mechanism within key client sectors.
- The current evaluation incorporates findings from the Evaluation of Science Funding. For the year that the ACCASP used a competitive funding process (2018-19), ACCASP data was disaggregated and analyzed.

[1] 2017 Horizontal Evaluation of the Clear Air Agenda Adaptation Theme
[2] DFO's Management Action Plan: http://www.dfo-mpo.gc.ca/ae-ve/evaluations/16-17/6B168-eng.html
[3] 2017 CESD Report "Adapting to the Impacts of Climate Change"
[4] DFO Evaluation of Science Funding: http://www.dfo-mpo.gc.ca/ae-ve/evaluations/18-19/Evaluation-Science-Funding-eng.pdf

Evaluation Context - Continued

Evaluation Scope

The evaluation was designed as an **outcome evaluation** and covered the period from 2016-2017 to 2019-2020. The evaluation assessed the ACCASP's achievements toward the expected results, and the efficiency of the program in delivering on its objectives.

Each of the four years within the scope of the evaluation reflects a different funding context for the ACCASP.

2016-17 The ACCASP was extended for 2 years under the Clean Air Agenda. Budget 2016 allocated $2.8 M to the program.

2017-18 The ACCASP was renewed under the Pan-Canadian Framework. Budget 2017 allocated $700K to the program in 2017-18, in addition to the $2.8M allocated in 2016-17. Total program funding was $3.5M.

2018-19 The ACCASP began receiving A-base funding of $3.5M per year under ECCC's Adapting to the Impacts of Climate Change Initiative.

2019-20 The ACCASP continued to receive $3.5M A-base funding. Only a portion of this year falls within the scope of the evaluation.[5]

Evaluation Methodology

The evaluation examined the questions presented in Table 1. It used multiple lines of evidence, both qualitative and quantitative, which were triangulated to mitigate potential limitations. The methodology included: document review, interviews, administrative data analysis, financial analysis, webometric analysis, and analysis of data obtained from DFO's Evaluation of Science Funding (2018-2019).

The **evaluation methodology and limitations** are presented in **Appendix A.**

Table 1: Evaluation Questions

1. What needs does the ACCASP address?
2. To what extent is the research funded by the ACCASP available to users?
3. To what extent is the research funded by the ACCASP being used?
4. How efficient is the ACCASP research funding cycle?
5. To what extent are ACCASP resources appropriate to support the achievement of its objectives?
6. To what extent does the ACCASP address challenges and explore opportunities for improvements?
7. Are the application and approval processes for ACCASP research funding equitable to all potential applicants?

The **evaluation matrix** is presented in **Appendix B.**

[5] Data collection was completed in December 2019.

Program Context

The ACCASP is an **internal science-funding program** that allocates research funds to DFO scientists. The ACCASP conducts scientific research and monitoring activities necessary to identify climate change impacts and vulnerabilities, improve ocean forecasting and develop adaptation information and tools for vulnerable coastal regions. The objective of the ACCASP is to inform DFO's adaptation decisions related to fisheries, ocean management and coastal infrastructure.

The ACCASP receives **$3.5M per year** (A-Base) under Environment and Climate Change Canada's (ECCC) **Clean Growth and Climate Change – Adaptation (CGCC)** initiative. **Eight (8)** full time equivalents (FTEs) are funded under the program. Six **(6)** FTEs, one in each region, conduct regional research activities and participate in national ACCASP working groups. Two **(2)** FTEs, based in the NCR, are responsible for program management, oversight and coordination at the regional and national level. The NCR team also acts as the point of contact for internal and external requests related to climate change adaptation.

The ACCASP contributes to the objectives and activities of **DFO** and the Government of Canada's **Pan-Canadian Framework for Clean Growth and Climate Change (PCF)** by supporting the aquatic climate change research, communication and collaboration that lead to data acquisition and adaptation knowledge creation. Relevant and reliable science information is needed to inform decision-making and respond to climate change commitments from a departmental and federal government perspective.

At the Federal level:

- The ACCASP reports program outcomes to ECCC under the **Horizontal Management Framework (HMF) for Clean Growth and Climate Change.** All relevant horizontal outcomes and indicators are presented in **Appendix C.**
- The ACCASP has contributed to the **Adaptation and Resilience Pillar** of the **PCF** since 2017-18.

At the Departmental level:

- The ACCASP falls under the Ocean and Climate Change Science Program within DFO's Departmental Results Framework. The program contributes to the **Aquatic Ecosystems** Core Responsibility to *conserve and protect Canada's oceans and other aquatic ecosystems and species from human impact and invasive species.*
- The ACCASP directly supports the departmental result that 'Scientific information on Canada's oceans and other aquatic ecosystems is available to inform management decisions'.

Rising sea levels can damage shorelines and coastal infrastructure.

Program Context – Continued

The program is designed to advance science activities in three closely interlinked priority areas: **Ocean Chemistry**; **Vulnerability of fisheries and coastal infrastructure to climate change**; and **Refining applied ocean models**.

Ocean Chemistry (OC)

ACCASP collects ocean chemistry data to assess the current and expected extent of ocean acidification and hypoxia; study the interaction of ocean acidification and hypoxia with other climate stressors and conditions (i.e., temperature, ocean circulation, fresh water input); and help understand how these interactions affect fish and other aquatic species.

Vulnerability of fisheries and coastal infrastructure to climate change (V)

ACCASP conducts:

- Fisheries vulnerability assessments that consider levels of exposure to climate stressors and the resiliency and adaptive capacity of fish species and stocks to determine how these factors could change their distribution, productivity and abundance; and
- Vulnerability assessments for coastal infrastructure and coastal areas that consider the climate change impacts of sea-level rise, frequent storm surges and changing ice conditions.

ACCASP develops adaptation tools and methods to inform planning and management decisions when developing adaptation strategies in order to address and minimize risks to fisheries and coastal communities.

Refining applied ocean models (M)

ACCASP produces ocean models and simulations that incorporate past and present assumptions as well as direct observations to predict future climate and ocean conditions (i.e., temperature, currents and ocean chemistry). The ACCASP also refines ocean models to improve the accuracy of predictions, develop smaller-scale predictions that are specific for individual communities and extend model simulations over longer timescales.

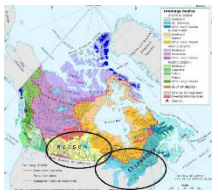
- The three priority areas were determined based on previously identified risks. In 2013, the ACCASP conducted **risk-based assessments** of climate change impacts to Canada's four large aquatic basins over a 10 and 50 year horizon.
- The Arctic, Pacific, Freshwater, and Atlantic aquatic basin risk assessments considered how climate change could impact the four regions in terms of six pre-identified climate change risks to DFO sectors, infrastructure and operations:[6]

1. Ecosystems and Fisheries Degradation and Damage
2. Increased Demand to Provide Emergency Response
3. Changes in Access and Navigability of Waterways
4. Changes in Biological Resources
5. Species Reorganization and Displacement
6. Infrastructure Damage

Pacific basin


Arctic basin


Atlantic basin


Freshwater basin

[6] Climate Change risks were identified in DFO's Climate Change Risk Profile (2012), which was developed following department-wide consultation in response to the requirements of the Federal Adaptation Policy Framework (2011). DFO was one of the only five federal departments recognized for this effort in the 2017 CESD Report on Climate Change.

Broader Climate Change Context

The ACCASP operates within a context of high demand for aquatic climate change research to inform adaptation efforts at international, national, departmental, and regional levels. The ACCASP **does not have direct responsibilities beyond supporting aquatic climate change research for DFO**. Nevertheless, the ACCASP contributes a **unique expertise** at the federal level. The department is required to ensure scientific information is available to support **broader responsibilities and commitments** that may go beyond ACCASP science, climate change science in general, and adaptation.

Demand for aquatic climate change adaptation services is driven at the international, national and departmental levels.

1 International Climate Change Drivers

- Commonwealth Blue Charter (2018)
- High Level Panel for a Sustainable Ocean Economy (2018)
- North-American Leaders Summit (2016)
- UN 2030 Agenda for Sustainable Development (2015)
- UNFCC Paris Agreement (2015)
- International Panel on Climate Change (IPCC)(1998)
- Arctic Council (1996)
- UN Framework Convention on Climate Change (1992)

2 Canadian Climate Change Initiatives

- Federal Sustainable Development Strategy (2019-22)
- Greening Government Strategy (2017)
- Pan-Canadian Framework on Clean Growth and Climate Change (2016)
- Federal Adaptation Policy Framework (2011)

3 DFO Responsibilities

- Legal obligations under the *Oceans Act (1996)*; *Federal Sustainable Development Act (2008)*; *Fisheries Act (1985)*, including *Bill C68* amendments *(2019)*
- Federal commitments under the Federal Sustainable Development Strategy (2019-22), Greening Government Strategy (2017); Pan-Canadian Framework (2016); and Federal Adaptation Policy Framework (2011)
- Minister of Fisheries, Oceans, and the Canadian Coast Guard Mandate Letters
- Commitments under the Horizontal Management Framework for Clean Growth and Climate Change (2016)
- DFO's Corporate Risk Profile (2019-20)

More details on the **evolution of these drivers** and resulting pressures on the ACCASP are presented in **Appendix D**.

Summary of Key Findings

Under its current mandate and design, the **ACCASP performed well**. However, in the evolving climate change context, the needs for aquatic climate change science information and tools have also evolved within and beyond the ACCASP's ***Ocean Chemistry***, ***Vulnerability Assessment*** and ***Ocean Modelling*** priority areas.

The ACCASP responds to needs to some extent

- The ACCASP responds to needs for aquatic climate change science information and tools. ACCASP-funded projects and ongoing monitoring activities advance aquatic climate change science to support adaptation efforts, as per the program's objectives. Most activities have been completed as planned and on schedule.
- However, the **demand for ACCASP-generated information is greater** than what the program can provide under its existing design and resources. Outstanding and evolving science needs for evidence-based decision-making in support of adaptation efforts for DFO and the Government of Canada are **broader than the ACCASP's current mandate.**
- The practice of **distributing research funds by DFO's six regions** is in line with the actual regional distribution of scientific expertise; however, it results in **differential knowledge acquisition across Canada's three coasts** because four of the six DFO administrative regions are located in the Atlantic coast.

