

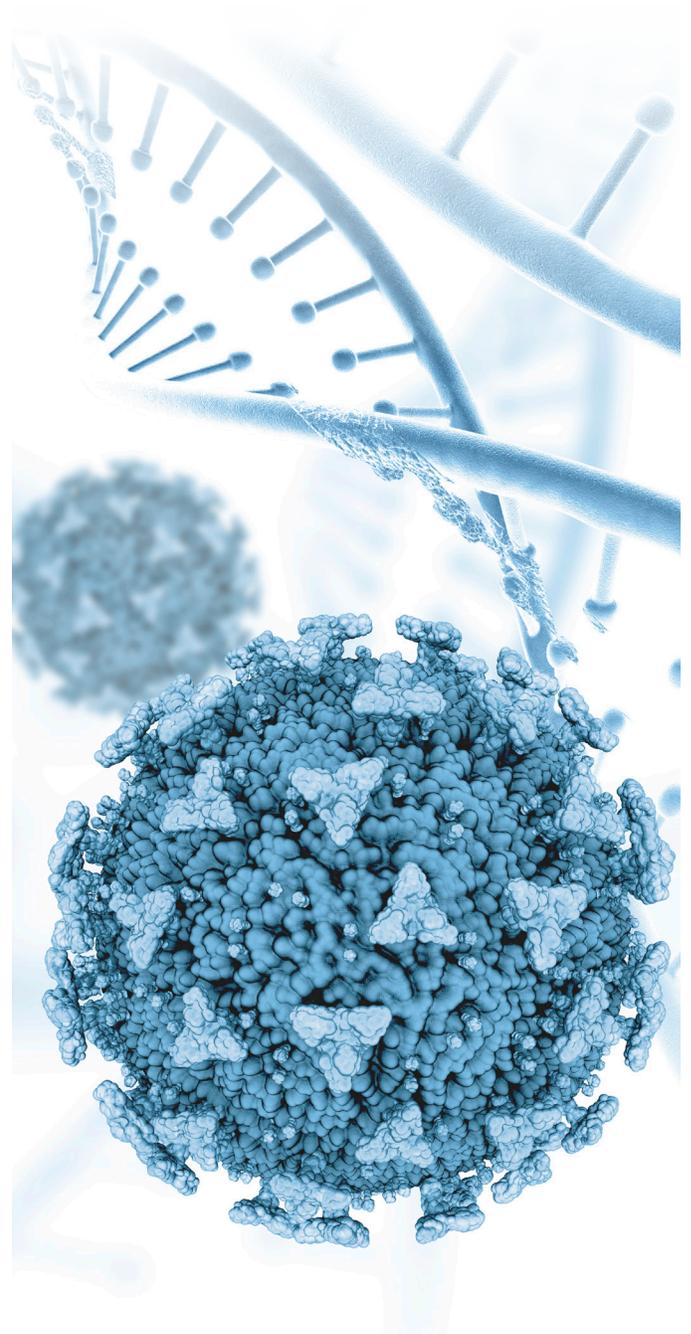


**Leading the Way Toward Recovery, Resilience and Prosperity:
Roadmap for an Integrated Life Sciences
Ecosystem in Ontario**

Context

When reports of a then-unknown respiratory disease first emerged in January 2020, it was difficult to imagine the catastrophic health, societal and economic toll COVID-19 would unleash across the globe.

In the first year of the pandemic, we have tragically witnessed almost 8,000 deaths in Ontario (which have disproportionately impacted elderly and vulnerable populations), widespread business closures, tremendous pressures on our healthcare system and healthcare workers, cancellations or delays in non-COVID-19-related health services (e.g. elective surgeries), soaring demand for mental health support, declines in life satisfaction, a growing unemployment rate and a projected economic impact of ~\$72B.



These personal and societal sacrifices cannot be diminished or discounted, but despite many tragedies, we have been able to navigate through this threat and mitigate the impact of COVID-19 thanks to the Provincial Government’s willingness to collaborate across sectors and Ministries and our strengths across the life sciences ecosystem.

