



GenomeCanada



2020

2021

Corporate Plan

GLOBAL CHALLENGES ♦ GENOMIC SOLUTIONS

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GenomeCanada

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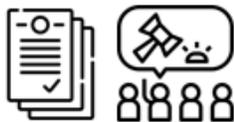
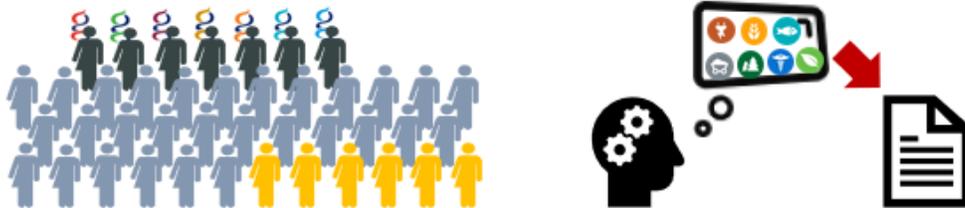
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1.0 About Genome Canada

Organizational context

Genome Canada is a not-for-profit organization that acts as a catalyst for developing and applying genomics and genomics-based technologies to create economic and social benefits for Canadians. Genome Canada defines genomics as the comprehensive study – using high throughput technologies – of the genetic information of a cell or organism and its functions. This includes related disciplines such as proteomics, metabolomics and bioinformatics.

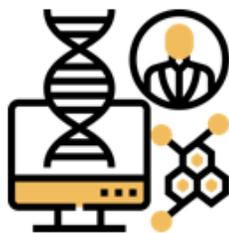
The **Genome Enterprise** works with **academics** and **industry** to turn ideas into proposals



Projects are reviewed by panels of experts to ensure the **highest quality** and maximum feasibility.



Once approved, the Enterprise works with the project teams and committee members to ensure milestones are being met and to **support projects** as needed.



As projects progress, outputs and outcomes are generated. What and when varies by project, but the **knowledge** is shared globally, **products** brought to market, and ideas turned into **spin-off companies**.



Great ideas often lead to more great ideas and many researchers build on their previous research and apply for further funding in later competitions.



Genome Canada has invested **\$3.7B** (including co-funding) into **440** 'omics research projects across **7** sectors.

Genome Canada connects ideas and people across public and private sectors to find new uses for genomics. It also invests in large-scale science and technology to fuel innovation and translate discoveries into solutions across key sectors of national importance.

Genome Canada catalyzes multidisciplinary research and innovation across sectors where genomics can contribute solutions. This provides clear opportunities for Canada to play a leading international role in emerging global issues, such as antimicrobial resistance and climate change.

Since its inception in 2000, Genome Canada and six affiliated regional Genome Centres have been at the heart of Canada's genomics enterprise. This enterprise is a collaborative network of individuals and organizations who coordinate and conduct research, translate discoveries into applications and apply the results to the benefit of Canadians.



Genome Canada and the Genome Centres are dedicated to delivering on federal policy priorities for science and innovation. They have fueled the genomics enterprise and set a national agenda for genomics in Canada, driven by Government of Canada support. Genome Canada is the only agency in Canada with a singular focus on genomics – and its applications across multiple sectors of importance. It plays a unique and collaborative role in the broader science, technology and innovation ecosystem.

Through myriad partnerships and strategic program design, Genome Canada ensures its alignment with key federal players. These include granting councils, science-based departments and federally funded not-for-profit organizations. Working with such entities ensures a continuum of funding support across the entire life cycle of a research project – from discovery to application in the marketplace and public sector.

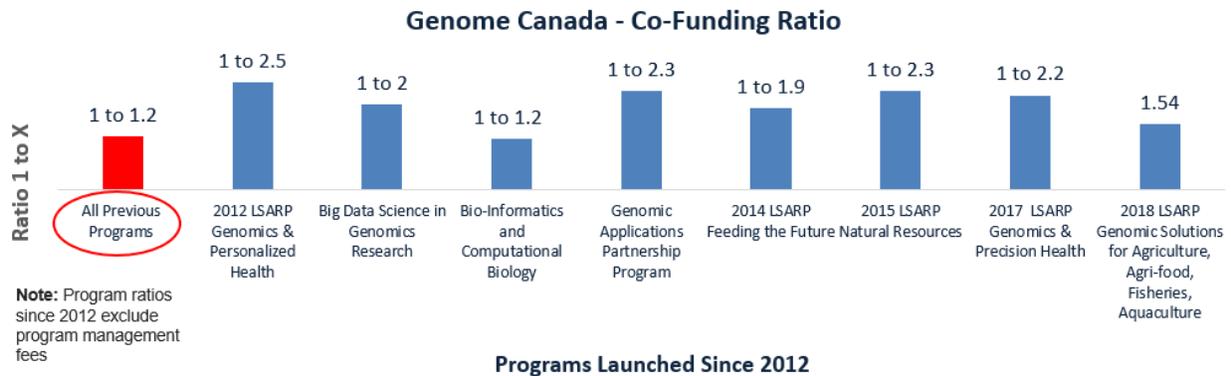
Genome Canada's business model provides national coordination while setting strategic direction that is responsive to regional needs and priorities. Upfront engagement with users of genomics ensures that the research is strategic and purpose-driven. This makes research more likely to be translated into applications that target opportunities and solve challenges in all sectors of the bioeconomy and across all regions of Canada.