ACCASP information and tools are underutilized

The ACCASP produces research of **high scientific value.** ACCASP research has been used by DFO, and across governments and private organizations. The broader science community in Canada and internationally also uses ACCASP research and data. Nevertheless, ACCASP-generated tools and information are not well known and therefore **remain underutilized.**

- ACCASP information and tools are primarily used by early adopters while **potential users** have been **identified and are likely to increase** as more DFO programs and external organizations increase their climate change adaptation efforts.
- A number of challenges, common to science-oriented programs, impede the communication of ACCASP information and tools to a broader audience to inform decision-making in support of adaptation efforts. Moreover, the ACCASP does not carry out formal client engagement or outreach strategies since the program is not designed or funded for this purpose.

The ACCASP fulfills a role beyond its mandate

- ACCASP management staff fulfill a growing role within the department and are involved in activities that are driven by an evolving broader climate change context. These activities, which have increased continuously since 2017, **exceed the program's direct responsibilities**.
- The program does not have the **sufficient internal capacity** to fulfill this expanding role and this further detracts resources from being focused on ACCASP-specific activities.

Evaluation Findings

THE ACCASP RESPONDS TO FEDERAL GOVERNMENT AND DFO NEEDS TO SOME EXTENT

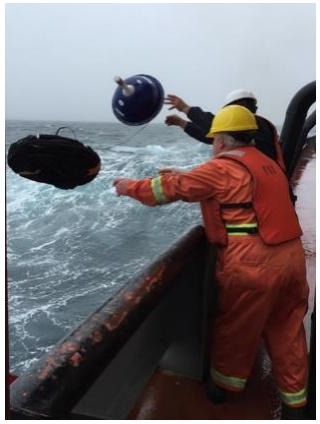
The ACCASP responds to needs for aquatic climate change science in support of adaptation efforts. Nevertheless, outstanding and evolving science needs to support evidence-based decision-making are broader than the ACCASP's current mandate. Moreover, DFO and federal government needs are likely to increase as a result of different factors.

Adapting to the expected impacts of climate change and minimizing associated risks requires aquatic climate change science information to support evidence-based decision-making.

Federal Government

- The federal government is a **unique source** of **authoritative climate change science** information supporting adaptation efforts in Canada.
- The **ACCASP is the only federal program** that advances research in the area of aquatic climate change science in support of federal adaptation efforts, including ECCC's Horizontal Initiative on Clean Growth and Climate Change and the Pan-Canadian Framework.
- Under the PCF and the Horizontal Initiative on CGCC, the ACCASP, on behalf of DFO, is responsible for activities that support adaptation in **vulnerable coastal and northern regions**.

Coastal communities are especially vulnerable to the impacts of climate change.



A drifting buoy being deployed near the North Labrador coast.

Fisheries and Oceans Canada

- By supporting DFO's **departmental result 2.2**, *Scientific information on Canada's oceans and other aquatic ecosystems is available to inform management decisions,* the ACCASP contributes information that supports several of the department's key priorities.
- ACCASP research also contributes to DFO commitments to **use good scientific evidence** and traditional Indigenous knowledge when making decisions affecting fish stocks and ecosystem management (2019 DFO Mandate Letter), and to ensure effective use of research resulting from restored federal funding for freshwater research, **federal ocean science and monitoring programs** among others (2018 DFO Mandate Letter).

There is strong evidence that climate change has been affecting, and will continue to affect Canada's oceans, aquatic resources, marine ecosystems and coastal regions. The risks induced by climate change and the need to mitigate them were recently confirmed by the Federal Government's ***Canada's Climate Change Report (2019)***; and the Council of Canadian Academies' ***Canada's Top Climate Change Risks (2019).***

Evaluation Findings

SCIENCE NEEDS ARE EVOLVING BEYOND THE ACCASP'S CURRENT MANDATE

A number of factors suggest that, overall, science needs to support evidence-based decision-making within the ACCASP's three priority areas will increase.

- Climate-induced changes in the ocean are occurring. There will be a continuous need for monitoring activities to provide a comprehensive assessment of the current state and **extent of changing ocean conditions**.
- The **body of knowledge** on aquatic climate change science is advancing, and with it, new gaps and areas of importance. For example, the prominence of research on ocean acidification had not been anticipated ten years ago.
- The **technology** that is available to conduct aquatic climate change research is evolving. This will further drive science needs as, for example, areas that were previously inaccessible become more accessible.
- **Awareness** of climate change risks and adaptation needs is increasing among potential users within and outside the department. The need to assess vulnerabilities and develop adaptation tools for new clients is likewise expected to increase.
- Demand for research that is **integrated** across ACCASP's complementary priority areas and research themes is increasing.
- Demand for research that integrates **additional factors** in conjunction with ocean chemistry, vulnerability assessments and modelling activities is increasing. Factors such as **socio-economic impacts on affected communities** are critical and will be needed to better understand complex phenomena and adopt effective measures.

Evolving needs lie beyond the current mandate of the ACCASP to address them.

ACCASP priorities and resources were determined based on assessments of DFO climate-change risks as of 2016, as well as the state of technology and scientific knowledge **at that time**.

Meanwhile, the **broader climate change adaptation context** and related science needs **continue to evolve**. DFO and the federal government are expected to respond to these evolving demands and responsibilities based on sound science advice.

As the **only federal program** advancing the aquatic climate change science body of knowledge, the ACCASP is **unable to address evolving needs** within the existing program **design** and **resources**.

More details on the **increased pressures** on the ACCASP as a result of the evolving broader climate change context are presented in **Appendix D**.

Evaluation Findings

RESOURCES ARE ALLOCATED TO THE THREE PRIORITY AREAS AS DESIGNED

The ACCASP addresses aquatic climate change science needs within three priority areas. As designed, funding is allocated to priority areas in proportion to the relative importance of informing climate change adaptation decision-making.

The ACCASP has advanced research in ocean monitoring, vulnerability assessment and modelling activities.

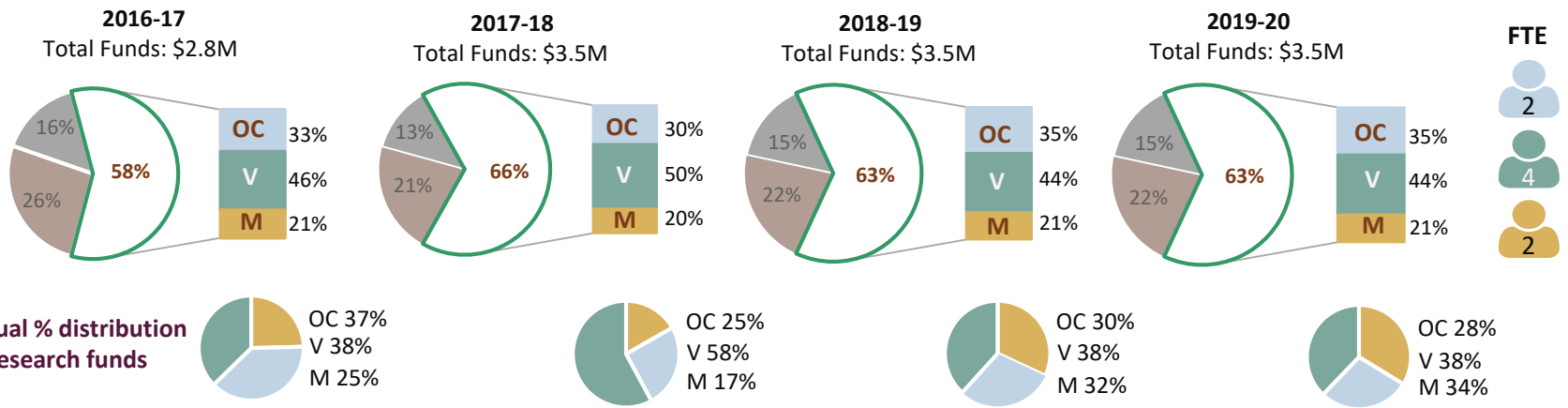
22%

DFO undertook a science advisory peer-review process to develop a framework to enable the systematic integration of climate change, oceanographic and ecological stressor data and fish stock vulnerability information into stock assessments to enable climate-ready decision-making in fisheries resource management. **22% of fisheries stock assessments now incorporate climate change considerations.** The program is on track to reach a target of 100% by 2026.

Long-term baseline ocean chemistry data has been collected for **offshore areas**; more coastal ocean acidification monitoring is required. Foundational knowledge on the acidification of Canada's oceans has been augmented.

Since 2017-18, the total **budget identified in the ACCASP foundational documents** is **$3.5M per year** and includes salaries for eight FTEs, costs for internal services, and operations and maintenance (O&M). The O&M research budget lies between **58%** and **66%** of total program funds. The number of **FTEs** has remained unchanged.

Planned % Distribution of the Total ACCASP Budget, by Year



The variance between the planned and actual O&M distribution ranges from **4% to 13%.**

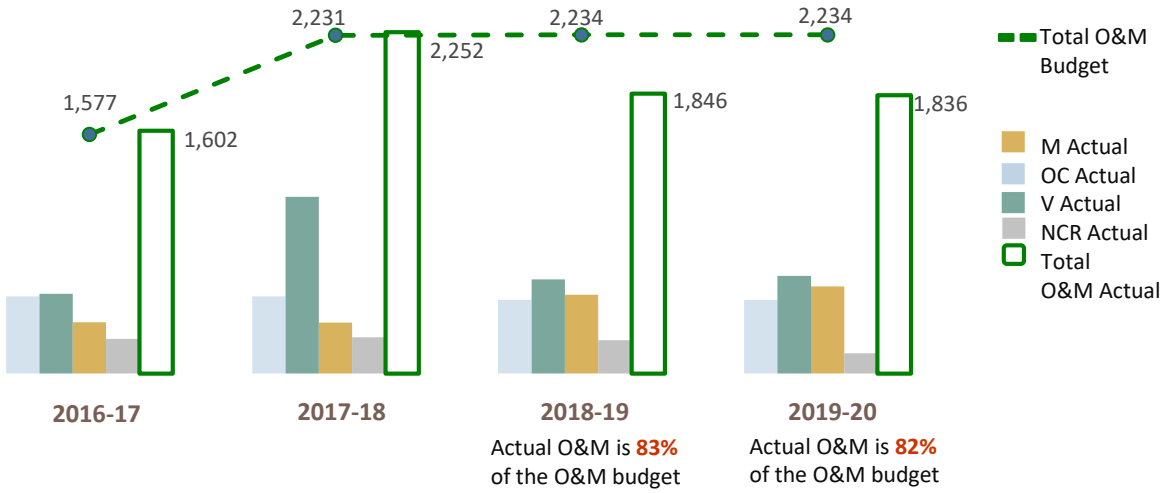
Source: ACCASP documents; ACCASP administrative data

Evaluation Findings

FINANCIAL RESOURCES ALLOCATED TO RESEARCH ACTIVITIES WERE LESS THAN EXPECTED

Since 2018-19, the O&M expenditures in support of ACCASP research activities have been less than the O&M budget in the relevant foundational documents.