- **We've broken down sectoral barriers and accelerated our response to COVID-19 through public-private partnerships.**

For example, Ontario Genomics led the creation of [ONCOV: Ontario's COVID19 Genomics Rapid Response Coalition](#) that leveraged funding from the [Canadian COVID-19 Genomics Network \(CanCOGen\)](#) to increase viral surveillance through sequencing in Ontario; [McMaster's Centre of Excellence in Protective Equipment and Materials](#) is collaborating with Canadian manufacturers to support retooling and development of personal protective equipment (PPE); and [Ventilators for Canadians Consortium](#), Ontario's [Thornhill Medical](#) and others across Canada are working together to create, scale-up and supply over 10,000 ventilators to the Public Health Agency of Canada.

- **The Provincial government has mobilized resources, made financial commitments (exceeding \$16.3B since the start of the pandemic as of April 2021, including as part of the 2021 provincial budget) and coordinated efforts across sectors to strengthen our response to the pandemic.**

For example, the Provincial government designed: the [Ontario Together Portal](#) to address medical supply challenges early in the pandemic and crowdsource innovative solutions from Ontario's research, business and manufacturing communities; [Supply Ontario](#) to centralize procurement and delivery of PPE and other critical supplies to healthcare workers; the [Ontario Health Data Platform](#) to integrate cross-organizational health datasets to support advanced analytics and decision-making; the [COVIDAlert App](#) initiated by Ontario Digital Service in collaboration with Shopify for contact tracing in 9 provinces/territories; and the [COVID-19 Rapid Research Fund](#) that has already provided over \$20M to combat the pandemic.



- **Ontario's life science organizations stepped up, providing emergency relief (e.g. masks, community support, supply of critical medicines), helping Ontarians access critical healthcare services, and pivoting research and operations to target COVID-19 and produce Ontario-made solutions.**

Select examples include: laboratory testing ([LifeLabs](#)); point-of-care diagnostics ([Spartan Bioscience](#)); N95 respirators ([3M Canada](#)); new PPE through recycling/reprocessing of polypropylene ([Carmina de Young Inc.](#), [LifeCycle Health](#)); remote monitoring and patient management solutions ([AusculSciences](#)); innovation grants and data repositories ([Roche Canada](#)); and vaccine candidates currently in clinical trials ([Medicago](#); [Providence Therapeutics](#)).

Envisioning a Powerful Future

While organizations across the ecosystem have shown an unprecedented degree of agility and ability to rapidly innovate, it is clear that we could have been better prepared for the pandemic. We must learn from this experience. Indeed, COVID-19 has helped us to envision what we need to do to create a more resilient, prepared, and *integrated* life sciences ecosystem—across sectors, across academia, across disciplines, across the innovation continuum, and across government—that not only helps us recover from the pandemic but also positions the Province for health security and economic prosperity into the future.

With the foundational elements already in place, including a world-class academic and research community, leading healthcare institutions, robust healthcare data and a willingness to partner, imagine what our response to current and future pandemics—as well as other existing health crises like cancer—could be if we had:



- Stronger partnerships between the public sector and private companies to advance common priorities, share risk and accelerate impact.
- A more connected, comprehensive, secure and transparent data ecosystem that enhanced our ability to understand disease and its impact, produce relevant innovations and deliver tailored care.
- A globally-competitive and attractive business environment that empowered local companies to stay in Ontario and more easily access readily-available capital.
- A more diverse and inclusive talent pool that enhanced the productivity and novelty of our research and innovation efforts and addressed inequities in times of threat and beyond.
- A more streamlined and proactive regulatory and procurement system that accelerated the pace of science and, ultimately, the adoption of and access to both local and global solutions.
- Strengthened supply chains that allowed our SMEs to compete on a global scale, while partnering with multinational organizations and attracting foreign direct investment into Ontario.
- An empowered, engaged and literate patient population and public actively involved in the innovation process and shaping the life sciences agenda.
- Greater unity among sectors and disciplines across Ontario, our counterparts across Canada and the globe to advance a more holistic view of health and sustainability, inclusive of the wellbeing of individuals, animals, food systems and our planet.