This focus is important because only in Canada will research and development (R&D) be undertaken to address Canadian priorities such as:

- the sustainability and productivity of Canadian farms, forests and fisheries,

- the environmental footprint of Canadian oil and mining industries,
- the viability of Canadian health-care systems, and
- the improvement of health and economic opportunities in the Arctic and for Indigenous peoples.

Securing co-funding through partnerships is central to the Genome Canada business model. Bringing together diverse partners to co-invest in Canadian genomics research aligns efforts and benefits society. In collaboration with the Genome Centres, Genome Canada has leveraged \$1.5 billion in federal funding since 2000 for a total investment of \$3.7 billion for genomics research in Canada.



Genomics is a maturing science, but we are only beginning to realize the enormous potential of this cutting-edge field of inquiry. As technological advances accelerate, early demonstrations of impact become clear. Thanks to sustained federal funding and the achievements of researchers supported by Genome Canada, the regional Genome Centres and other partners, Canada is now a powerhouse in genomics. Genome Canada is poised to build on this success and generate competitive advantages for Canadian sectors globally through genomics.

Genome Canada's range of programs

Genome Canada supports the advancement of genomics in Canada. The knowledge generated through its funding programs strengthens Canada's bioeconomy, supports evidence-based policy-making and improves the quality of life for Canadians.

Since its inception in 2000, Genome Canada has evolved its suite of programs. They now reflect both the rapidly changing state of genomics-based science and the opening up of opportunities across all sectors of the bioeconomy. These changes have been driven by users of genomics technology in the private and public sectors. Today, the Genome Canada portfolio of programs supports fundamental science through to translation and into application.

Large-Scale Applied Research Project (LSARP) competitions fuel the innovation pipeline. Through the LSARP program, Genome Canada supports discovery and applied research. It also encourages investigators to explore the potential uses of their discoveries by engaging with those who can help translate the research into applications that benefit Canadian society and the bioeconomy.

The Genomic Applications Partnership Program (GAPP) is an academic-receptor partnered program whose goal is to increase and accelerate the positive social and economic impact of Canada's genomics R&D capacity.

GAPP's objectives are to:

- accelerate the application of Canadian genomics-derived solutions to real-world opportunities and challenges defined by industry and the public sector,
- channel Canada's genomics capacity into sustainable innovations that benefit Canadians,
- enhance the value of Canadian genomics technologies and incentivize investment from industry and other partners, and
- foster mutually beneficial collaboration and knowledge exchange between Canadian academia and technology receptors.

Genome Canada's Emerging Issues and Regional Partnership Priority Programs respond to regional and national strategically identified need. Both programs allow for rapid, flexible response to issues in society, from improve cannabis productivity to early detection of bipolar disorder to improve treatment.

Underpinning our research funding programs are technology programs, designed to provide Canadian scientists with access to leading-edge 'omics technologies. These technologies include bioinformatics and computational biology tools needed to manage, analyze and interpret the ever-growing amount of data produced through genomics inquiry.

Just as technology underpins the genomics scientific endeavour, so does understanding implications of genomics in society. Genome Canada programs address genomics and its ethical, environmental, economic, legal and social (GE³LS) aspects, as well as genomics in society.

Commitment to accountability

In delivering its mandate, Genome Canada is committed to applying the highest standards of accountability and transparency to its operations. It provides a high level of assurance through mechanisms and instruments such as:

- corporate plans and annual reports,
- independent performance audit and evaluation studies,
- peer review and research oversight committee processes,
- annual attest audits,
- continuous risk management assessment, and
- effective oversight by the board of directors.

Genome Canada rigorously monitors its expenditures in order to manage operations in a fiscally prudent manner.

2.0 Results 2019-20

Through early work on capability and capacity building, Genome Canada developed large-scale fundamental research projects and technology platforms. As the technology matured and the strength of the genomics enterprise in Canada increased, Genome Canada built up the expertise to drive innovation through its support of applied genomics, using genomics research to address challenges and opportunities in all sectors vital to Canada's growing bioeconomy.

The Genome Canada approach ensures alignment and complementarity with other key members of Canada's science, technology and innovation ecosystem. This mutually reinforces respective strategies and objectives and capitalizes on synergies that can be derived from working together.

Short- and medium-term outputs and outcomes from 2019-20

In 2019-20, Genome Canada achieved a broad and substantial range of short- and medium-term outputs and outcomes. They include the following:

- **Funding of the 2018 LSARP Competition – Genomic Solutions for Agriculture, Agri-food, Fisheries and Aquaculture.** This \$77.9 million competition, including co-funding, was launched January 2018 in partnership with Agriculture and Agri-food Canada. It supports 8 projects that demonstrate how genomics research can be translated into solutions advancing the sustainability, productive capacity and competitive position of the Canadian agriculture/agri-food and fisheries/aquaculture sectors.
- **Funding of the 2017 LSARP Competition – Genomics and Precision Health.** This \$163.9 million competition, including co-funding, was launched in January 2017 in partnership with the CIHR. It supports 15 projects that demonstrate how genomics-based research can contribute to a more evidence-based approach to health. These projects are expected to improve health outcomes and/or enhance the cost-effectiveness of the health-care system. A broad range of projects were funded, including several focused on diagnosis and treatment for cancers, reducing health care disparities and improving diagnostic success for children with genetic diseases from Indigenous populations, diagnosis of rare diseases, and several chronic illnesses, including cystic fibrosis, inflammatory bowel disease, and childhood arthritis.
- **Continued investment in the 2015 LSARP Competition – Natural Resources and the Environment.** Genome Canada and co-funding partners are investing a total of \$112.1 million in 13 projects. The scope of this competition includes genomics research in energy, mining, forestry, water stewardship, wildlife management and conservation. It also includes genomics research in bioproducts that will provide tools to help conserve natural resources and protect the environment. Outcomes have the potential to contribute to the Canadian bioeconomy and well-being of Canadians.
- **Continued investment in the 2014 LSARP Competition – Genomics and Feeding the Future.** Genome Canada has continued to fund the 11 projects announced in 2015 via a \$94.4 million investment, which includes co-funding. The projects use genomics approaches within the agriculture/agri-food and fisheries/aquaculture sectors to address challenges and opportunities related to global food safety, security and sustainable production. Funding flowed to projects focused on the application of genomics in multiple areas, including sustainable fisheries and honeybees, stress and disease resistance of crops and livestock and, in partnership with the

Western Grains Research Foundation, utilizing genomics to expedite breeding for desirable traits in wheat, lentils and soybeans.

- **Continued investment in the 2012 LSARP Competition – Genomics and Personalized Health.** A total of \$150.2 million, including co-funding, was committed over the complete term of these projects. The projects are completed and are in the process of submitting their final reports. The projects aim to demonstrate how genomics can contribute to a more evidence-based approach to health, improve the cost-effectiveness of the health-care system, and ensure discoveries are translated into patient and population benefits. Areas of focus included tailoring patient treatments and therapies through the application of genomics. These are applied in fields as diverse as epilepsy, autism, HIV/AIDS, cancer, cardiovascular disease, rare neurological diseases and stroke, among others. These projects are nearly all completed and are preparing final reports.
- **Funding of more projects through GAPP.** Throughout 2019-20, Genome Canada continued to invest in GAPP. A total of \$346.8 million, including co-funding, through round 15 has been committed to 61 receptor-led projects to date. Through GAPP, Genome Canada connects academic researchers with receptors in industry and the public sector. GAPP is designed to increase collaboration between genomics scientists and users of genomics research to advance projects that address real-world challenges and opportunities. GAPP is also intended to stimulate investment from private and public partners in Canadian genomics technologies. Recent rounds included projects that are working to develop diagnostic tests for pediatric cancers and tools to detect and identify surface microbial contamination.
- **Continued partnership with Mitacs through GAPP to provide training opportunities in the private sector.** Mitacs is a non-profit, national research organization. It manages and funds research and training programs for undergraduate and graduate students as well as post-doctoral fellows in partnership with universities, industry and government in Canada.

A Genome Canada partnership with Mitacs provides placements and funding for graduate students and post-doctoral fellows to work on GAPP projects within industry partners' operations. The partnership prepares Canada's next generation of innovators to advance the field of genomics by allowing candidates to apply their knowledge and skills in a real-world setting. Companies, meanwhile, benefit from the high-quality research expertise. During 2019-20, this partnership supported eight Mitacs Accelerate internships in GAPP projects.

- **Continued investment in a GE³LS network in genomics and personalized health.** The GE³LS Network was introduced as a complement to the Genomics and Personalized Health 2012 LSARP competition. Genome Canada knows that there are challenges in implementing precision medicine technologies in practice. Many of these barriers are related to the GE³LS aspects of genomics research. Recognizing that working across projects would generate synergies that working in silos could not, Genome Canada invested \$5.8 million, including co-funding, in the Precision Medicine Policy Network for three years, starting March 2016. The Network focuses on ethics, economics and health technology assessment, knowledge translation, intellectual property and commercialization.
- **Continued investment in the Joint Initiative with the Social Sciences and Humanities Research Council (SSHRC) on Societal Implications of Genomics.** This \$1.3 million initiative

jointly supports social sciences and humanities research and related activities that will enrich the understanding of the societal implications of genomic research. By reaching a community of social sciences and humanities scholars who may still be unfamiliar with Genome Canada's programs, the initiative is also intended to help build the cadre of social sciences and humanities scholars interested in pursuing genomics-related research collaborations and facilitate their becoming part of multidisciplinary teams applying to Genome Canada applied research competitions. SSHRC has the lead on the peer review as applicants apply through SSHRC's regular programs. A total of 11 projects have now been approved for funding.