Actual vs. Budgeted O&M Expenditures by Year, in $K



Source: ACCASP foundational documents (Planned); ACCASP administrative data (Actual)

O&M actual expenditures are broken into four categories: Modelling (M), Ocean Chemistry (OC), Vulnerability (V), and NCR support.[7]

- In 2016-17 and 2017-18, the O&M budget included a dedicated amount of $90K per year (in addition to the research funding) to conduct national **synthesis and communication of research findings**. Since 2018-19, communication expenditures and other NCR support have been sourced from O&M research funds.

Since 2018-19, actual expenditures supporting ACCASP research activities were slightly above 80% of the planned O&M budget. Several factors likely contributed to that:

- As an A-Base funded program, the ACCASP is subject to **variable reductions** that take place after the initial annual budget has been allocated (e.g., financial support for corporate initiatives to enhance infrastructure and financial pressures at the sector/regional level).[8]
- The cost of **employee benefits** increased. This was not anticipated in the initial program budgets.

[7] Operations and maintenance (O&M) funding includes research and monitoring, as well as professional services, scientific materials, ship time, etc. The NCR support includes communication, translation, travel support, etc.

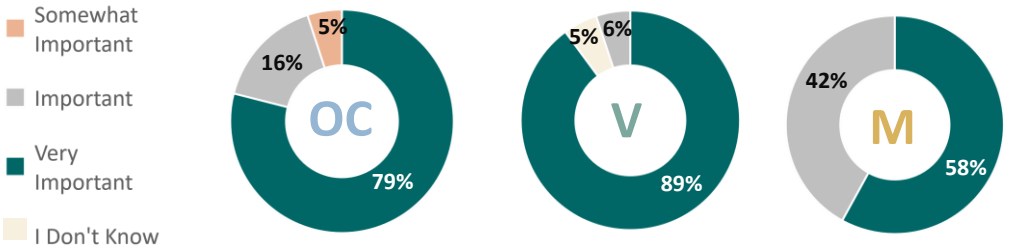
[8] These reductions apply to all DFO A-base budgets, and support corporate initiatives, such as improving the department's IT infrastructure. The ACCASP transitioned to A-Base funding in 2017-18.

Evaluation Findings

KNOWLEDGE GAPS REMAIN WITHIN AND BEYOND ACCASP PRIORITY AREAS

The ACCASP's three priority areas remain relevant, however knowledge gaps exist both within and beyond the areas.

Interviewees agreed that all priority areas are **relevant** and **important** to advance.



Vulnerability assessments were viewed as **most critical** based on the **magnitude, scope,** and **urgency** of the departmental needs and gaps that are and will continue to be addressed (e.g., annual demands for information to enable adaptive responses to the climate change induced events that are already taking place).

Aquatic climate change science in support of adaptation efforts could be **advanced** within each priority area to address current knowledge gaps as well as emerging science needs that lie beyond the ACCASP's current design.

	Current Gaps	Emerging science needs
OC	Certain geographical and coastal areas lack the **baseline ocean chemistry data** needed to inform climate change adaptation measures. Major gaps currently exist in many areas, **particularly in the Arctic** where the demand is greatest, as well as **Canada's freshwater basins**.	Ocean chemistry parameters may be supplemented with factors related to nutrients and heavy metals. Additional areas of interest include increased **near-shore monitoring** and blue carbon and ocean effects on the carbon budget.
V	Vulnerability assessments have been conducted for a number of fish stocks but will be required for **all** major fish stocks, as well as species of **non-commercial value**.	Ecosystem impacts, such as the changing distribution of species-at-risk and food-web relationships, may be integrated into vulnerability assessments.
M	**Biogeochemical modelling** efforts could enable assessments of vulnerabilities and climate change impacts in priority coastal areas, particularly by providing targeted projections for **coastal** regions.	Capacity for real time high-resolution projections for major port areas and coastal communities, including the Arctic, may be developed alongside **scaled-down models** that may provide targeted projections.

Evaluation Findings

PROJECTS WERE COMPLETED AS PLANNED

ACCASP-funded projects and ongoing monitoring activities advance aquatic climate change science to support adaptation efforts, as per the program's objectives. Most activities have been completed as planned and on schedule.

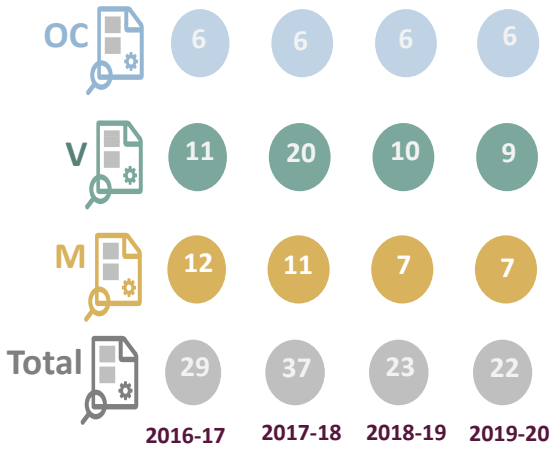
Monitoring activities advance research objectives under the **Ocean Chemistry** priority; **directed funds**[9] are provided on an annual basis per region.

Research projects advance objectives under **Vulnerability Assessment** and **Ocean Modelling** priorities; projects must demonstrate a **clear link** to a priority area and are assessed based on different criteria such as **scientific rigor**, **feasibility**, and **timing**.

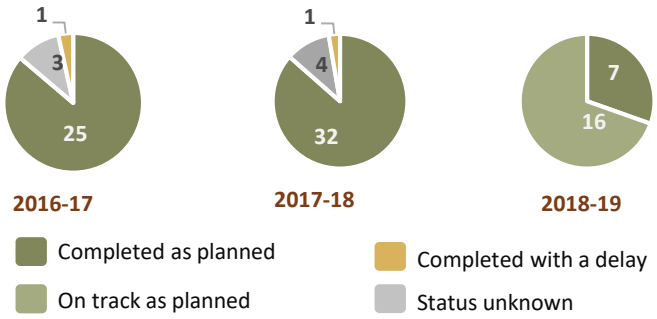
- Prior to 2015-16, a **competitive funding process**[10] was used.
- In 2016-17 and 2017-18, the funding allocation process was **informal** due to the timing of the program renewal. The regions proposed new projects, recommendations based on DFO risks were made by the NHQ National Manager and Regional Science Managers, then the Science Executive Committee made decisions.
- In 2018-19, a **competitive funding process** was used and 16 successful research projects received funding for multiple years. Planned funds for 2019-20 were distributed for Year 2 activities of these multi-year projects.

Number of funded projects by Year and Priority Area

(multi-year projects are counted as separate annual phases)



Status of 89 funded projects from 2016-17 to 2018-19.[11]



- **90%** of research projects were **completed as planned** and **on schedule**.
- In 2016-17 and 2017-18, **seven projects** were funded for which researchers did not provide reports; hence, their **status is unknown**. Under the current funding requirements, there are **no consequences** if funded researchers do not submit reports, or reports are delayed.
- In 2018-19, the **16 projects** that are **on track** were funded for multiple years.

[9] Directed funding approaches target specific scientists to submit proposals or conduct specific research.
[10] Competitive funding processes involve an open call to all eligible scientists in the EOS sector.
[11] Year-end reports for 2019-20 were not submitted as of December 2019.

Evaluation Findings

GENDER-BASED ANALYSIS PLUS (GBA+)

ACCASP applicants perceived some barriers related to career status but none related to gender, age, or official language based on an analysis of the 2018-19 competitive funding cycle against various identity factors.

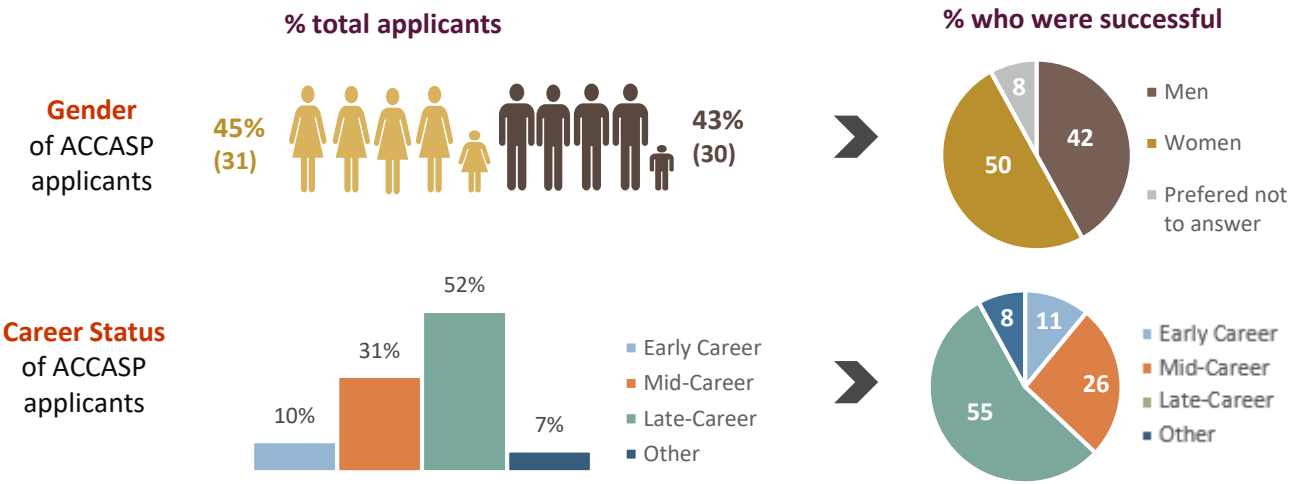
The Evaluation of Science Funding conducted a GBA+ analysis[12] that considered the differential success rate of diverse groups of applicants in the 2018-19 EOS funding cycle (n=69). The evaluation explored gender and other identity factors to assess barriers to participation.

ACCASP applicants identified as being a man or a woman in **similar proportions**, while 12% preferred not to answer.

ACCASP applicants **are more often late career researchers** (52%) than mid (31%) and early (10%) career researchers.[13]

The evaluation found that **57% of applicants** were successful at receiving funds from the ACCASP. Successful ACCASP applicants were approved for funding in the same proportion by **gender, age, and career status** indicating **there are no barriers** with respect to these identity factors.