At a time when the importance of the life science sector is more apparent than ever, we must seize this moment to empower a truly integrated life sciences ecosystem that unlocks the globally-competitive potential of our sector.

Our Life Sciences Sector

While the life sciences are often synonymous with human health, they are, in fact, much more encompassing. The life sciences sector in Ontario—and around the world—brings together science, R&D and technology-based products and services that contribute to human, agricultural and environmental/planetary health. The life sciences are interdisciplinary and interconnected, driven by organizations and companies contributing to biohealth (e.g. biopharmaceuticals, diagnostics), bioenergy (e.g. biomolecules, biofuels), bioindustry (e.g. biomaterials, sustainable development) and agri-biotechnologies (e.g. plant and animal genetics, food).

Impact of Ontario's Life Sciences Sector At-A-Glance:



Accounts for **51% of Canada's R&D spending**



Contributes **~\$58B to Ontario's GDP** (top-11 highest contributor, above transportation, information and cultural industries, accommodation and food services, utilities, mining, oil and gas extraction) and \$8.8B in taxes



3rd highest number of companies across sectors in Ontario, above food & beverage, automotive, mining and aerospace sectors



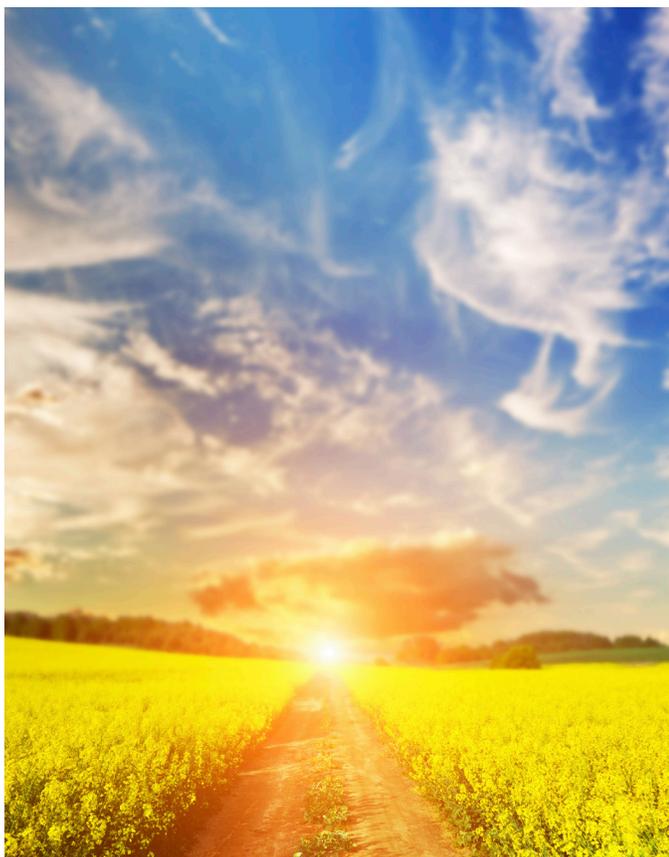
Employs **~90K highly-skilled workers** (Ranking 4th among N. American jurisdictions by life science employment) across more than **6,140 companies** (Ranking 3rd among N. American jurisdictions by life science establishments)



1 in 13 Ontarians work in a job connected to the life sciences sector, sustaining **over 191K jobs** through direct, indirect and induced impacts



The first step towards a coordinated life sciences strategy is the creation of a permanent, industry-government partnership table and a well-defined partnership framework



The Path Forward

Ontario's life sciences sector already has the foundational building blocks in place to achieve impact through a more interconnected ecosystem (See Figure 1). To realize our vision, we must prioritize areas that will integrate these strengths, amplify the collective power of all players and result in a vibrant ecosystem positioned to deliver measurable benefit to Ontario and across the globe.

The following recommendations and actions are priorities that we can and must take now. They are vital to creating a more integrated and productive life sciences sector—and are positioned to deliver near-term impact while setting a foundation for longer-term growth and greater contribution of the life sciences ecosystem to Ontario's future.