- **Launch of the Genomics in Society Interdisciplinary Research Teams program.** This program, launched February 2019, is part of Genome Canada's Translational suite of Programs. The Interdisciplinary Research Teams aim to bring researchers from different disciplines together to investigate factors affecting the advancement, adoption, evaluation and governance of genomics research and address issues at the intersection of genomics and society that will ultimately contribute to Canada's leadership and social and/or economic benefits in various sectors. This program is designed to support and enhance GE³LS research that addresses important and overarching challenges that affect the adoption and uptake of the outcomes from genomics research and/or accelerate the synthesis and dissemination of research pertinent to users, including policy-makers, within a sector.
- **Continued investment in Emerging Issues.** Genome Canada is currently funding emerging issues projects that address important and timely needs. Since 2000, Genome Canada has invested \$7.4 million (including co-funding) into Emerging Issues projects. Most recently, Genome Canada's Board approved a project exploring Lyme disease in Nova Scotia that addressed gaps in the understanding of how the diversity of *B. burgdorferi* strains impact Lyme disease pathological manifestations and sensitivity of diagnostic tests.
- **Continued investment in the 2015 E-Rare-3 Joint Transnational Call – Translational Research Projects on Rare Diseases, Structural Genomics Consortium.** The total investment from all partners for the nine projects is \$13.4 million over three years. Genome Canada directly funds three of the projects, with two of these now completed. \$111,000 was invested in the final project in 2019-20. These projects focus on harmonizing phenomics information and improving the diagnosis and treatment of a cardiac arrhythmia syndrome. They also focus on studying a life-threatening autosomal skin disease to understand its pathophysiology, facilitating the development of targeted therapies. E-Rare-3 is enabling scientists in different countries to build effective collaboration around a common interdisciplinary research project based on the sharing of expertise.
- **Continued support for the Structural Genomics Consortium.** The Structural Genomics Consortium (SGC), established in 2004, is a not-for-profit public-private partnership that supports the discovery of new medicines through open access research. Throughout 2019-20, Genome Canada continued its investment in the SGC. Up to \$400 million in investments have been made in collaboration with partners so far.
- **Investment in the Regional Priorities Partnership Program.** This \$20.4 million initiative (including co-funding) supports the Genome Centres in developing initiatives that advance genomics research and translation capacity in areas of strategic priority to their regions. Ten projects have been approved thus far on various topics, including:

- implementation of a modern and sustainable mussel breeding program
 - improving cannabis productivity and strain identification
 - a provincial platform to meet clinical genomics needs
 - development of process for identifying healthy, fertile, resilient dairy cows
 - accelerate development of high-yield soybean cultivars
 - identification of genetic variations that yield lower stress sows
 - design of a biofertilizer formulation of bacteria that can improve growth and yield of plants exposed to drought
- **Continued investment in the 2015 Bioinformatics and Computational Biology Competitions.** The objectives of this competition, held in partnership with the CIHR, are to support the development of next-generation tools and methodologies and to provide the research community broad and timely access to these tools. Sixteen projects were funded for two-year terms for a total of \$4 million. The projects will bolster federal action on antimicrobial resistance through stronger surveillance, stewardship and innovation. Other projects will enhance diagnosis and treatment for patients, improve crops of importance to Canada, and strengthen environmental monitoring.
 - **Continued investment in the 2017 Bioinformatics and Computational Biology Competitions.** Launched in December 2017, the major objectives of this \$24-million competition are similar to those of previous competitions. The 2017 competition supported proposals under two streams: proposals mainly impacting the human health sector, and proposals mainly impacting one or more of the other sectors that Genome Canada focuses on. The 25 projects funded included ones using machine learning to predict drug resistance in pathogenic bacteria, toolkits for rapid characterization of bacterial genomes, tackling environmental and agri-food context of antimicrobial resistance, among many others.
 - **Continued investment in the Genomics Technology Platforms.** Ten technology platforms are being supported for a total of up to \$186.9 million, including co-funding, over five years, beginning in April 2017. The technology platforms provide the research community with the highest-quality 'omics technologies and advice. Each of the platforms provides researchers access to high throughput 'omics technologies such as DNA sequencing, proteomics and metabolomics. The platforms also provide researchers with new method and protocol development, data analysis and bioinformatics.
 - **Funding the 2017 Disruptive Innovation in Genomics Competition.** Genome Canada and co-funding partners are investing \$19.1 million in seven phase 1 projects that are advancing to phase 2. These projects focus on a range of areas, for example, the development of techniques to rapidly isolate and analyze fetal cells for prenatal diagnosis of genetic abnormalities using non-invasive procedures and diagnostic testing to increase the success rate of genetic testing in children with rare genetic diseases and cancer.
 - **Continued investment in the 2015 Disruptive Innovation in Genomics Competition.** Genome Canada and co-funders are investing in projects that deliver innovations in the field of genomics. These projects have the potential to displace an existing technology, disrupt an existing market or create a new market. It is anticipated that disruptive innovations will enable the rapid acceleration of genomics research, marking a significant leap forward for the genomics revolution. Twenty projects were selected for funding under the first round of Phase 1 of this competition and five

projects were selected for funding in the first round of Phase 2 for a total investment of \$18.5 million.