Applicants were approved for funding in similar proportions by gender and career status (n=69)



By proportion of successful applicants, women's success rate **(50%)** was higher for the ACCASP compared to the overall EOS sector **(Men: 57% and Women: 43%)**.

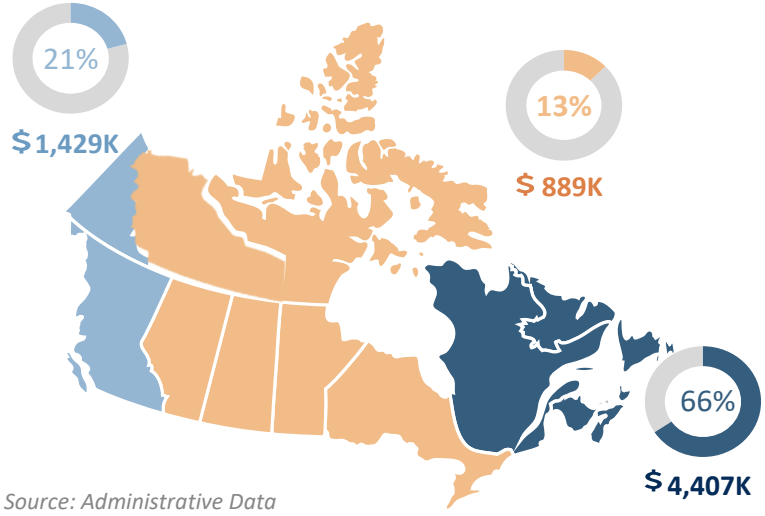
[12] GBA+ analysis explores how population groups are differentially affected by policies and programs based on identity factors such as gender, sex, race, ethnicity, and age.
[13] **Early-career researcher** - a researcher whose career spans less than five years since the completion date/award of doctoral or other research postgraduate qualifications. **Mid-career researcher** - a researcher whose career spans more than five but less than 15 years since the completion date/award of doctoral or other research postgraduate qualifications. **Late-career researcher** - a researcher whose career spans more than 15 years since the completion date/award of doctoral or other research postgraduate qualifications.

Evaluation Findings

KNOWLEDGE ACQUISITION OCCURS AT DIFFERENT RATES ACROSS CANADA'S COASTS

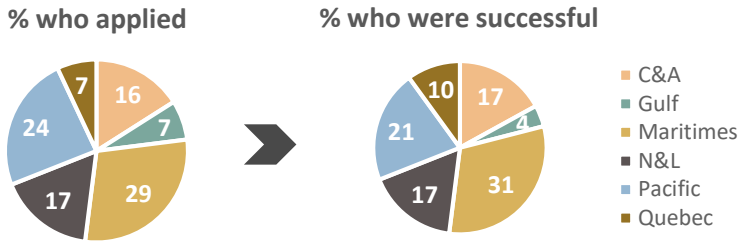
No geographical barriers to participation in the ACCASP were identified by applicants. The practice of distributing research funds by DFO's six administrative regions[14] is in line with the actual regional distribution of scientific expertise; however, it results in differential knowledge acquisition across Canada's three coasts.

- ACCASP applicants in the 2018-19 competitive funding cycle were approved for funding in **similar proportions by region.** This indicates there are **no barriers related to geographic location.**
- The figure below shows the distribution of O&M research funds, from 2016-17 to 2019-20, by Canada's **Pacific coast**, **Arctic coast**, and **Atlantic coast.**



Source: Administrative Data

- When research activities are grouped by Canada's coasts, more projects are funded on the East coast since **four out of six DFO administrative regions** are located in the **Atlantic coast** (Newfoundland & Labrador, Maritimes, Gulf and Quebec) versus one each on the Pacific and Arctic coasts.



- ACCASP researchers on the East coast benefit from **potential opportunities to collaborate based on research synergies** (for example, focal species of interest). Based on geography, there are less potential opportunities for knowledge-sharing and collaboration in the Pacific and Central & Arctic regions.
- ACCASP research in the Pacific and C&A regions is also affected by the **differential cost** of conducting research activities due to the size and geography of the regions. For example, Arctic research is critical for informing subsistence and commercial harvesting practices in areas where climate change impacts food security, as per DFO's mandate.[15] However, the Arctic **lacks necessary baseline monitoring data** and costs associated with working in the Arctic are **significantly higher** than any other region. Research activities on the West and East coasts include arctic components, yet the rate of knowledge acquisition is **slowest** in the C&A region.
- Resulting gaps in the aquatic climate change science available to support adaptation efforts may impact DFO's ability to meet commitments regarding **vulnerable coastal and northern regions** outlined in the 2019-22 Federal Sustainable Development Strategy and the Pan-Canadian Framework.

[14] The creation of a DFO Arctic Region was announced in October 2018 and is under development.
[15] DFO is committed to working with fishers, coastal and Indigenous communities to enable their continued prosperity from fish and seafood (Departmental Plan, 2019-20)

Evaluation Findings

ACCASP INFORMATION AND TOOLS ARE USED BY DFO AND EXTERNAL ORGANIZATIONS

The ACCASP produces relevant science information and tools. ACCASP research has been used within DFO; other federal, provincial, territorial and municipal governments; and private organizations.

ACCASP research has been used to develop adaptation tools for **internal** and **external users** to inform decisions related to managing fisheries, oceans and coastal infrastructure and help prepare for expected future changes. Tools are available via the ***Turning Science Into Action*** page, accessible on ACCASP's ***Aquatic Climate Change Science*** website. ACCASP research is also available on **www.sealevelrise.ca,** which was developed by the Ecology Action Centre in partnership with DFO and other partners to inform Atlantic Canadians and help local authorities and developers enhance future community planning.

The ACCASP has developed **three main tools**:

1. **Coastal Infrastructure Vulnerability Index (CIVI)**[16]
   The index reflects a site's vulnerability to sea-level rise, storm surge, and other effects of climate change. It incorporates harbor engineering and socio-economic indicators. The CIVI is not publicly accessible.

2. **Canadian Extreme Weather Water Level Adaptation Tool (CAN-EWLAT)**[17]
   The tool provides sea-level rise projections for Canada's coastline and advice on how much higher to build coastal infrastructure to accommodate sea-level rise projections. CAN-EWLAT is available online to the public.

3. **Fish Stock Climate Vulnerability Assessment Tool (FSCVAT)**[18]
   The tool helps fisheries managers determine which commercially valuable species are most vulnerable to climate change. FSCVAT is not publicly accessible.

DFO's Small Craft Harbors Program uses the **CIVI** and **CAN-EWLAT** to incorporate climate change adaptation measures in all sites, except one in the Arctic.

DFO's Real Property is exploring the potential for using ACCASP tools to assess risks to DFO's coastal infrastructure.

Municipal partners access ACCASP information through Sealevelrise.ca to plan for flood risk, disasters, and predicted changes in fisheries distributions.

The **Geological Survey of Canada** applies the **CIVI** to inform their Coastal Climate Geoscience Program to help coastal communities plan for regional sea level rise.

Port authorities and **private insurance companies** have sought out ACCASP information to develop emergency plans, conduct environmental assessments, and implement insurance policies based on flood risk vulnerability.

[16] A link to the Small Craft Harbours Coastal Infrastructure Vulnerability Index (CIVI) Pilot Project 2018 is provided.
[17] A link to the Canadian Extreme Weather Water Level Adaptation Tool (CAN-EWLAT) summary page is provided.
[18] A link to the Fish Stock Climate Vulnerability Assessment for Species Supporting Capture Fisheries project (2014-15) description is provided on the website.

Evaluation Findings

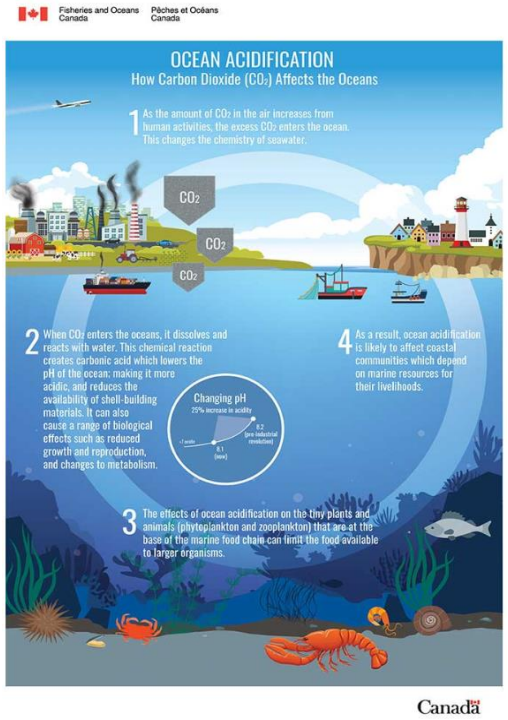
ACCASP INFORMATION AND TOOLS ARE ACCESSIBLE IN VARIOUS WAYS

Although the website is the program's main platform for communicating with users and the broader Canadian public, ACCASP information and tools are also accessible through various platforms.

Following the recommendations of the 2017 Evaluation of the Horizontal Adaptation Theme, the ACCASP updated the program's **Aquatic Climate Change Science** website[19]. The program facilitated access to information and tools for different levels of users: waders, swimmers, and deep divers.

The program has made efforts to increase the *interpretability* of its information.	The website now includes a series of **videos and infographics** related to **Ocean Acidification** and **Hypoxia.**
The program has made efforts to increase the *accessibility* of its information	The ACCASP website continues to be developed to include all completed research projects, including project summaries and links to relevant **academic articles**, **technical reports**[20] and **manuscript reports**.[21]

75% of ACCASP science products were available on its website within three months of publication.[22]



Ocean Acidification Infographic

The **following pages** describe how ACCASP information is accessible through the program website, various reporting initiatives and academic journals.

[19] ACCASP Aquatic Climate Change Science website: https://www.dfo-mpo.gc.ca/science/oceanography-oceanographie/accasp-psaccma/index-eng.html
[20] Technical Reports are directed primarily toward a worldwide audience and have an international distribution.
[21] Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional challenges. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflect the broad interests and policies of Fisheries and Oceans Canada, namely, fisheries and aquatic sciences.
[22] Refers to 61 (out of 89) projects posted on the ACCASP website as of November 2019.