The recommendations include different provincial Ministries and sectors, underscoring the need for dialogue, alignment and collaboration across the ecosystem in order to unlock the sector's potential. While some actions also span jurisdictions and fall within federal purview, Ontario has an opportunity to lead the way and demonstrate the impact of these recommendations in delivering a more resilient and secure future.

FOUNDATIONAL BUILDING BLOCKS OF ONTARIO'S LIFE SCIENCES ECOSYSTEM

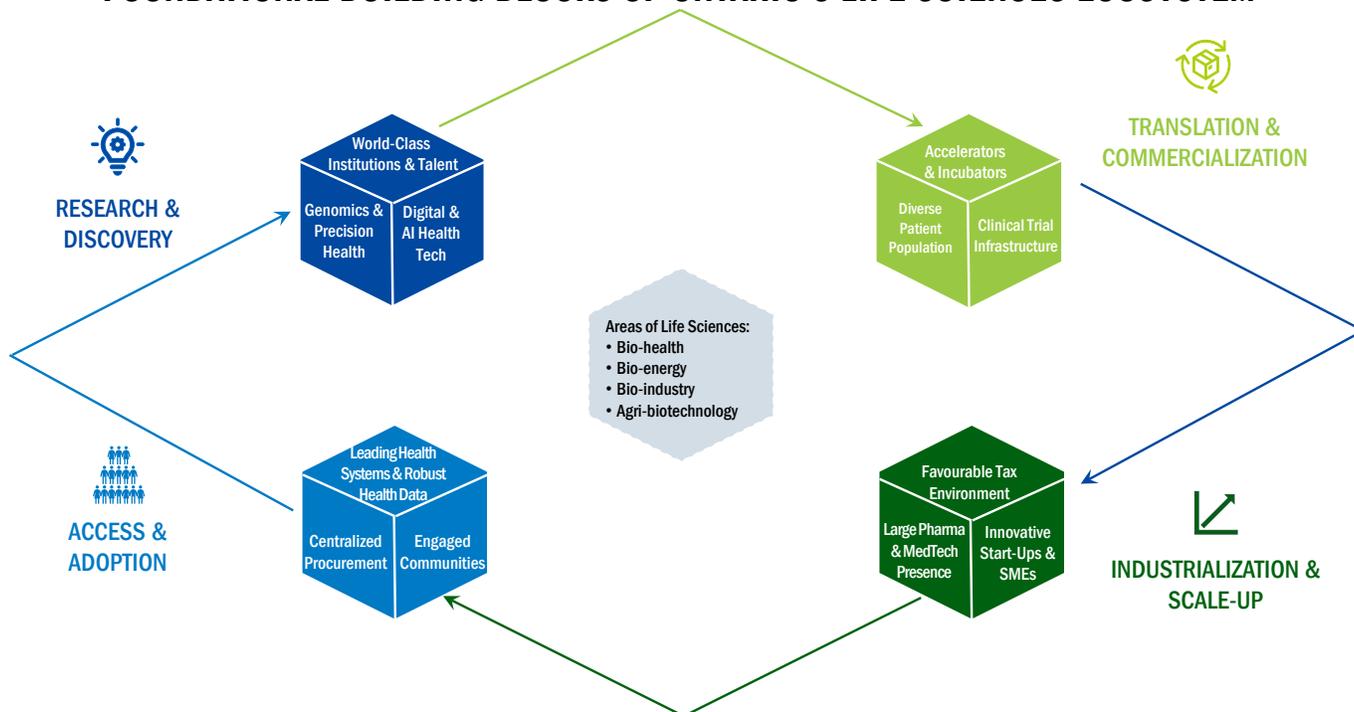


Figure 1



1. UNLOCKING THE FULL POTENTIAL OF PUBLIC-PRIVATE PARTNERSHIPS

To leverage the resources and capabilities of organizations across diverse sectors, foster greater alignment between public and private sector stakeholders and accelerate the development of relevant innovations positioned to make an impact for Ontarians, we must:

- Engage the private sector more deliberately (e.g. creation of a permanent, industry-government partnership table and a well-defined partnership framework) when setting priorities for the Province to ensure market perspectives inform public spending decisions and to foster greater alignment between private sector activities and public system needs.
- Create a system of incubators and accelerators (e.g. Regional Innovation Centres) that are nimble and agile in their ability to partner with the private sector and adopt market-driven principles (i.e. less risk-averse).
- Establish a common set of IP policies across academic institutions (and with private sector partners) to streamline IP transfer processes and ensure shared realization of value.