- **Advancing precision health in Canada.** Genome Canada launched a precision health initiative to advance precision health for Canadians through the implementation of clinical genomics. Several working groups were created to advance specific components, and a forum of the funded and prospective GAPP Rare Disease leads has been formed to support the projects' abilities to meet these conditions and enhance the likelihood of success for the initiative. A Mission Statement for the partnership has been developed and made public. Additionally, in March 2019 a precision health "data" workshop was held that included leading Canadian Bioinformaticians and representatives from CIHI, CHIR, INFOWAY and other National Initiatives (Genomics England, All of Us, Undiagnosed Disease Network, Australia Genomics and Genomic Medicine Sweden). A draft data governance framework has been developed and will continue to be refined. An initial webinar hosted by the Canadian College of Medical Geneticists regarding the initiative took place in October 2019 as part of the engagement with and education for healthcare professionals.
- **Continued outreach.** Genome Canada engaged in several outreach activities in 2019-20:
 - National series on Genomics and Society begun. Genome Atlantic most recently hosted an event in February 2019.
 - Media content is being developed in partnership with other national initiatives, such as Genomics England to increase patient and community engagement. Genome Canada will organize a series of webinars for the Canadian Organization of Rare Disorders (CORD) over the next year.
 - In June of 2019 Genome Canada organized a panel at the Canadian College of Medical Geneticists (CCMG) annual conference. As a result of the success of the panel, Genome Canada has been invited to be involved with the CCMG webinar series "The Leading Strand".
 - Numerous smaller-scale outreach events, including booths at conferences, keynote addresses, scientific cafes, and lab tours for students.
- **Implementing a new strategic vision for Genome Canada.** As a prelude to the launch of a new strategic vision, Genome Canada consulted with more than 300 stakeholders from coast to coast, including researchers, industry, academic leaders and federal and provincial policymakers. Based on these consultations and on discussions among the Board and senior leadership, a new vision was developed and launched in 2019. This vision allows for the flexibility required of a fast-moving science, while also giving a clear direction forward for the organization to continue to drive genomics research in Canada. Its implementation will continue through 2020.
- Genome Canada signed the Dimensions Charter as an organization committed to the principles of equity, diversity, and inclusiveness in its policies, practices, action plans, and culture.
- Genome Canada is a signatory on the Declaration on Research Assessment (DORA) as an indication of its ongoing support for equitable demonstrations research excellence that go above and beyond traditional outputs, such as journal impact factor or number of publications.
- The organization supported this year's Summer internship for Indigenous peoples in Genomics Canada (SING Canada) at the University of Alberta.

Remaining challenges from 2019-20

The principal challenge remaining from 2019-20 is **co-funding**. The current model of short-term funding agreements with the Government of Canada inhibits strategic investment planning. It also negatively impacts the ability of Genome Canada and the Genome Centres to secure co-funding through medium- to long-term partnerships. A longer-term federal funding commitment would position Genome Canada as a stable and credible partner with industry and the provinces and territories. Funding should also be at a level that allows for the full implementation of Genome Canada's strategic plan. Genome Canada's essential co-funding partners require a multi-year planning horizon for the kind of large-scale and long-term investments that genomics research and innovation entails.

High requirements for co-funding can also affect equitable access to Genome Canada funding, favouring more experienced researchers with larger networks and those with a long track record of funding to attract co-funding partners.

3.0 Moving forward into 2020-21

Genome Canada will continue to work to put genomics in the hands of those who will use it to the benefit of Canadians. To do this, Genome Canada is committed to driving high-impact research, deliver effective purpose-fit programs that support our mission, and promote the responsible application of genomics in Canada.

Genome Canada Strategic Vision

OUR VISION Canada is a world-leader in the application of genomics-based biosciences for human health, the environment, and across the bioeconomy.	OUR MISSION Genome Canada commits to put genomics in the hands of those who will use it to create health, environmental, and economic benefits for Canadians.	OUR OBJECTIVES <ol style="list-style-type: none">1 Drive high-impact research to benefit Canada2 Deliver effective, purpose-fit programs that support our mission3 Promote the responsible application of genomics in Canada
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As the leading voice for Canadian genomics researchers, Genome Canada will continue to support the genomics research ecosystem and genomics researchers through its provision of large-scale funding for big genomics research projects while also enabling timely responses to social needs through rapid-response funding for emerging and strategic issues. Genome Canada will maintain its support of researchers that seek to push the limits of their methodologies and tools and who want to disrupt current ways of thinking and doing with funding in bioinformatics and disruptive technologies. Genome Canada hopes to challenge researchers to continue to push the boundaries of innovation, to think outside the box and disrupt technologies, tools, and industries through the application of genomics research and tools in practice. And finally, Genome Canada seeks to nurture the understanding and application of genomics in all sectors through its support of the study of genomics in society.

For the 2020-21 fiscal year, Genome Canada will continue to manage ongoing programs and initiatives funded by the various agreements noted in Table 1 at the end of this report. Additionally, this fiscal year, funding from the 2019 Contribution Agreement will also begin to flow. Table 2 (at the end of this report) includes a list of all programs funded by Genome Canada that will be active in 2020-21.

1. Drive High-Impact Research to Benefit Canada

Genome Canada will continue to support large-scale, interdisciplinary research with line-of-sight to application. It will fund strategic mission-driven research addressing social challenges, while providing access to leading-edge technologies and supporting research on genomics in society.

To support this objective, Genome Canada will:

- Maintains its commitment to large-scale, interdisciplinary research through its inclusion of GE³LS in the LSARP programs
- Continue its Genomics in Society Interdisciplinary Research Teams program and partnership with SSHRC to build capacity in research on genomics in society.

- Ongoing funding of the Precision Medicine Policy Network funded for \$1.1 million in 2020-21.
- In 2020-21, Genome Canada will invest \$28.3 million (excluding co-funding) into LSARP projects. and is preparing its next LSARP competition to be launched in 2020. This upcoming competition has up to \$25 million available and will be focused on natural resources and the environment.
- \$16.0 million is intended to be invested in GAPP, which will, through the Mitacs partnered Accelerate scholarship program, support at least five fellows.
- In 2020-21, Genome Canada is slated to invest \$13.9 million in its 10 technology platforms.
- Genome Canada is continuing to invest in its big data program, Bioinformatics and Computational Biology (B/CB), in 2020-21 to ensure scientists have the tools needed to interpret, manage, govern, store and share genomics data in a secure and equitable manner.