Evaluation Findings

INFORMATION AVAILABLE THROUGH THE ACCASP WEBSITE

The ACCASP website attracts reasonable traffic from a variety of sources. Content related to aquatic climate change adaptation information and tools is nevertheless hard to find and not easily navigable for users.

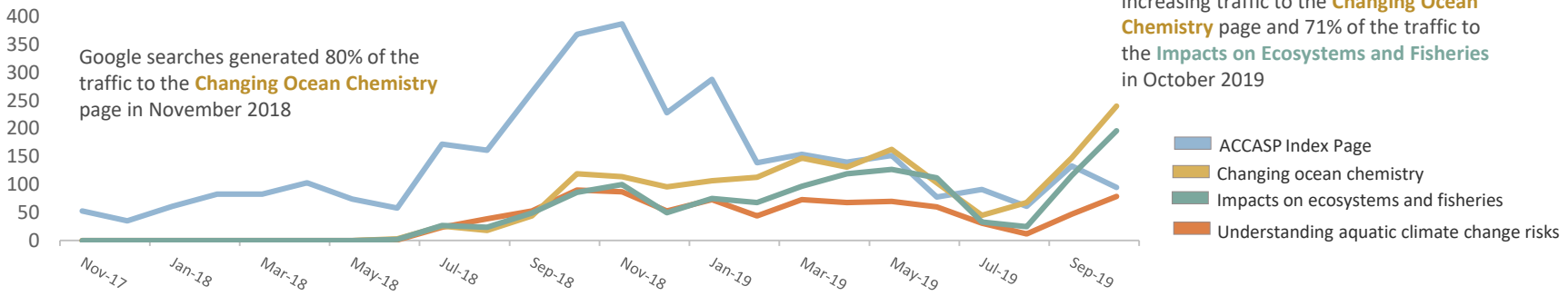
The number of visits to the ACCASP website varies across pages. The three most visited pages are: ***Changing ocean chemistry***; ***Impacts on ecosystems and fisheries***; and ***Understanding aquatic climate change risks***. Substantial traffic to the ACCASP website originated from Google searches and a direct source.[23]

Number of visits to Key ACCASP Webpages (Nov-17 to Aug-19)

A direct source generated more than 50% of the traffic to the **ACCASP index page** between September 2018 and January 2019 (during peak traffic on the index page)

Google searches generated 80% of the traffic to the **Changing Ocean Chemistry** page in November 2018

Google searches generated 73% of the increasing traffic to the **Changing Ocean Chemistry** page and 71% of the traffic to the **Impacts on Ecosystems and Fisheries** in October 2019

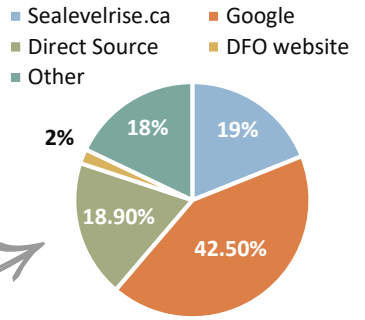


>700 visits The entire ACCASP site reached peak traffic between October and November 2019. Most likely this is due to the increased number of visits to the ***Changing Ocean Chemistry*** and ***Impacts on Ecosystems and Fisheries page.***

171 visits ACCASP tools are available in the ***Turning Science into Action.*** This page has generated low traffic since its launch in July 2018.

60-140 visits Traffic to the **Canadian Extreme Weather Water Level Adaptation Tool (CAN-EWLAT)** summary page has been moderate but consistent for the past two years. This likely demonstrates the tool has a modest, but dedicated audience. Only 2% of visits were generated by the DFO website.

Sources of Traffic to CAN-EWLAT:



[23] Direct source refers to website traffic generated by visitors that type the website URL directly into their browser or click on a link embedded in an e-mail or document.

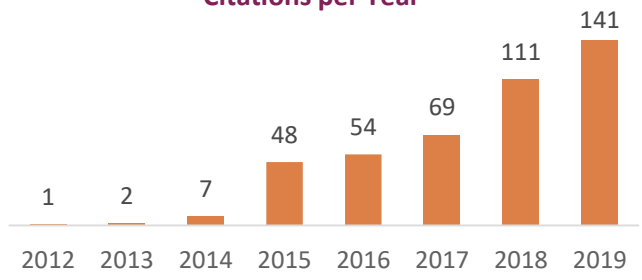
Evaluation Findings

INFORMATION AVAILABLE THROUGH ACADEMIC JOURNALS

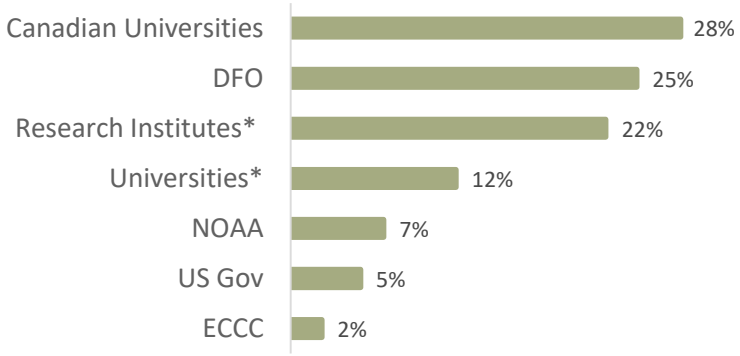
ACCASP scientists largely communicate research findings through contributions to the primary literature. Therefore, ACCASP research publications are accessed through academic journals and cited in other publications.

- As of November 2019, **84 of the 129** scientific research publications attributable to ACCASP are available on the **Web of Science**.
- On average, each article has been cited **5.15 times**. The number of citations for the 84 indexed journal articles has been increasing.[24]
- ACCASP research is used **around the world.** ACCASP research is largely cited by Canadian universities and federal departments, research institutes, international partners (e.g., National Oceanic and Atmospheric Administration (NOAA)), and foreign governments.

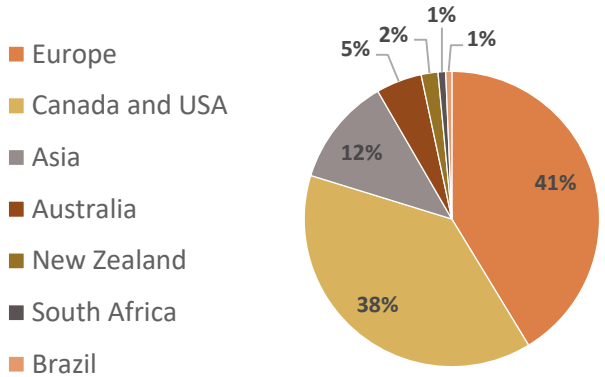
Citations per Year



Universities and Research Institutes are Among the Top 7 Institutions of Articles Citing ACCASP Research (n=456).



Origin of Citing Articles (n=598)



[24] Since many of these reports were produced in 2018 and 2019, citation data might not be indicative of their influence. A minimum window of 3-5 years from publication time is recommended for effective citation analysis.

Evaluation Findings

INFORMATION AVAILABLE THROUGH VARIOUS PUBLICATIONS

ACCASP research contributes to a number of DFO and external reports at the federal, national and international level.

49

Since 2015, the ACCASP provided input to 49 external and DFO reports; many in response to requests from the Canadian Science Advisory Secretariat. **The program is meeting a target of one departmental and/or national report that has incorporated aquatic climate science research findings per year starting in 2017-18.**

The Atlantic State of the Ocean Report was produced by DFO and includes the effects of climate change on marine ecosystems.

Canada's Changing Climate Report was produced by Natural Resources Canada. DFO led the development of Chapter 7: Changes in Oceans Surrounding Canada.

Departmental

- **State of the Atlantic Ocean Report** (2018)
- **Framework for Incorporating Climate Change Considerations in Stock Assessments** (2018)
- **Atlantic Zone Monitoring Program Science Advisory Report** (2017)

National and Federal

- **Natural Resources Canada. Canada's Changing Climate Report** (2019)
- **Northwest Territories. Status of the Environment Report** (2019)
- **Canadian Meteorological and Oceanographic Society. Special Reports** (2015 and 2019)
- **Arctic Monitoring and Assessment Programme. Arctic Ocean Acidification Assessment; Case 5: Climate change impacts on subsistence fisheries in the Western Canadian Arctic** (2018)
- **Natural Resources Canada. Canada's Marine Coasts in a Changing Climate** (2016)
- ***Expected in 2020-21***: **Environment and Climate Change Canada. National Climate Change Science and Knowledge Plan**

International

- **UN International Panel on Climate Change (IPCC). Special Report on Oceans and Cryosphere** (2019)
- **Arctic Monitoring Assessment Programme. Arctic Ocean Acidification – Second report** (2018)
- **International Ocean Institute. Ocean Acidification in Canadian Waters, Ocean Yearbook "Future of Ocean Governance and Training"** (2018)

Evaluation Findings

ACCASP INFORMATION IS BEING USED, HOWEVER IT REMAINS UNDERUTILIZED

ACCASP information and tools have been used by early-adopters within DFO and across governments. The broader science community in Canada and internationally also uses ACCASP research and data. However, ACCASP information and tools are not well known. Different categories of users and potential users of ACCASP information have been identified.

DFO – Ecosystems and Oceans Science sector

- The **EOS sector** is the primary intended user of ACCASP information. ACCASP research activities complement ongoing science programs and contribute to EOS objectives and results.
- However, ACCASP contributions to the EOS may not always be clearly identified or explicitly articulated.

ACCASP applicants are encouraged to identify clients in research proposals. Nonetheless, interviewees believe that the **program has low visibility** and is **not well-known by clients.**

- The ACCASP also provides science advice to the EOS sector through the **Canadian Science Advisory Secretariat (CSAS)** process[25]. While a CSAS response usually involves the EOS sector at large, the ACCASP provides input specific to climate change related management needs.

41% of the ACCASP applicants consulted for the Evaluation of Science Funding expected that **almost half** of ACCASP projects result in a CSAS Science Advisory report.

DFO – Other non-science sectors

- The **Small Craft Harbors Program** uses ACCASP information and tools for asset management, harbor planning and construction, and implementing climate change adaptation measures in the coastal areas. **CIVI** was specifically developed for this purpose.
- **Resource Management** uses ACCASP's vulnerability assessments, tools and frameworks to inform decision-making related to sustaining and protecting fisheries and fish stocks of commercial value.

ACCASP has contributed to the **Ecosystem Approach to Fisheries Management (EAFM),** lead by Fish Population Science, since its inception in 2019. EAFM is a great example of cross-sector collaboration for policy development based on sound aquatic climate change science advise.