2. CREATING A MORE ROBUST DATA AND DIGITAL ECOSYSTEM

To make evidence-based decisions related to our healthcare system's readiness, capacity and effectiveness, maximize the value of existing health data in Ontario and ensure our data processes and policies inspire confidence and trust and ensure accountability, we must:

- Invest in and create an interoperable health data infrastructure that connects all levels of Ontario's and Canada's healthcare systems and integrates new technologies and tools (e.g. artificial intelligence, machine learning, big data analytics) that allow for effective and rapid data mining and insight generation.
- Evolve our processes and policies related to data gathering and sharing in a manner that maximizes benefit, minimizes privacy and security risks, and allows for more advanced evaluation of 21st century innovations (e.g. use of real-world data to evaluate precision medicine technologies, integration of diagnostics to support clinical decision-making).
- Establish mechanisms to foster more efficient and robust sharing of data across public and private sectors (e.g. data-sharing agreements, health data repositories) and catalyze new intersectoral collaborations aimed at unlocking the full potential of Provincial data (e.g. Project SPARK).

3. EXPANDING ACCESS TO CAPITAL AND TAX INCENTIVES FOR LIFE SCIENCES COMPANIES

To support the growth of Ontario-based innovations domestically, retain Ontario-based innovators in the Province and position companies for research, development and commercial success, we must:

- Expand existing Scientific Research and Experimental Development (SR&ED) and other related programs (e.g. Life Science Tax Incentive, New Employment Tax Credits, competitive contribution grants and forgivable loans) that help extend companies' capital for early-stage R&D efforts.
- Develop a robust and diverse risk-capital ecosystem by activating early-stage and transformational capital (e.g. angel tax credits, venture capital) and unlocking the capacity for investment by Ontario pension funds.
- Reduce barriers to the pursuit of Initial Public Offering and dual-listing on the Toronto Stock Exchange and US exchanges to provide access to late-stage capital and support company scale-up toward revenue-generation.

4. BUILDING A MORE DIVERSE, INCLUSIVE AND TALENTED LIFE SCIENCES WORKFORCE

Recognizing the criticality of a diverse and talented workforce to driving innovation and maintaining Ontario's competitiveness on a global scale, and to ensure our future life sciences workforce meets the increasingly diverse and evolving needs of the sector, we must:

- Strengthen and broaden a diverse talent pool by: expanding wage subsidies (e.g. Career Focus through BioTalent Canada) and training programs (e.g. access to Ontario's Youth Job Strategy); reducing administrative barriers to employing in-demand talent (either homegrown or foreign); developing, retaining and attracting diverse senior management talent who can scale-up and commercialize Ontario innovations; and, creating provincial incentives for professional development (e.g. education, credits, grants) and subsidies for management development programs.
- Address systemic issues related to equity, inclusion, decolonization and justice for all (e.g. through training and education, dedicated hiring programs and practices) to uplift, attract and entrench a more diverse and inclusive talent pool and workforce.
- Increase investments in life sciences research, infrastructure and people to further elevate Ontario's research efforts, leading to innovative discoveries, new companies, and a strengthened life sciences workforce positioned to attract and grow additional talent.



5. FOSTERING A MORE COMPETITIVE AND RECEPTIVE ENVIRONMENT FOR LIFE SCIENCES INNOVATIONS

To create a thriving business environment that will support the development, scale-up, and commercialization of Ontario-made innovations, we must:

- Embed local SMEs into global supply chains to amplify local scale-up and biomanufacturing capabilities in Ontario.
- Enhance our clinical trial capacity to allow for earlier access to promising treatments, medical devices and other innovations developed in Canada and globally through more streamlined and harmonized regulatory processes to support remote/at-home trials, robust mechanisms to engage patients and the public—including vulnerable populations—in clinical trials (e.g. through national registries, particularly for rare diseases), and resources to communicate Ontario’s and Canada’s clinical trial assets and attract global companies (e.g. single clinical trial portal/concierge service).
- Become first adopters of Ontario-made innovations by creating support programs (e.g. set-aside programs) and fostering an Ontario marketplace that connects local buyers (e.g. hospitals, clinics, government) and sector suppliers (i.e. innovators).