2. Deliver Effective, Purpose-Fit Programs that Support our Mission

Genome Canada is committed to supporting an equitable, diverse, and inclusive research program focused on excellence and impact. It will continue to focus on strengthening the impact of research and innovation through collaboration and coordination within academia and industry, and nationally and internationally.

- Genome Canada has implemented an EDI policy and Action Plan, which the Board of Directors approved an EDI Action Plan at its June 2019 meeting.
- Genome Canada is a signatory on the Dimensions Charter.
- Genome Canada works to remain in touch with the research ecosystem and industry needs by regularly undertaking and updating its sector strategies. All of its programs are informed by the research community, its stakeholders, relevant industry, and the Genome Centres.
- Genome Canada regularly works with the six Genome Centres, who have regional expertise and capabilities, to ensure that all programs remain relevant and responsive.
- The Regional Priorities Partnership Program focuses on supporting the Genome Centres in developing initiatives that advance genomics research and translation capacity in areas of strategic priority to their region. In 2020-21, Genome Canada plans to have approximately \$2.3 million available for the Regional Priorities Partnership Program.
- Genome Canada believes that part of what we must do to generate innovation is to challenge the norm. The Disruptive Innovation in Genomics competition (DIG) supports the development of new genomics-based technology (or the application of existing technology from another field applied to genomics) that is transformative and has the potential to displace an existing technology or disrupt an existing market or create a new one. In 2020-21, Genome Canada will continue its investment in existing disruptive innovation projects with \$2.8 million.
- Genome Canada has been a member and supporter of the Global Alliance for Genomics and Health (GA4GH) since 2014. Genome Canada is planning to provide approximately \$122,000 in 2020-21 to support the convening activities to advance the research efforts of the alliance.
- The Structural Genomics Consortium (SGC), is a unique Canadian-led public-private partnership established in 2004 to support the discovery of new medicines through open science research. Genome Canada's funding has allowed the SGC to remain in Canada and facilitated its open access programming through new partnerships. Genome Canada will invest \$0.9 million in 2020-21.
- Established in 2007, the Canadian Stem Cells Consortium (CSCC) is formed of the Canada Foundation for Innovation, the Canadian Institutes of Health Research, Genome Canada, the Ontario Institute for Cancer Research and the Stem Cell Network. The goal of the CSCC is to

develop and implement a strategy to support research in cancer stem cells. Genome Canada is investing \$0.2 million in its CSCC initiatives in 2020-21.

- Genome Canada is also forging ahead with its continued work on rare diseases. In addition to supporting several ground-breaking projects on rare diseases, Genome Canada has seen the need for more and taken the lead on establishing a national Precision Health Strategy to develop a coordinated, national strategy for applying genomic research to rare diseases.

3. Promote the Responsible Application of Genomics in Canada

Genome Canada will demonstrate thought-leadership through a genomics lens by participating in a national dialogue on genomics and policy. The organization will work collaboratively with its stakeholders to share information and develop its strategy.

- Genome Canada supports and encourages outreach and engagement in the community. Genome Canada-funded scientists open their labs to tours by school students of all levels every year. They take on co-op and summer students to generate capacity and interest in science. They support the interest of undergraduate, masters, PhD students, and postdoctoral fellows by finding places for them on their research projects. They speak at local schools and universities, are invited to speak at other universities globally, are visiting professors in other departments, and hold public workshops to share their knowledge.
- In addition to our support of scientists and their outreach, in 2020-21, Genome Canada will continue to sponsor and participate in outreach events, both nationally and internationally. Genome Canada represents Canadian genomics in national and international conferences and meetings and engages with broad sets of stakeholders through Genome Centre programs like GeneSkool and through partnerships supporting initiatives like the Summer Internship for Indigenous Peoples in Genomics, and others.
- Genome Canada regularly consults with its stakeholders to revise its sector strategies. These sector strategies are led by a steering committee and serve to define the role of genomics in agriculture/agri-food, the environment, energy and mining, fisheries and aquaculture, forestry, and health. Currently, Genome Canada is revising its health, agriculture/agri-foods and fisheries/aquaculture sector strategies in its ongoing efforts to keep up with the speed of innovation in genomics.
- Genome Canada is a world leader in genomics and its ethical, environmental, economic, legal, and social aspects (GE³LS). To ensure it stays that way, Genome Canada is working to implement the recommendations from its Integrated GE³LS Program Review and is developing a plan for GE³LS research, and the Genomics in Society portfolio.
- Genome Canada and the Centres continue to produce policy briefs on current issues in genomics such as human genome editing, data access and sharing, and genetic discrimination.
- Genome Canada-funded scientists are among the forefront of genomics-related thought leadership nationally and internationally. They have been invited to speak before Parliamentary committees, been admitted to the Royal Society of Canada, and have been the recipient of the Kyoto Prize, Heineken Prize, Gairdner Award, and the Killam Prize, among others. Genome Canada is seeking to tap into this excellence to better share their knowledge with all our stakeholders.
- Finally, as it has always done, Genome Canada will continue to maintain and develop national and international partnerships in areas of pressing importance to Canadians and it will continue to reach out to all types of industries and potential users to inform them of the many ways in which genomics research and tools could be applicable to their sector.

4.0 Financial management

The federal government, through Innovation, Science and Economic Development Canada, has committed \$1.5 billion in funding to Genome Canada since 2000-01. This includes the most recent support of \$100.5 million in Budget 2019. All funding is provided through funding agreements between Genome Canada and Innovation, Science and Economic Development Canada. Genome Canada and the Genome Centres raise co-funding from others, including the public, not-for-profit and private sectors.