- **Real Property** has identified collaboration with ACCASP as a potential area for **future work** and is currently in the stage of informal discussions. ACCASP information and tools could be used to address DFO's and the Canadian Coast Guard's infrastructure risks along the coastline that may result from the impacts of extreme weather, sea-level rise or ice conditions.

While Real Property is a key player for addressing DFO commitments under the **Greening Government Strategy (GGS)** [26], the scope of the requirements are broader. Thus, other DFO groups (**Ocean Management, Canadian Coast Guard's Search and Rescue, Aquaculture Management**) have been identified as potential users of ACCASP information.

[25] DFO's main, formal process for obtaining science advice to inform policy and decision-making for all departmental priorities is the Canadian Science Advisory Secretariat (CSAS).
[26] The GGS requires that all federal departments take action to understand the wide range of climate change impacts that could potentially affect federal assets, services and operations across the country by 2021, and develop measures to reduce climate change risks to assets, services and operations by 2022.

Evaluation Findings

ACCASP INFORMATION IS BEING USED, HOWEVER IT REMAINS UNDERUTILIZED - Continued

Federal Government Departments

- **ECCC** is a key partner of the ACCASP as the Department lead for the Horizontal Initiative on CGCC, to which the ACCASP reports on results.

ACCASP is collaborating with ECCC to develop the **National Climate Change Science and Knowledge Plan** to support the delivery of the PCF. The ACCASP leads on the Aquatic Systems section.

ECCC's **Canadian Centre for Climate Services (CCCS)** will house products and services to provide Canadians with authoritative information and tools to respond to climate change.

- The ACCASP also collaborates with **Natural Resources Canada** on their **Adaptation Platform.**

The Adaptation Platform promotes ACCASP research and tools such as **CAN-EWLAT** to help Canadians, non-governmental organizations, as well as provincial, territorial and municipal governments adapt to climate-change impacts.

Other Canadian Users

Early users of ACCASP tools and information were identified among public and private organizations in Canada. They include northern and coastal communities; provincial/territorial governments; insurance, fishing and engineering companies; and port authorities. Information is used in planning and design, infrastructure and asset management, emergency preparedness, and business decisions.

As more DFO programs and external organizations recognize their needs related to climate change impacts and risks, it is expected that users of ACCASP information and tools will continue to increase.

Academia (Canadian and International)

Universities and research institutions from Canada and abroad access ACCASP publications in scientific journals and databases to support their research activities.[27]

ACCASP information contributes to the climate-change expertise and knowledge developed and disseminated through the **Consortium on Regional Climatology and Adaptation to Climate Change** (OURANOS).

International Users

ACCASP contributes research findings to a broader international domain of data and information on oceanic climate change impacts. International organizations also share ACCASP input to a worldwide audience:

- The **National Oceanic and Atmospheric Administration** (NOAA) collaborates with the ACCASP to coordinate monitoring efforts and knowledge in the Pacific and Atlantic coasts. It also advances the understanding and responses to climate impacts on fisheries. The **National Centre for Environmental Information** (NCEI) data portal hosts ACCASP data produced in collaboration with NOAA.
- The **Global Ocean Acidification – Observation Network** (GOA-ON) maintains an international portal for ocean monitoring data to which ACCASP contributes.
- The Arctic Council's **Arctic Monitoring Assessment Programme** (AMAP)

ACCASP provides Canadian information on UN Sustainable Development indicator ***14.3 Ocean Acidification***. This information will be available through the **Federal Sustainable Development Data Hub** hosted by Statistics Canada.

[27] Details about the academic reach of the research publications produced by the ACCASP are presented on p. 20.

Evaluation Findings

OPPORTUNITIES TO INCREASE THE VALUE ADDED OF ACCASP RESEARCH

In the context of increasing demand for aquatic climate change science to support adaptation efforts, there are opportunities to increase the value-added of ACCASP research for known and potential users.

ACCASP information is available to support decision-making at departmental, federal and international levels. However, under the current design, the ACCASP does not engage with current and potential users which results in low visibility for the program. Nevertheless, user engagement still occurs in three key ways:

1. Researchers receive **ad-hoc requests** from potential users based on existing personal working relationships. This type of engagement is opportunity-based and varies by region.
2. Researchers **co-develop research projects** with northern communities and land-claim co-managers in the **C&A region**. This leads to **face-to-face meetings and training sessions** with Territorial governments and independent northern organizations.
3. Researchers provide input related to climate-change to **CSAS** requests for the EOS sector.

The Department does not have a **long-term strategy** in place to address climate change challenges in a holistic and coordinated manner where the ACCASP could contribute more effectively.

Several approaches have been suggested to increase the value-added of ACCASP research. However, a number of factors impede the implementation of these approaches. However, some of the potential solutions are beyond the scope of the current program.

Increase DFO sector engagement	▪ **Proactively engage** with users to increase awareness of ACCASP activities and disseminate ACCASP information and tools; and ▪ **Consult** DFO sectors when prioritizing research activities within ACCASP's priority areas.	**Dedicated internal resources are needed to coordinate and engage across regions and sectors.**
Integrate and prioritize ACCASP research	▪ **Seek** opportunities to integrate ACCASP activities across research themes, regions, DFO science programs and external partners (e.g., across federal government and universities); and ▪ **Prioritize** ACCASP research based on the urgency of climate change risks across DFO sectors.	**Coordination within the department would be needed. ACCASP could lead this effort but not in isolation.**
Expand the applicability of ACCASP research	▪ **Synthesize** research across research themes and regions to provide information based on clients' common interests; ▪ **Improve** the accessibility and interpretability of research; ▪ **Translate** research into operationally meaningful findings for clients; and ▪ **Produce** user-oriented products, information and tools, and provide support.	**Specialized communication, technical, and knowledge translation expertise is needed but currently unavailable at the EOS sector.**

Evaluation Findings

COMMUNICATION CHALLENGES

ACCASP information and tools are available across a range of departmental, federal and international platforms. Still, a number of challenges impede communication with a broader audience to inform decision-making in support of adaptation efforts.

As subject-matter experts, the program could coordinate efforts to improve the communication, interpretability and applicability of ACCASP research. However, the following challenges impede broader communication of ACCASP research.

Low degree of awareness of the ACCASP at DFO

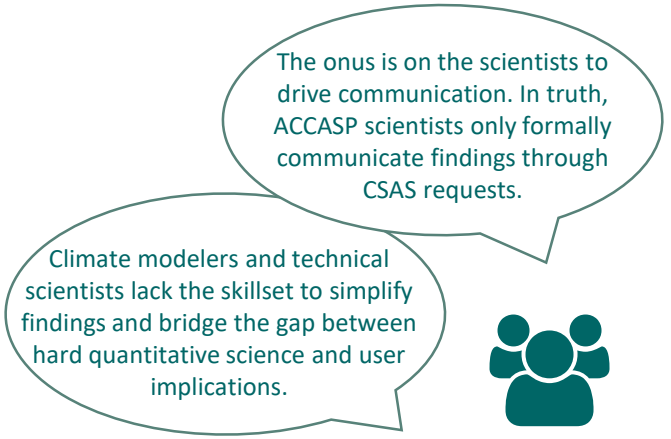
- The ACCASP is not widely known. ACCASP research has **low visibility** since program information is largely integrated into **broader reporting initiatives** and therefore program contributions are not obvious or advertised.
- The program's ability to increase its **profile** within the department is limited. The ACCASP lacks the **internal capacity** necessary to enable collaboration and coordination efforts across the EOS sector and DFO.
- DFO programs are not systematically incorporating **climate change considerations** in their program design and delivery since there is no departmental guidance to do so. Program-specific science needs for aquatic climate change research in support of adaptation efforts are therefore not known.

Information synthesis and mobilization efforts are required

- For meaningful communication, content should be suited for **various levels of users** and should comply with communication requirements related to **plain language**, **accessibility**, and both **official languages**.
- The ACCASP lacks the resources, capacity and expertise to carry out such tasks, and communication services and support from the department are limited.

Expertise is required to develop targeted tools and information

- Resources and capacity are required to either develop or engage expertise in: **communication outreach**, **client services and engagement**, and **tool development**.
- This is not necessarily the role of scientists who have different priorities and lack the specific skillset needed to carry out broader activities related to communication and information dissemination. Therefore, the **role of scientists in disseminating information** beyond contributions to the primary literature **is unclear**.



Scientists and Program Managers said

Evaluation Findings

ACCASP ACTIVITIES ARE INCREASING

ACCASP responsibilities within program-specific activities have continuously increased while program resources have remained unchanged. Therefore, the program's internal capacity to address the evolving extent of program activities is limited.

The ACCASP NCR team (2 FTEs) carries out **ongoing work** related to ACCASP management and administration, such as planning, oversight, reporting, and management activities at the regional and national level. The NCR team is also involved in communication, collaboration and coordination activities that support **DFO's responsibilities** and the **Horizontal Adaptation Initiative**. Over the years, ACCASP involvement and responsibilities have continuously increased.

For instance, the NCR Team:

Provides strategic leadership, guidance, coordination and support within the program, the EOS sector, and oversees formal research collaborations.

- The NCR team organizes and leads regular teleconferences and face-to-face meetings of the National ACCASP Working Group and the ACCASP National Ocean Chemistry Working Group.
- The management team **co-leads** and participates in the DFO-NOAA Steering Committees on Ocean Acidification and Fisheries Vulnerabilities; several DFO-NOAA working groups; and the National Ocean Science Steering Committee.

Represents the program and liaises in several departmental and interdepartmental activities related to the Horizontal Adaptation theme.

- The ACCASP participates in ongoing discussions and collaborations with federal partners through several working groups, i.e., the Biodiversity Adaptation Working Group, Natural Infrastructure Working Group, Natural Resources Canada Adaptation Plenary, Coastal Management Working Group, Federal Family for Climate Services Working Group, and Canadian Centers for Climate Services Federal/Provincial Working Group., etc.

Conducts performance monitoring and reporting of ACCASP performance indicators within the department and the Horizontal Adaptation Initiative.

- This includes the **ACCASP's** Performance Information Profile, Mandate Letter Tracker, **ECCC's** Horizontal Management Framework Supplementary Tables, and **PCF** Synthesis Reports.

Develops relevant aquatic climate change science website content and related communication and education material.

The management, coordination and governance of the ACCASP is overall effective in carrying out the day-to-day oversight of the program. However, the workload and the administrative burden related to the **evolving extent of program-specific activities** rest on the NCR team and have been increasing since 2017.