6. ENSURING EARLY AND UNENCUMBERED ACCESS TO INNOVATIONS

To ensure that provincial and federal governments fully appreciate the value of innovation, that mechanisms are in place to procure and adopt made-in-Ontario and made-in-Canada life sciences technologies and solutions, and that Ontarians have equitable access to the necessary goods and innovations, we must:

- Evaluate and modernize approaches to health technology assessments, reimbursement processes and procurement decisions to leverage data-driven insights and recognize the full value of an innovation (e.g. on patient experience and outcomes, health system efficiency, economic productivity, societal impact) across government budgets (recognizing that procurement of innovation by one ministry will realize savings and ROI across ministries).
- Continue to leverage the Province’s purchasing power (e.g. Supply Ontario) and desire for value-based supply chains to ensure organizations across all levels of Ontario’s health system (e.g. community hospitals, private clinics, academic health sciences centres, Ontario Health Teams) have seamless access to innovations to deliver better quality of care.
- Reinforce greater coordination of regulatory and reimbursement decisions at the national level, reduce administrative burden or red-tape (e.g. online drug submission portals, streamlined approval and funding of companion diagnostics, and/or “zero time to list” pilot program) and redundancies across both national and pan-provincial processes.

7. EMPOWERING A MORE ENGAGED AND LITERATE PATIENT POPULATION AND PUBLIC

With patients and the public demanding increasing control of their health, data and consumption of information surrounding science and innovation, we must:

- Enhance the integration of patient and public perspectives across all stages of the research and innovation process—from developing research questions to defining research objectives to collecting and evaluating data to disseminating findings.
- Improve scientific literacy among patients and the public to unlock mutual opportunities to share and benefit from data, enhance engagement and accountability, overcome barriers to healthcare access stemming from low literacy, and minimize vulnerability to misinformation.
- Create opportunities for patients and the public to shape the life sciences agenda and train the life sciences community on how to engage with patients and the public and build awareness about the sector.

8. AMPLIFYING COLLABORATION AND GLOBAL CONNECTIONS ACROSS OUR DIVERSE ECOSYSTEM

To ensure that the life sciences are integrated into all aspects of provincial, national and international economies and policies, we must:

- Foster partnerships and advance innovations that reinforce a One Health focus and integrate human health, agriculture and the environment (e.g. solutions that adapt to and mitigate climate change, ensure global food security and enhance social determinants of health for Ontarians).
- Strengthen relationships with other ministries, including cross-ministerial partnerships (e.g. health, finance, economic development and innovation) and identify pan-government programs that can be leveraged to develop and grow life sciences innovation.
- Align with other leading districts' life sciences strategies (e.g. [Québec Life Sciences Strategy](#), [Massachusetts Life Sciences Initiative](#)) to leverage partnership/development opportunities and share best practices.



Ultimately, investing in areas that will create a more integrated life sciences ecosystem will deliver on the promise of a more secure and resilient health and economic future for Ontario (See Figure 2).