Investment and management of funds

The Audit and Investment Committee supports Genome Canada's board of directors in fulfilling its fiduciary responsibilities with respect to the management of funds. The committee meets quarterly and reports to the board on the outcome of its deliberations.

The committee is responsible for:

- overseeing the investment and management of funds received from the Government of Canada as per a board-approved investment policy
 - the policy outlines guidelines, standards and procedures for the prudent investment and management of funds, and
- overseeing Genome Canada's policies, processes and activities in the areas of accounting and internal controls, risk management, auditing and financial reporting.

The board's programs committee brings further oversight to the management of funds by ensuring research funding and activities are aligned with Genome Canada's strategic priorities. The committee provides advice to the board of directors on research programs and projects, research partnerships and collaborations, competitions and program evaluation.

Source and use of funds

Genome Canada currently manages funds arising from the following funding agreements.

TABLE 1: GENOME CANADA FUNDING AGREEMENTS WITH INNOVATION, SCIENCE AND ECONOMIC DEVELOPMENT CANADA

Federal budget	Competitions and projects funded
Budget 2008 (\$140 million)	Competition in applied genomics research in bioproducts and crops Two research projects through the Cancer Stem Cell Consortium and the International Barcode of Life project Support for the Science and Technology Innovation Centres The operations of six regional Genome Centres and Genome Canada through to 2012-13
Budget 2010 (\$75 million)	Competition in forestry and the environment Multi-sector competition Competition for operations support for the Genomics Innovation Network
Budget 2011 (\$65 million)	Competition in applied genomics research in personalized health Funding of Phase III of the Structural Genomics Consortium (SGC) and continued funding for the International Barcode of Life project Funding for the Public Population Project in Genomics Competition in bioinformatics and computational biology Contribution to the operations of six regional Genome Centres and Genome Canada for 2013-14

Federal budget	Competitions and projects funded
Budget 2012 (\$60 million)	Funding for the Genomic Applications Partnership Program Funding for renewal of the Genomics Innovation Network for two years Funding of the SGC and the International Barcode of Life project
Budget 2013 (\$165 million)	Two competitions in large-scale applied genomics research Funding for Genomics Innovation Network operations in 2015-16 and 2016-17, as well as related technology development Funding for disruptive innovation in genomics and in bioinformatics and computational biology Funding for national and international partnerships, including the SGC and the International Barcode of Life project Contribution to the operations of six regional Genome Centres and Genome Canada through to 2016-17
Budget 2016 (\$237 million)	Two competitions in large-scale applied genomics research Support for genomics technology platforms and for bioinformatics and computational biology competitions Funding for the Genomic Applications Partnership Program Funding for national and international partnerships and strategic initiatives Contribution to the operations of six regional Genome Centres and Genome Canada through to 2019-20
Budget 2019 (100 million)	One competition in large-scale applied genomics research Funding for Technology Platforms and research projects in bioinformatics and computational biology, technology development and disruptive technology Support for translational research Operating costs of Genome Canada and contribution to the operations of six regional Genome Centres through 2021-22

Cash management

Genome Canada disburses funds on a quarterly basis through the six regional Genome Centres (for approved research projects) and the technology platforms. On a quarterly basis, each Genome Centre is required to review the expenditures to date. Each Centre is also required to estimate cash requirements for Centre operations and for each project and technology platform that it manages. It then submits a “draw request” to Genome Canada, indicating the cash needs for the subsequent quarter.

The Genome Centres assess the project / technology platform needs against the approved budget, actual expenditures, scientific progress to date and co-funding received from other sources. Genome Canada then conducts its own thorough review of the draw request submission before releasing funds.

Receipts and disbursements

Table 2 on the following page provides an estimate of the receipts and disbursements for the funding agreements.