Evaluation Findings

INTERNAL CAPACITY OF THE ACCASP IS LIMITED

There is a desire to implement ongoing improvements to the program and program research activities. However, the ACCASP cannot dedicate sufficient time and resources to advance these efforts.

Strategic thinking is required to advance a number of program aspects:

Enhancing collaboration between scientists

There is a desire for more **collaborative and networking opportunities** at the working level. Despite examples of good working relationships, most projects are conducted in silos. Increased networking activities could facilitate opportunities to integrate research efforts between regions and research themes.

The ACCASP's **insufficient internal capacity** significantly impedes its ability to enhance this type of collaboration and coordination within the program and EOS sector.

Enhancing the quality of the ocean monitoring information

The ACCASP is in the process of developing a formalized **National Ocean Chemistry Monitoring Program** to standardize sampling and data collection methods and protocols across the regions.

Data management practices are also required at the national level. Reviewing and establishing national management practices for ACCASP ocean chemistry data will allow the program to provide input into various international data platforms.

ACCASP research activities crucially depend on **sufficient network connectivity** and **capacity for data storage** to collect, share and analyse large volumes of data. Access to **high performance computing capacity** is also needed to run complex analyses and ocean models.[28]

Strengthening internal tracking and reporting practices

Internal reporting practices could be improved to ensure that information on the progress of funded research projects is **readily available to the NCR team**. Reports are not always provided by scientists and this creates challenges when consolidating information about funded projects. Timely and complete reports allow the management team to gain **insight about issues and challenges** that could be addressed to improve efficiency.

While interviewees were of opinion that reporting requirements are clearly communicated to the funded researchers, the administrative data analysis illustrated **reporting challenges and limitations**.

Developing the ACCASP's Path Forward

Within its current mandate, the program recognizes a need to discuss opportunities for strategic planning. Allowing for long-term planning to address urgent and time sensitive research topics could increase the value of ACCASP research efforts.

The program is currently considering options related to the funding allocation process (direct/targeted call versus a competitive process).

[28] IM/IT challenges were acknowledged in the 2019-20 Evaluation of the Ocean Protection Plan (Phase 1). Measures are currently in development at the department and are expected to resolve IT capacity and data management challenges to some extent. However, it is not clear if and how the ACCASP will benefit from these efforts.

Evaluation Findings

ACCASP CONTRIBUTIONS EXCEED PROGRAM RESPONSIBILITIES

The increased involvement of ACCASP staff in activities driven by the broader climate change context exceeds the current program mandate and is clearly beyond what the program was designed to do.

The ACCASP has been involved in activities **beyond the program's direct responsibilities**. Moreover, this involvement has significantly increased since 2017 due to the evolution of the broader climate change adaptation context (See Appendix D). This involvement **further detracts resources** from ACCASP **activities and improvements.**

> DFO does not have a dedicated group to coordinate climate change efforts for the department. Because of its expertise, the ACCASP has taken on a part of this role.

In addition to overseeing activities related to the program's core mandate, the NCR team also:

1. Provides advice and input to **strategic planning and briefing documents for DFO senior management**;
2. Responds to varied **ad-hoc requests for climate change-related information** beyond those related to aquatic climate change science;
3. Provides support to PCF interdepartmental governance and coordination activities and committees, including participation in activities **not specific to the Adaptation Pillar**; and
4. Collaborates on **national and international initiatives** that exceed expectations for ACCASP contributions. (e.g., IPCC Special Reports, National Climate Change Science and Knowledge Plan, GGS Risk Assessments)

Regular involvement and contributions since 2017 that are beyond the ACCASP's mandate include:

- **Coordination** of the National State of the Ocean Working Group; National Ecosystem Approach to Fisheries Management Working Group; National Arctic Science Committee and the Science Website Renewal at DFO.
- **Support** to the PCF's Deputy Minister and Assistant Deputy Minister Oversight Committees (all four pillars).
- **Input** to the Convention on Biodiversity - an international legally-binding treaty for the conservation and sustainable use of biodiversity.
- **Reviewing and coordinating** DFO's input to the IPCC Special Report on Ocean and Cryosphere in a Changing Climate (2019).

The ACCASP also participates in:

- **The PCF's** Director Level Adaptation and Resilience Task Group, and the DG Adaptation and Resilience Committee, which coordinates federal adaptation **activities at the Director and senior manager level,** including aspects of Provincial/Territorial engagement, results measurement and capacity building.
- Working groups and discussions leading to the development of the Aquatic Systems component of the **National Climate Change Science Plan.**
- **ECCC/TBS** Working Group on Risk Assessments to provide guidance on the departmental risk assessment requirements of the Greening Government Strategy.
- **Interdepartmental** Natural Infrastructure Working Group and Climate Engineering Working Group.
- **IPCC** meetings and working groups, as required.

Lessons Learned

Overall, the evaluation finds that the ACCASP faces many challenges that are beyond its purview and control since the program is not designed to respond to growing needs for aquatic climate change science to inform decision-making in support of adaptation efforts. Although the ACCASP is performing well under its current mandate, it faces and will continue to face challenges while it fulfills a broader role to support Departmental climate change initiatives.

Departmental considerations:

The ACCASP is the **only** dedicated federal source of aquatic climate change science to inform decision-making in support of adaptation efforts. **DFO relies on this expertise** to respond to existing and upcoming commitments driven by an evolving climate change context.

The most significant impact of future storms will likely be in areas of Canada where winter sea ice decreases.

The **2019-22 Federal Sustainable Development Strategy** and **Pan-Canadian Framework** outline DFO commitments for supporting adaptation in particularly vulnerable coastal and northern regions.

The **Greening Government Strategy** requires that all federal departments take action to understand the wide range of climate change impacts that could potentially affect federal assets, services and operations across the country by 2021, and develop measures to reduce climate change risks to assets, services and operations by 2022.

There is no **dedicated group within DFO** that coordinates climate change efforts for the department. Because of its expertise, the ACCASP has taken on a part of this role. However, the current mandate and resources of the ACCASP are insufficient to fulfill this expanding role and focus on ACCASP-specific activities.

The climate change context, including that for DFO, is evolving and it is expected that demand for aquatic climate change science beyond adaptation at federal, national and international levels will continue to increase. Although DFO actively contributes to broader climate change initiatives, the Department does not have a **long-term strategy** in place **to address climate change challenges** in a **holistic and coordinated manner**, to which ACCASP could contribute more effectively.

Appendix A: Methodology

The evaluation used multiple lines of evidence, both qualitative and quantitative, which were triangulated to mitigate potential limitations. The methodology and limitations are described below.

Document Review

- **Internal ACCASP documents** such as tools and templates, application guides, calls for proposals, steering committee minutes and operating frameworks were reviewed.
- Broader **national and international initiatives** were reviewed to understand how the program and its objectives align with climate change adaptation priorities and activities of broader national and international initiatives.

Interviews

- **23 scoping and key informant interviews** were conducted with ACCASP scientists, ACCASP program managers, DFO senior management, as well as internal and external end-users of ACCASP data and information.

Administrative Data Analysis

- An analysis of **111 research projects** funded between 2016-17 and 2019-20 was conducted to assess whether research was completed as originally planned and according to schedule.

- **Limitation:** Administrative data represents only a one year funding cycle (2018-19) which poses a challenge for assessing trends.

Financial Analysis

- Financial **data from DFO's Chief Financial Officer Sector** was used to assess the extent to which the program received funding to deliver on its objectives.

- **Limitation:** Only partial information was available as a base of this analysis as there is only one complete year of program activities following the transition period. In addition, the analysis of ACCASP financial data indicates that a discrepancy exists between the financial data obtained from DFO's corporate systems and from the program which precluded a detailed analysis of financial information.

Appendix A: Methodology - Continued

Data Obtained form the Evaluation of Science Funding (2018-19)

- Secondary data was obtained from the **Evaluation of Science Funding**[29] which collected information from applicants, reviewers and end-users of all 16 **Ecosystems and Oceans Science (EOS)** sector funding programs for the 2018-19 funding cycle.
- The data was filtered by program to facilitate a meta-analysis of ACCASP-relevant information from responses to the applicant survey (n=83) and end-users survey (n=18).[30] Using survey data, identity factors including **gender, career status** and **geographical location** were explored to assess potential barriers to funding access for applicants.

- **Limitation:** The Evaluation of Science Funding addressed the overall efficiency of all 16 EOS funding programs. Therefore, it is challenging to ascertain the extent to which responses are specific to the ACCASP as opposed to the whole suite of science funding programs.

Webometric Analysis

- The program's publications and website traffic were analyzed to assess the **availability, reach, and potential use** of ACCASP-funded research.
- To conduct the webometric analysis, a list of **129 academic articles**, **55 DFO reports**, and **17 external reports** to which the ACCASP has contributed was compiled and vetted by the program. With the support of DFO's Library Services, a **citation analysis** of 85 publications indexed on the *Web of Science* was conducted. For publications that were not indexed on the *Web of Science*, a **cited reference search** was conducted separately.
- To analyze the impact of several websites supported by the ACCASP, web metrics were generated with the support of DFO's Communication Services. This included links to the main ACCASP website and links to several online tools.

- **Limitation:** For effective citation analysis, it is recommended a minimum window of 3 to 5 years after the date of publishing has passed. The list of provided publications contains many recent publications, therefore the webometric analysis results should be considered a preliminary snapshot of potential use. Citation analyses are also restricted to publications available on the Web of Science.

[29] DFO Evaluation of Science Funding: http://www.dfo-mpo.gc.ca/ae-ve/evaluations/18-19/Evaluation-Science-Funding-eng.pdf
[30] Applicant Survey data was filtered out by those who applied to the ACCASP directly as a principal investigator or indirectly as a member of a research team. End-user survey data was filtered by those who reported being clients or end-users of research produced by the ACCASP.

