



## **Equipping Canada for Success in the Global Bioeconomy**

**Genome Canada's Presentation to the Standing Committee on Finance  
Pre-Budget Consultation 2016**

**February 19, 2016**



**Genome Canada is seeking an investment of \$513.5 million from the Government of Canada, to be committed in Budget 2016, for the launch of programs over the next five years. Genome Canada, together with the six regional Genome Centres, will leverage this investment at a ratio approaching 1:2 (Genome Canada: co-funding partners). As a result, the total of this investment in Canadian genomics research and its translation into application will be nearly \$1.4 billion.**

**This investment will save lives, make our health-care system more efficient and cost-effective, create jobs and economic growth, boost exports and protect our cherished environment.**

**It will do so by supporting the translation of genomics discoveries into real-world applications. This will help transform sectors of critical importance to Canada's bioeconomy and society at large, including human health, agriculture and agri-food, forestry, fisheries and aquaculture, the environment, energy and mining.**

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There is a global race underway. Around the world, countries are seeking the economic and social benefits that will come from leveraging research and innovation in the biological sciences. These benefits include improved health outcomes, boosts in productivity of agricultural and industrial processes, and enhanced environmental sustainability. Indeed, the Organisation for Economic Co-operation and Development (OECD) predicts the bio economy (all economic activity rooted in biology) will be worth \$1trillion by 2030. <sup>1</sup>

Canada is well-placed to capture its share and more of the bioeconomy, thanks to its ongoing investments in genomics<sup>2</sup> -the science that examines the genetic code and the function of genes within the DNA of all living things. Reading and understanding the "code of life" is enabling the transformation of sectors that form the bedrock of our economy and social well-being, from human health, and agriculture and agri-food to forestry, fisheries and aquaculture, the environment, energy and mining. Quite simply, genomics is the engine that is driving Canada's bioeconomy.

Genome Canada's vision is to harness the transformative power of genomics for the benefit of

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<sup>1</sup> The Bioeconomy to 2030 – Designing a Policy Agenda, OECD, 2009

<sup>2</sup> Broadly speaking, our definition of genomics includes related disciplines such as proteomics, metabolomics, pharmacogenomics and bioinformatics.



Canadians. Since our inception in 2000, we have received \$1.2 billion in funding support from the Government of Canada. In collaboration with Canada's six regional Genome Centres (Genome British Columbia, Genome Alberta, Genome Prairie, Ontario Genomics, Genome Quebec, Genome Atlantic), we have more than doubled that investment to \$2.6 billion<sup>3</sup> by leveraging every federal taxpayer dollar at a 1:1 ratio and, more recently, at a 1:2 ratio.

As a result of these investments, we have catalyzed the development of a thriving Canadian genomics enterprise and built world-class genomics capacity across all key sectors of our bioeconomy. Our research is saving lives, improving treatment and introducing cost effective innovations to the health-care system. Defibrillators are being implanted in the chests of Canadians with a genetic predisposition to sudden cardiac death, saving the lives of hundreds of Canadians. Our dairy industry is realizing benefits of more than \$200 million per year through genomics-informed breeding for desirable traits, such as fertility and milk production. Energy and mining companies are beginning to explore the use of microbes that can aid in extraction and cleanup of tailings ponds and pollutants. Forest managers are using genomics in the fight against the mountain pine beetle and other pests destroying our forests and urban trees. In the face of climate change, foresters can also use genomics, combined with tree breeding, to match "best fit" tree genotypes to appropriate climatic and geospatial zones. Our research is helping to avert food-borne illness from pathogens, such as *Listeria* and *E. coli*, which will benefit Canadian consumers as well as food manufacturers and exporters. To date, over 100 companies have either been created or advanced through the results of research funded by Genome Canada and the Genome Centres. Our funded research has prompted the creation of high-value knowledge jobs and economic growth in Canada.

Today, genomics is at a tipping point. Although it is still a relatively young science (the term 'genomics' was first coined in 1986 and the first human genome sequence completed in 2003), the underlying technology is both more powerful and affordable than ever before. In Canada, the genomics research capacity is strong and the receptor capacity within Canadian sectors to integrate genomics to their advantage is growing. Now is not the time to slow down. On the contrary, it is time to accelerate. What is required now are the resources and leadership in Canada to enable our nation's genomic enterprise to fully harness the transformative power of genomics for the benefit of all Canadians.

Genome Canada is uniquely positioned to provide that leadership. We are the only agency with a singular focus on genomics and its application across multiple sectors of economic

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<sup>3</sup> As at August 31, 2015



importance to Canada. Our business model – national breadth coupled with regional depth through the work of the six Genome Centres – has been tremendously effective in driving a national agenda informed by regional needs and priorities. Our upfront engagement with users of genomics ensures our research is more strategic and purpose-driven, with a greater likelihood of genomics discoveries being translated into applications that solve challenges in all key sectors of our bioeconomy and across all regions of Canada. This Canadian focus is important because only in Canada will research be undertaken to address uniquely Canadian problems, such as the sustainability of the Alberta oil sands and Canadian mining sites, the productivity of our farms and forests in the face of climate change, and the improvement of health and economic opportunities in the Arctic and for Indigenous Peoples.