TABLE 2: SUMMARY OF RECEIPTS AND DISBURSEMENTS

Details (in millions of dollars)	Actual 2000-19	Forecast 2019-20	Forecast 2020-21	Forecast other	Total	Estimated co-funding	Genome Canada and co- funding	%
RECEIPTS								
Government of Canada								
Previous budgets	1,040.0				1,040.0		1,040.0	26.5%
Budget 2013	153.6	11.4			165.0		165.0	4.2%
Budget 2016	83.8	60.4	38.0	55.0	237.2		237.2	6.0%
Budget 2019			31.5	69.0	100.5		100.5	2.6%
Investment income	91.6	0.8			92.4		92.4	2.4%
Co-funding						2,294.4	2,294.4	58.4%
	1,369.0	72.6	69.5	124.0	1,635.1	2,294.4	3,929.5	100.0%
DISBURSEMENTS								
Research projects and Genome Centres funding								
Projects and programs completed in previous years	866.3				866.3	1,091.4	1,957.7	49.9%
2012 LSARP: Genomics and Personalized Health	46.0	0.3	0.3		46.6	103.6	150.2	3.8%
2014 LSARP: Genomics and Feeding the Future	24.8	4.8	3.0		32.6	61.8	94.4	2.4%
2015 LSARP: Natural Resources and the Environment	17.3	7.6	7.6	1.9	34.4	77.7	112.1	2.9%
2017 LSARP: Genomics and Precision Health	8.2	6.5	11.0	19.1	44.8	119.1	163.9	4.2%
2018 LSARP: Genomics and Agriculture, Agri-Food, Fisheries and Aquaculture		2.3	7.5	20.8	30.6	47.3	77.9	2.0%
2020 LSARP: Natural Resources and the Environment				25.0	25.0	25.0	50.0	1.3%
Genomics Technology Platforms	49.8	15.5	13.9	10.5	89.7	97.2	186.9	4.8%
Genomic Applications Partnership Program	43.2	13.8	16.0	33.5	106.5	240.3	346.8	8.8%
Cancer Stem Cells Consortium	21.5	1.1	0.2		22.8	67.8	90.6	2.3%
Disruptive Innovation in Genomics	9.2	2.6	2.8	0.9	15.5	22.1	37.6	1.0%
Bioinformatics and Computational Biology	8.9	2.6	4.0	3.3	18.8	20.5	39.3	1.0%
Structural Genomics Consortium IV	8.4	3.2	0.9		12.5	82.7	95.2	2.4%
Strategic Initiatives	2.6	2.2	5.6	7.6	18.0	41.7	59.7	1.5%
Advancing Big Data Science	1.9	0.1			2.0	4.0	6.0	0.2%
Emerging issues	1.2	0.1			1.3	6.1	7.4	0.2%
GE ³ LS Third Modality	0.8	0.2			1.0	1.0	2.0	0.1%
Regional Priorities	0.3	1.6	2.3	1.8	6.0	14.4	20.4	0.5%
Translational Networks		0.0	1.4	1.3	2.7	3.1	5.8	0.1%
Genome Centre operations	97.1	4.7	4.8	4.8	111.4	167.6	279.0	7.1%
	1,207.5	69.2	81.3	130.5	1,488.5	2,294.4	3,782.9	96.4%
Genome Canada operations	120.9	7.2	6.6	6.6	141.3	0.0	141.3	3.6%
Total disbursements	1,328.4	76.4	87.9	137.1	1,629.8	2,294.4	3,924.2	100.0%
Excess receipts over disbursements	40.6	-3.8	-18.4	-13.1	5.3			
Opening cash balance	0.0	40.6	36.8	18.4				
Closing cash balance	40.6	36.8	18.4	5.3	5.3			

5.0 Risk assessment, mitigation measures and Performance Monitoring

Genome Canada has a wide array of policies, systems and processes that have been developed over time to address issues of risk assessment and mitigation strategies. They also address ongoing performance and evaluation monitoring. An updated *Performance, Evaluation, Risk, Audit Framework* was approved by the Board of Directors in December 2019.

Risk management

Risk management is integrated into all of Genome Canada's operational, managerial and governance activities. A formal risk management framework is in place and is annually updated and approved by the board of directors. Strategic risks arising from the external operating environment as well as the internal operating environment are assessed on an ongoing basis.

- At the project selection level, risk is managed and mitigated through a process that restricts funding to certain projects. Namely, these are projects judged to have the greatest probability of success from both a scientific and managerial point of view. The viability of each project's success is further mitigated through ongoing monitoring and reviews.
- At the operational level, officers of Genome Canada identify risks and propose strategies for mitigating and reporting. Examples include due diligence routines for reviews of draw requests and for reviews of funded projects.
- At the managerial level, policies, systems, processes and procedures (administrative, financial, human resource management) are developed, implemented and monitored.
- At the governance level, the board of directors and its committees are aware of their risk management responsibilities. They exercise modern governance practices with respect to policy approval and oversight.
- The Audit and Investment Committee is responsible for the monitoring of risk and mitigation strategies and regularly reviews the organization's corporate risk profile.
- The Genome Canada internal working environment culture is one that values honesty, integrity and ethical conduct.

Annual audit

The annual audit of Genome Canada's financial statements is conducted in accordance with generally accepted Canadian auditing standards. The statements are filed with Innovation, Science and Economic Development Canada by July 31 of each fiscal year. The objective is to express an opinion on whether Genome Canada's financial statements present fairly – in all material respects – the financial position, results of operations and cash flow of the corporation.

Upon completion of the audit, the financial statements and a summary of audit findings are presented to the audit and investment committee. They are then presented to the board of directors for approval. The financial statements can be found on the Genome Canada website: www.genomecanada.ca.

Recipient audit

Genome Canada has developed and implemented a recipient audit framework in consultation with the Genome Centres. As part of this exercise, a risk assessment tool was developed to enable the Genome Centres to identify projects that would undergo a detailed compliance audit. This includes the technology platforms. This framework was introduced to bring a common approach to recipient audits across Canada and to improve the management control framework within which genomics research is administered.

Compliance audit

In fiscal year 2018-19, Innovation, Science, and Economic Development Canada, as a routine practice, initiated a compliance audit of Genome Canada. It was conducted by an independent accounting firm. The stated objective of the audit was to assess Genome Canada's compliance with the requirements of the Contribution Agreement that was in effect in fiscal year 2017-18.

Performance measurement and evaluation

Genome Canada's funding agreement with Innovation, Science and Economic Development Canada specifies that Genome Canada will provide reporting on data collected in the past fiscal year. This is described in the *Performance Information Strategy*.

Performance monitoring

Genome Canada has adopted a corporate scorecard to monitor the organizations performance. This scorecard monitors performance in four key areas, People, Finance, Programs and Thought Leadership. The scorecard is reviewed by the Board Quarterly.

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