Appendix B: Evaluation Matrix

Evaluation Question	Indicators	Data from Evaluation of Science Funding	Administrative Data Analysis	Interviews	Document/ Literature Review	Financial Analysis	Webometric Analysis
Q1 What needs does ACCASP address?	1.1 Evidence of departmental, federal government, and national climate change adaptation priorities/commitments to which ACCASP has contributed			X	X		
	1.2 Analysis of ACCASP-funded proposals by: • The three ACCASP priority areas; • The departmental risks related to climate change.		X		X		
Q2. To what extent is the research funded by ACCASP available to users?	2.1 Analysis of project deliverables (e.g., research completed as planned and according to intended schedule) • % of planned aquatic climate change research projects completed	X	X				
	2.2 Evidence that the completed research was communicated to potential and/or identified users. • % of ACCASP products available on DFO's website within 3 months of publication	X	X				

Appendix B: Evaluation Matrix - Continued

Evaluation Question	Indicators	Data from Evaluation of Science Funding	Administrative Data Analysis	Interviews	Document/ Literature Review	Financial Analysis	Webometric Analysis
Q3. To what extent is the research funded by ACCASP being used?	3.1 Evidence of ACCASP-funded research addressing commitments and needs identified by priority areas.	X	X	X	X		
	3.2 Evidence of ACCASP-funded research being used to inform reporting or decision-making.	X	X	X	X		
	3.3 Webometrics analysis of publications to which ACCASP contributed.					X	X
Q4. How efficient is the ACCASP research funding cycle?	4.1 Evidence that potential applicants are aware of the timing and requirements for applications.	X	X	X			
	4.2 Views about alternative ways to deliver the O&M research funding.	X	X	X	X		
Q5. To what extent are the ACCASP's resources appropriate to support the achievement of its objectives?	5.1 Financial Analysis of available resources.					X	

Appendix B: Evaluation Matrix - Continued

Evaluation Question	Indicators	Data from Evaluation of Science Funding	Administrative Data Analysis	Interviews	Document/ Literature Review	Financial Analysis	Webometric Analysis
Q6. To what extent does ACCASP address challenges and explore opportunities for improvements?	6.1 Extent to which recommendations from previous audits and evaluations have been addressed.				X		
	6.2 Evidence of current challenges and risks to the program.			X	X		
	6.3 Evidence of mitigation strategies/response being put in place to address challenges/risks.			X			
	6.4 Views on potential opportunities to achieve better results for the allocated resources.	X		X			
	6.5 Evidence of gaps of non-financial resources and their impact on the ACCASP's ability to achieve its objectives.			X	X		
Q7. Are the application and approval processes for the ACCASP research funding equitable to all potential applicants?	7.1 Success rate of applicants disaggregated by gender, career status and geographic location.	X					
	7.2 Views regarding the extent to which all eligible applicants have equal and impartial access to ACCASP research funding.	X					
	7.3 Evidence that barriers exist within ACCASP funding that create challenges to the participation of certain groups of scientists.	X					

Appendix C

PERFORMANCE MEASUREMENT UNDER THE HORIZONTAL MANAGEMENT FRAMEWORK for CLEAN GROWTH AND CLIMATE CHANGE

The 2017-18 outcomes and indicators below support the long-term outcome for the Adapting to impacts of Climate Change Horizontal Initiative.

Time Frame	Outcome	Performance Indicator	Target	PIP	HMF
Short term (1-3 years)	Aquatic climate change research is conducted	% of planned aquatic climate change research projects completed	80-100% of funded projects are completed annually	X	X
Medium term (3-5 years)	Aquatic climate change science information is available to stakeholders	# of Departmental and/or national reports that have incorporated Aquatic climate change science research findings	1 per year starting in 2017/18	X	
		% of ACCASP science products available on DFO's website within 3 months of publication	100% of ACCASP science products	X	
Long term (5-10 years)	Aquatic climate change science information informs management decisions	% of managed fisheries stock assessments that incorporate climate change science considerations	100% by 2026	X	

Appendix D: Broader Climate Change Context

INTERNATIONAL DRIVERS FOR AQUATIC CLIMATE CHANGE ADAPTATION SERVICES

1. International Climate Initiatives

- Canada is a signatory of the **UN 2030 Agenda for Sustainable Development, which defines 17 global sustainable development goals with 169 targets.** Under this initiative, countries implement national sustainable development strategies, monitor progress toward goals and targets, and make performance data available for international sharing and analysis. The ACCASP reports Canadian data on target **14.3: *Ocean Acidification*.**

- Canada signed the **UN Framework Convention on Climate Change (UNFCC)** and the **UNFCC Paris Agreement (2015),** and committed to address climate change through mitigation and adaptation measures.

- The **UN International Panel on Climate Change (IPCC)** provides scientific expertise internationally in support of the Convention. ACCASP researchers contribute to the activities of IPCC Working Groups.

- Canada has been a member of the **Arctic Council** since 2008. ACCASP research contributes to two of the Council's priorities: Monitoring and Assessment of Arctic Ocean Acidification, and Ecosystem Approach to Management in the Arctic.

- In line with the decisions of the **North-American Leaders Summit (2016)**, Canada has committed to strengthening cooperation on ocean management as well as the integration of ocean observation systems, oceans and climate change research.

How are International Drivers evolving?

- In line with the UN 2030 Agenda for Sustainable Development, a **Decade on Ocean Science and Sustainability (2021-30)** has been declared.

- The UN International Panel on Climate Change (IPCC) has **increased the intensity and prominence of research** and reporting related to adaptation and vulnerability. Canada is contributing to these activities with regards to the oceans, cryosphere, and also more broadly.

- Collaboration with the **Arctic Council** is expected to increase based on the recognition that the Arctic faces significant knowledge gaps and experiences climate change at a faster rate. The ACCASP will contribute to the **2020 Synoptic Arctic Survey** in conjunction with the **Arctic Monitoring Assessment Programme Working Group**.

- Collaboration with the **National Oceanic and Atmospheric Administration (NOAA)** on Ocean Acidification and fisheries vulnerability is ongoing.

- **International data sharing collaboration** through the **Global Ocean Acidification Observing Network (GOA-ON)** is ongoing.

Appendix D: Broader Climate Change Context - Continued

CANADIAN DRIVERS FOR AQUATIC CLIMATE CHANGE ADAPTATION SERVICES

2. Canadian Climate Change Initiatives

- The **Federal Adaptation Policy Framework (FAPF)** was developed in 2011 in response of the 2010 CESD Report [31] recommendations. The policy guides domestic actions by the Government of Canada to address adaptation to the impacts of climate variability. It sets out a vision of adaptation in Canada, objectives and roles for the federal government, and provides criteria for setting priorities for action.
- In 2016, the **Pan-Canadian Framework on Clean Growth and Climate Change (PCF)** was introduced as Canada's strategy to meet the Paris Agreements/Vancouver Declaration. ACCASP is part of the **Adaptation and Resilience Pillar** of the PCF. Its specific responsibilities are to support adaptation activities in vulnerable coastal regions. ACCASP generates knowledge and tools on oceans, marine ecosystems and coastal areas to support actions identified in the PCF.
- The **Greening Government Strategy** led by the Treasury Board Secretariat defined requirements for federal departments to lead on climate change actions by example.

"Canadians need authoritative science and information to understand current and expected changes. This includes changing conditions (e.g., rainfall, temperature, and sea ice) and the impacts of climate change across Canada. Long-term monitoring and local observations are also key. Data, tools, and information need to be widely accessible, equitable, and relevant to different types of decision-makers in different settings."

Source: Federal Government Documents

How are the National and Federal Climate Action Drivers evolving?

- Following the recommendations of the 2017 CESD Report on Climate Change, the federal government is enhancing the coordination of the implementation of the PCF. **Governance and consultation efforts at all levels of senior management are increasing.**
- The PCF includes requirements for sharing knowledge and disseminating information to Canadians. Thus, the presence of ACCASP information in public platforms such as **Natural Resources Canada's Adaptation Platform** and **ECCC's Centre for Climate Change Services** is expected to increase. ACCASP contributes to the coordination of these initiatives as a member of several working groups.
- **ECCC** is developing the **National Climate Change Science and Knowledge Plan** (due by 2020-21). ACCASP managers are part of the team and are leading the development of a Discussion Paper on Aquatic Systems for the federal government.
- The **Greening Government Strategy** sets stronger requirements for all departments to take action to understand the wide range of climate change impacts that could potentially affect federal assets, services and operations across the country by 2021, and develop measures to reduce climate change risks by 2022.

[31] https://www.oag-bvg.gc.ca/internet/English/parl_cesd_201012_03_e_34426.html

Appendix D: Broader Climate Change Context - Continued

DFO RESPONSIBILITIES RELYING ON AQUATIC CLIMATE CHANGE ADAPTATION SERVICES

3. DFO responsibilities

A number of commitments at the departmental level are driving a need for ACCASP-generated research.

- DFO has legal responsibilities under the ***Oceans Act*** (1996), ***Species at Risk Act*** (2002), ***Federal Sustainable Development Act*** (2008), and ***Fisheries Act*** (1985), including the 2019 amendment, Bill C68.
- The **DFO Minister's Mandate Letter** outlines DFO commitments to **use good scientific evidence** and traditional Indigenous knowledge when making decisions affecting fish stocks and ecosystem management (2019) and ensure effective use of research resulting from restored federal funding for freshwater research, **federal ocean science and monitoring programs** among others (2018).
- In the past several years, the ACCASP has been addressing many requests for climate change adaptation action within the department. The scope of these requests is broader than the science and adaptation aspect. They include implementation requirements and **representation on behalf of the department at the federal level** related to the Federal Adaptation Policy Framework and the PCF.
- Recent ACCASP research builds on the risk assessments of the four water basins conducted by ACCASP in 2013. The **2012 DFO Climate Change Risk Profile** identified 6 key risks for the department, and the scientific needs to address these risks. In the **2019-20 DFO Corporate Risk Profile**, the *risks associated with changing aquatic environments* have been elevated as mission critical.

> Canada's children and grandchildren will judge this generation by its action – or inaction – on the defining challenge of the time: climate change.
>
> A clear majority of Canadians voted for ambitious climate action now. And that is what the Government will deliver. It will continue to protect the environment and preserve Canada's natural legacy.
>
> *Source: Speech from the Throne (2019)*

How are DFO needs and responsibilities expected to evolve?

- With the implementation of **Bill C68,** DFO is committed to implementing measures to maintain major fish stocks at or above the level necessary to promote the sustainability of the stock, taking into account the biology of the fish and the environmental conditions affecting the stock.
- The **2019 Speech from the Throne** clearly states that protecting Canada from climate change impacts is a **key federal priority**. DFO, as the guardian of the oceans, plays a key role and shares responsibilities in this aspect.
- Under the **Greening Government Strategy**, DFO is required to take action to understand the wide range of climate change impacts that could potentially affect federal assets, services and operations across the country by 2021, and develop measures to reduce climate change risks by 2022.
- Departmental demands and requirements are increasing and expected to continue to do so in response to the climate change activities that are taking place at **national and international levels**.