Partnerships are at the heart of our business model. In collaboration with partners, we synergize our activities to ensure genomic investments have the greatest impact and maximize the value of the federal investment through co-funding. We catalyze multidisciplinary research and innovation across sectors where genomics can contribute solutions, providing clear opportunities for Canada to play a leading international role in emerging global issues such as antimicrobial resistance, climate change, rising energy demand and a growing and increasingly aging population. We provide Canadian researchers with access to the most advanced technologies, as well as the tools needed to extract meaning from the influx of "big data," so that our society can derive the benefits hidden within. And we are working to instill public confidence in genomics and overcome barriers to its application by fostering deepened understanding of genomics and its ethical, environmental, economic, legal, and social (GE<sup>3</sup>LS) aspects.

Our *mission* has not changed. Our plan for 2016-21 will *connect* ideas and people across public and private sectors to find new uses and applications for genomics, *invest* in large-scale science and technology to fuel innovation and *translate* discoveries into applications to maximize impact across all sectors. We will do this through a harmonized set of strategies and three key program pillars: funding large-scale science, providing researchers access to leading-edge technologies and translating genomics into applications to be used in society.

As an integral component of the science, technology and innovation ecosystem in Canada, Genome Canada is playing its part, in concert with others, to address our nation's lagging productivity. For example, through our Genomic Applications Partnership Program, we are connecting genomic academic researchers with users in industry and public sector organizations. The program has experienced phenomenal success in terms of participation across sectors since its launch in 2013. Twenty projects are currently in play with users



focusing on applications as diverse as novel therapeutics, greener automobile manufacturing, improved feed for fish, poultry and swine, enhanced cheese quality, and personalized diagnostic tools for lung transplantation and other diseases. It is clear that Canadian sectors are primed to integrate genomics to drive innovation, foster sustainable practices and power the growth of their businesses. ***The translation of genomics into applications across key sectors of the Canadian economy is the centrepiece of our plan going forward.***

We are facing a critical window of opportunity to more broadly and intensively drive genomics into applications across key sectors of our economy. The technology has advanced, the capacity in Canada has been built and the potential for the translation of genomics into applications is growing exponentially. Wavering on a national commitment to genomics now risks putting Canada on the outside looking in as other nations, which are making significant investments in genomics, reap the benefits of the exciting next phase of genomic breakthroughs.

To ensure Canada remains globally competitive in genomics and to create the advancements that will benefit Canadians, our industries and our health-care system, Genome Canada is requesting a federal funding commitment of \$513.5 million in Budget 2016 to launch programs over the next five years. As Genome Canada is an independent, not-for-profit organization that does not receive direct and annual appropriations from Parliament, we must request funding on an as needed basis. Without an investment in Budget 2016, Genome Canada is unable to initiate any new programs- programs supported by Budget 2013 have been launched and all funds will be committed by June 2016.

The requested five-year funding commitment is essential to position Genome Canada as a credible funding partner as we seek co-funding to leverage the federal investment at a ratio approaching 1:2. Without substantial, long-term funding, we simply will not be able to mobilize our partners adequately to achieve the 1:2 co funding target. The amount of funding is also critical. It represents an increase in federal funding levels relative to previous years and is needed to expand our portfolio of programs and the amount we invest in each. As genomics moves from the realm of discovery to applications, our researchers must work at a significantly greater scale (entailing the sequencing and analysis of sometimes hundreds of thousands of genomes) to be able to demonstrate the utility of their findings. Further, this funding is needed to address the escalating needs for innovative genomic solutions across key sectors of economic and social importance to Canada, and to enhance translation and the efficient uptake of these solutions, which will fuel our nation's emerging bioeconomy.



There is an opportunity cost to not investing at this time. Without substantial, long-term funding, Canada will be forced to buy genomic solutions invented outside our borders, which will undermine our ability to effectively address sector-based challenges and opportunities unique to Canada. Fewer young Canadians will be trained in the field and fewer home-grown entrepreneurs will emerge, able to transform the knowledge into innovations, economic growth, and new jobs to strengthen our nation.

To date, Genome Canada has delivered an exceptional return on the Government of Canada's visionary investments in genomics. This new funding commitment will put Canada in a strong position to build on its successes and become a leader in the emerging global bioeconomy. In this fast-moving field, the potential gains are enormous. Now is the time to realize that potential and to deliver even greater benefits to Canadians.

<b>Federal Budget 2016 – Five-Year (2016-2021) Investment Summary (in millions of dollars)</b>			
<b>AREAS OF INVESTMENT</b>	<b>FEDERAL GOVERNMENT INVESTMENT</b>	<b>CO-FUNDING TO BE SECURED</b>	<b>TOTAL INVESTMENT</b>
<b>Large-Scale Science</b>	<b>191.0</b>	<b>429.0</b>	<b>620.0</b>
<b>Leading-Edge Technology</b>	<b>157.0</b>	<b>226.0</b>	<b>383.0</b>
<b>Translation</b>	<b>105.0</b>	<b>195.0</b>	<b>300.0</b>
<b>Genome Centre Support *</b>	<b>25.5</b>	<b>25.5</b>	<b>51.0</b>
<b>Total Allocation to Programs</b>	<b>478.5</b>	<b>875.5</b>	<b>1,354.0</b>
<b>Genome Canada Operations*</b>	<b>35.0</b>	<b>0.0</b>	<b>35.0</b>
<b>Total Investments</b>	<b>513.5</b>	<b>875.5</b>	<b>1,389.0</b>

*\* Relates to five fiscal years 2017-18 to 2021-22*