FOUNDATIONAL BUILDING BLOCKS OF ONTARIO'S LIFE SCIENCES ECOSYSTEM

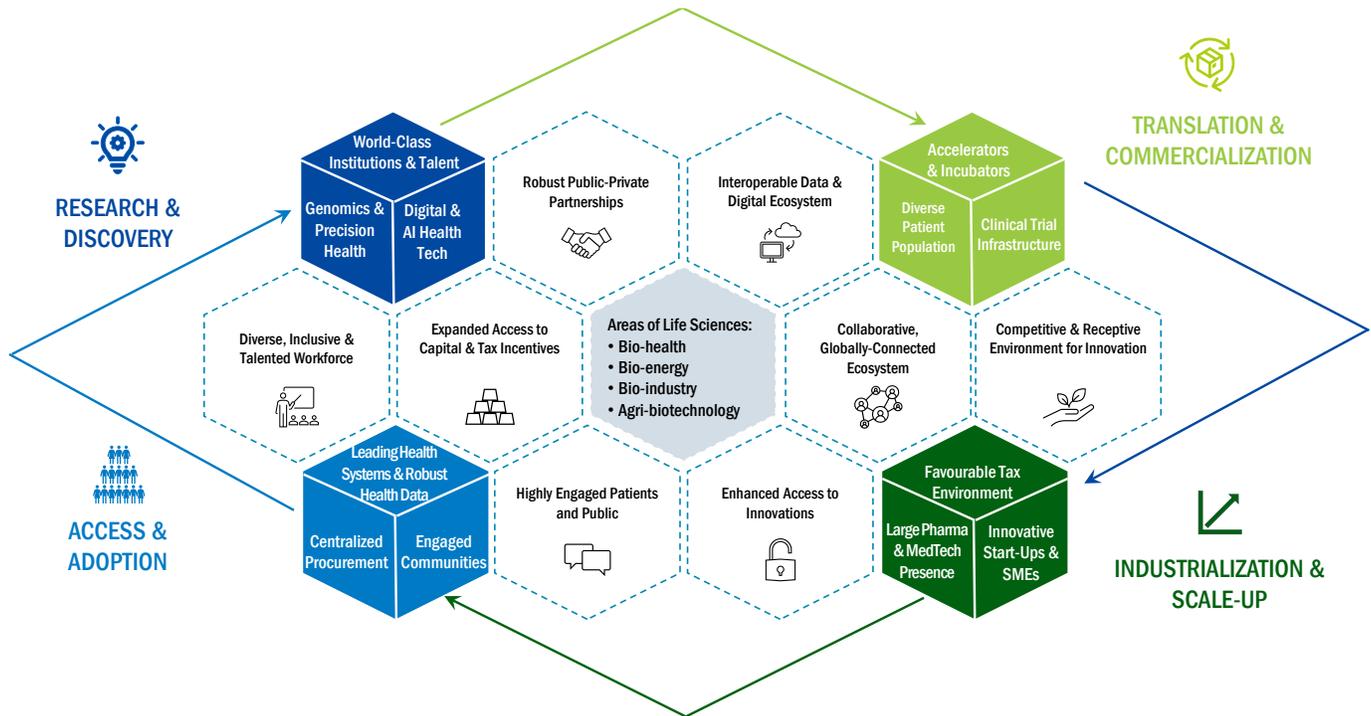


Figure 2

Conclusion



There has never been a brighter spotlight on, or greater sense of urgency, within the life sciences sector. Now is our moment to take concrete action that will ensure preparedness and response to biological threats (e.g. pandemics) and contribute to the health, social and economic recovery and prosperity for Ontarians.

The impact that a more resilient, integrated life sciences sector can—and should—achieve for Ontario will not be possible without buy-in, support and collaboration across our diverse community of stakeholders. Ontario can take the bold step of convening public sector (e.g. provincial ministries, universities, health charities, not-for-profits, patients and public organizations) and private sector stakeholders as part of a formal Life Sciences Advisory Panel to share lessons learned from COVID-19, prioritize and evaluate (e.g. cost-benefit analyses) recommendations, and set a coordinated strategy, vision and plan for a safe, secure and prosperous future for Ontario.

Building on the recommendations and priorities outlined in this Roadmap, Ontario can lead the way for other provinces, paving a path forward as an integrated community of partners. In doing so, Ontario will create a futureproofed innovation and policy environment that will deliver a powerful quadruple bottom-line impact (health, environment, society and economy) for the people of Ontario.



About the Authors

This report is authored by Life Sciences Ontario (LSO) with the support of key partner organizations. LSO's mandate is to drive our sector's commercial success through advocacy, promotion, and collaboration with governments, academia, industry, and other life science organizations in Ontario and across Canada. For more information, visit www.lifesciencesontario.ca.

The Roadmap report was developed in partnership with Shift Health



This report is endorsed by the following partners:



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